



WMCAUS 2017

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World Multidisciplinary
Civil Engineering - Architecture - Urban Planning
Symposium

Eco-friendly Symposium - WMCAUS



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ABSTRACT COLLECTION BOOK

JUNE 12-16
2017
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 12-16 June 2017. 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 2017 is the 2nd 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 700+ submissions by 600+ participants of WMCAUS 2017 from 60+ different countries all over the world for their interests and contributions in WMCAUS 2017. We wish you enjoy the World Multidisciplinary Civil Engineering-Architecture-Urban Planning Symposium – WMCAUS 2017 and have a pleasant stay in the city of romance Prague. We hope to see you again during next event WMCAUS 2018 which will be held in Prague (Czech Republic) approximately in the similar period.

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GREEN INFRASTRUCTURE AS AN OPPORTUNITY TO ENHANCE BIODIVERSITY AND ECOSYSTEM SERVICES

Teodoro Semeraro, Roberta Aretano



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ANALYSIS OF CRITERIA INFLUENCING CONTRACTOR SELECTION USING TOPSIS METHOD

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A MORPHODYNAMIC MODEL SUITABLE FOR RIVER FLOW AND WAVE-CURRENT INTERACTION

Silvia Bosa, Marco Petti, Francesco Lubrano, Sara Pascolo

AN EVALUATION OF INTEGRATED COASTAL ZONE MANAGEMENT PLAN PRACTICES IN THE TURKISH CASE

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RESHAPING OF COASTLINES AS THE BEGINNING OF URBAN STRUCTURES CHANGES IN NORTH POLAND

Izabela Maria Burda, Lucyna Nyka

INTEGRATION OF LAND AND SEA IN A PORT AREA: A CASE STUDY OF THE PORT OF KOPER

Lucija Ažman Momirski



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TEACHING ARCHITECTURE – CONTEMPORARY CHALLENGES AND THREATS IN THE COMPLEXITY OF BUILT ENVIRONMENT

Justyna Borucka, Bartosz Macikowski Gdanska

SPECIFIC SESSION: Places of post urban-conflict

VIOLENT AND NONVIOLENT CHANGES IN THE IMAGES OF CITIES IN THE ARAB SPRING COUNTRIES

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URBICIDE IN BAGHDAD: THE PRODUCTION AND EFFECTS OF SPATIAL DISRUPTION IN THE CITY WITH PARTICULAR REFERENCE TO OPEN GREEN SPACES

Namariq Al-Rawi

WARTIME COPING AND ITS RECONFIGURATION OF THE URBAN SPACE IN ALEPPO CITY DURING THE PROTRACTED SYRIAN CONFLICT

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ON THE SOCIAL MEANING OF SPACE: A QUEBEC EXAMPLE

Pierre-André Tremblay

SPECIFIC SESSION: Spatial analysis for urban planning

THE TRANSFORMATIONS OF TOURIST FUNCTIONS IN URBAN AREAS OF THE KARKONOSZE MOUNTAINS (POLAND)

Katarzyna Przybyła, Alina Kulczyk Dynowska

POVERTY RISK INDEX AS A NEW METHODOLOGY FOR SOCIAL INEQUALITY DISTRIBUTION ASSESSMENT

Malgorzata Swiader, Szymon Szewranski, Jan Kazak

SPATIAL TOURIST AND FUNCTIONAL DIVERSITY ON THE VOLCANIC ISLAND OF GRAN CANARIA

Eleonora Gonda-Soroczynska, Hanna Olczyk

LANDSCAPE CHANGE INDEX AS A TOOL FOR SPATIAL ANALYSIS

Piotr Krajewski, Barbara Mastalska-Cetera, Iga Solecka

URBAN SPRAWL IMPACT ON FARMLAND CONVERSION IN SUBURBAN AREA OF WROCŁAW, POLAND

Iga Solecka, Marta Sylla, Malgorzata Swiader



COSTS OF URBANISATION IN POLAND, BASED ON THE EXAMPLE OF WROCŁAW

Maria Heldak, Monika Pluciennik

VALUATION OF RESIDENTIAL PREMISES FOR THE PURPOSES OF SECURING THE RECEIVABLES OF THE CREDITOR IN POLAND

Maria Heldak, Agnieszka Stacherzak

APPLICATION OF SPATIAL MODELS IN MAKING LOCATION DECISIONS OF WIND POWER PLANT IN POLAND

Monika Pluciennik, Maria Heldak, Jakub Szczepanski, Ciechosław Patrzalek

SPECIFIC SESSION: Urban planning revisited: new challenges, theories and methods

THE ASSESSMENT OF THE ECOSYSTEM SERVICES CAPACITY IN NATURAL PROTECTED AREAS FOR BIODIVERSITY CONSERVATION

Silvia Ronchi, Stefano Salata

MONITORING THE URBAN VEGETATION CHANGE IN 13 CHILEAN CITIES LOCATED IN A RAINFALL GRADIENT: WHAT IS THE CONTRIBUTION OF THE MASSIVE CREATION OF NEW URBAN PARKS?

Francisco de la Barrera, Cristian Henriquez P.

AN INTEGRATIVE APPROACH TO ASSESS URBAN RIPARIAN GREENWAYS POTENTIAL: THE CASE OF MAPOCHO RIVER IN SANTIAGO DE CHILE

Alexis Vasquez

URBAN INFORMALITY IN SANTIAGO DE CHILE: THE "CALLAMPAS" BETWEEN 1947-1970

Emanuel Giannotti

URBAN GREENWAY SUITABILITY ANALYSIS

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GREEN SPACE MANAGEMENT IN THE FACE OF INADEQUATE DATA IN URBAN PLANNING: ŁÓDŹ (POLAND) CASE STUDY

Marcin Feltynowski, Jakub Kronenberg

FUNCTIONAL USE CHANGE IN GREEN SPACES: A CASE STUDY OF KIRKLARELI PROVINCE (TURKEY)

Beyza Sat Gungor

GREEN INFRASTRUCTURE ASSESSMENT FOR URBAN PLANNING: THE CASE OF TWO CHILEAN COASTAL CITIES

Alexis Vasquez, Emanuel Giannotti, Paola Velasquez



SPECIFIC SESSION: Water Hazards Engineering

**NUMERICAL LIMITATIONS OF 1D HYDRAULIC MODELS USING MIKE11 OR HEC-RAS SOFTWARE:
STUDY CASE BARAOLT RIVER, ROMANIA**

Andrei Armas, Robert Beilicci, Erika Beilicci

**INTEGRATED WATER HAZARDS ENGINEERING BASED ON MAPPING, NATURE-BASED AND
TECHNICAL SOLUTIONS**

Rares Halbac-Cotoara-Zamfir, Jannes Stolte, Sorin Herban, Csaba Bozan

SPECIFIC SESSION: Urban Planning with multidisciplinary approach

THE GEOGRAPHY OF CRIME AND ITS RELATION TO LOCATION: THE CITY OF BALIKESIR (TURKEY)

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**TRACES OF CULTURAL IDENTITY IN THE DESIGNS OF APARTMENT BLOCKS: THE CASE OF
HISTORICAL TRAIN LINE OF IZMIT (TURKEY)**

Senem Müştak, Nevnihal Erdoğan

THE RISE AND THE FALL OF TIOS-TIEION

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KOCAELI (TURKEY)**

Sonay Ayyıldız, Filiz Ertürk, Şahin Durak, Alper Dülger

**THE SPATIAL CHARACTER ANALYSIS OF STREETS AS PUBLIC SPACES: THE CASE OF HURRIYET
AND CUMHURİYET STREET IN IZMIT (TURKEY)**

Mehtap Özbayraktar, Merve Pekdemir, Qumru Mirzeliyeva

**DESIGN OF A GIS-BASED CAMPUS INFORMATION SYSTEM: THE CASE OF GAZI UNIVERSITY
(ANKARA-TURKEY)**

Ümit Yurt, Halil Yılmaz, Şule Tüdeş

**INFORMATION SYSTEM: A CASE STUDY IN GAZI FACULTY OF SCIENCE & ARTS CAMPUS AREA,
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Halil Yılmaz, Ümit Yurt, Şule Tudeş, Hanifi Tokgöz

**GLOBALIZATION IMAGE ON ARCHITECTURE: TALL AND ULTRA-MODERN BUILDINGS OF ANKARA
(TURKEY)**

Ahmet Tanju Gultekin

**AN EVALUATION OF THE CONSERVATION OF MODERN ARCHITECTURAL HERITAGE THROUGH
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Nevin Gultekin



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URBAN AND SPATIAL OPPOSITION BY THE SUBJECT

Gizem Saka, Nazan Kirci

AN ASSESSMENT OF SELÂNIK STREET (ANKARA, TURKEY) AS A LIVING URBAN SPACE

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BUSINESS MANAGEMENT IN SUSTAINABLE BUILDINGS

Arzuhan Burcu Gultekin, Neset Kutay Karaca

ASSESSMENT OF TEMPORARY AND PERMANENT HOUSING PROBLEMS AFTER DISASTER

Seher Ozkazanc, Aysu Ugurlar

AN EVALUATION ON LIVING PUBLIC SPACES AND THEIR QUALITIES: CASE STUDY OF KONUR, KARANFIL AND YUKSEL STREETS (ANKARA, TURKEY)

Nilufer Gurer, Burcu Imren Yavuz, Ibrahim Kavak

THE VALUE OF SUSTAINABILITY IN ARCHITECTURAL DESIGN AND REAL ESTATE DEVELOPMENT: A REVIEW OF AN ARCHITECT AS A REAL ESTATE VALUER

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THEORETICAL APPROACHES IN THE CONTEXT OF SPATIAL PLANNING DECISIONS AND THE RELATION WITH URBAN SUSTAINABILITY: A PROPOSAL

Kadriye Burcu Yavuz Kumlu, Sule Tudes

THE IMPACT OF STRUCTURAL DAMAGE IN URBAN TRANSFORMATION DECISION MAKING: THE ANKARA (TURKEY) EXAMPLE

Sinan Gunes, Umit Gedik, Yesim Aliefendioglu

MULTIDISCIPLINARY APPROACH DEVELOPMENT MODEL FOR EARTHQUAKE-SENSITIVE URBAN PLANNING

Nur Banu Ozdemir, Sule Tudes

SOLID WASTE LANDFILL SITE SELECTION IN THE SENSE OF ENVIRONMENT SENSITIVE SUSTAINABLE URBANIZATION: IZMIR (TURKEY) CASE

Sule Tudes, Kadriye Burcu Yavuz Kumlu

THE LIQUEFACTION POTENTIAL OF THE SETTLEMENT AREA OF SUSURLUK (BALIKESIR, NW TURKEY) IN THE CONTEXT OF EARTHQUAKE SENSITIVE URBANIZATION

Sule Tudes, Osman Samed Özkan, Nurcihan Ceryan, Sener Ceryan

SPECIFIC SESSION: Technology, organization and management in construction projects

DATA FLOW PROBLEM IN RELATION TO LIFE CYCLE COSTING OF CONSTRUCTION PROJECTS IN THE CZECH REPUBLIC

Vojtech Birolek, Tomas Hanak, Ivan Marovic



OPTIMIZATION MODEL FOR THE DESIGN OF MULTI-LAYERED PERMEABLE REACTIVE BARRIERS

Mieczysław Połoński, Katarzyna Pawluk, Iwona Rybka

CONTRACTORS` CLAIMS AS A FACTOR OF SCHEDULE AND COST RISK IN CONSTRUCTION WORKS

Iwona Rybka, Elżbieta Bondar-Nowakowska, Katarzyna Pawluk, Mieczysław Połoński

EVALUATION OF SUPPLY CHAIN MANAGEMENT SYSTEMS USED IN CIVIL ENGINEERING

Michał Tomczak, Łukasz Rzepecki

UPDATING LINEAR SCHEDULES WITH LOWEST COST: A LINEAR PROGRAMMING MODEL

Sławomir Biruk, Piotr Jaśkowski, Agata Czarnigowska

MINIMIZING PROJECT COST BY INTEGRATING SUBCONTRACTOR SELECTION DECISIONS WITH SCHEDULING

Sławomir Biruk, Piotr Jaśkowski, Agata Czarnigowska

RISK MANAGEMENT IN CONSTRUCTION PROJECT: TAKING INTO ACCOUNT THE PHENOMENON OF FAIRNESS

Jarosław Górecki

INFLUENCE OF SELECTED STAKEHOLDERS OF CONSTRUCTION INVESTMENT PROJECTS ON THE COURSE OF PROJECT

Jadwiga Bizon-Górecka, Jarosław Górecki

FORMS OF RELATIONSHIP AGREEMENTS IN CONSTRUCTION PROJECTS

Elżbieta Radziszewska-Zielina, Bartłomiej Szewczyk

PROPOSAL OF THE USE OF A FUZZY STOCHASTIC NETWORK FOR THE PRELIMINARY EVALUATION OF THE FEASIBILITY OF THE PROCESS OF THE ADAPTATION OF A HISTORICAL BUILDING TO A PARTICULAR FORM OF USE

Radziszewska-Zielina Elżbieta, Słodowski Grzegorz

POTENTIAL OF PROGRESSIVE CONSTRUCTION SYSTEMS IN SLOVAKIA

Maria Kozlovska, Marcela Spisakova, Daniela Mackova

IDENTIFICATION AND PROFILING THE PATTERN OF CONSTRUCTION ACCIDENTS

Wojciech Drozd

INFLUENCE OF CEMENTS CONTAINING CALCAREOUS FLY ASH AS A MAIN COMPONENT ON PROPERTIES OF FRESH CEMENT MIXTURES

Jacek Golaszewski, Tomasz Ponikiewski, Aleksandra Kostrzanowska-Siedlarz, Patrycja Miera Silesian

ASSESSMENT OF MATERIAL SOLUTIONS OF OFFICE BUILDING STRUCTURE WITHIN INTEGRATED LIFE CYCLE DESIGN PROCESS

Daniel Walach, Joanna Sagan, Magdalena Gicala



THE IDENTIFICATION OF THE CAUSES OF ACCIDENTS AT WORK WITH THE PARTICIPATION OF SCAFFOLDING AS AN EXAMPLE OF LOWER SILESIA

Mariusz Szostak, Bożena Hola, Anna Hola, Marek Sawicki

THE METHODOLOGY OF VARIANTS ASSESSMENT OF CONSTRUCTION PROJECTS WITH THE USE OF GRAPHICAL METHODS IN MULTI-CRITERIA ANALYSIS - SYSTEM APPROACH

Elżbieta Szafranko

APPLICATION OF EARNED VALUE METHOD FOR EVALUATION THE TIME/COST CONSEQUENCES OF VARIATION ORDERS IN A CONSTRUCTION PROJECT

Andrzej Czemplik

IMPACT OF ICT ON PERFORMANCE OF CONSTRUCTION COMPANIES IN SLOVAKIA

Peter Mesaros

PROBLEMS OF TECHNOLOGY OF ENERGY-SAVING BUILDINGS AND THEIR IMPACT ON ENERGY EFFICIENCY IN BUILDINGS

Malgorzata Fedorczyk-Cisak, Marcin Furtak, Katarzyna Knap, Pawel Kwasnowski

SPECIFIC SESSION: Urban heat island effects: from urban scale to buildings and health

NATURAL VENTILATION AS A MITIGATION STRATEGY TO REDUCE OVERHEATING IN BUILDINGS UNDER URBAN HEAT ISLAND

Massimo Palme

KEY PARAMETERS FOR URBAN HEAT ISLAND ASSESSMENT: SENSITIVITY ANALYSIS WITH URBAN WEATHER GENERATOR MODEL

Agnese Salvati, Massimo Palme

A COOL URBAN ISLAND CHANGE 1990-2014: COMPARATIVE BIOCLIMATIC ANALYSIS IN A DESERT CLIMATE, THE CASE OF ANTOFAGASTA CITY SQUARE

Gino Perez Lancellotti, Marcela Ziede Bize

DYNAMIC-PHYSICAL MODEL TO ANALYZE SOLAR CHIMNEYS IN DIFFERENT CLIMATE ZONES: CASE OF SOCIAL HOUSING IN ECUADOR

Luis Godoy Vaca, Manuel Almaguer, Javier Martinez, Andrea Lobato

HEAT ISLAND EFFECT ON ENERGY CONSUMPTION IN INSTITUTIONAL BUILDINGS IN ROME

Claudia Calice, Massimo Palme, Carola Clemente, Agnese Salvati

ENERGY EFFICIENCY AS A KEY FACTOR IN SUSTAINABLE CONSTRUCTION: CASE STUDY OF THE SUSTENTA BUILDING, ROSARIO, ARGENTINA

Marcelo Vega, Natalia Feldman, Rubén Piacentini

URBAN HEAT ISLAND OF VALPARAISO, CHILE. A COMPARISON BETWEEN 2007 - 2016

Claudio Carrasco, Massimo Palme, Miguel A. Galvez H., Andres Fonseca M.



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SPECIFIC SESSION: Education-based research and research-based studio as a method of better architecture design education

INTEGRATION OF SPACE LAYOUT AND COMMUNICATION TECHNOLOGY IN HEALTHCARE DESIGN WITH ETHIOPIAN CONTEXT

Siraje Tuha Muhammed, Fathi Bashier

THE DESIGN PROCESS-SYSTEM AS A DUAL FORM OF EDUCATION-BASED RESEARCH

Fathi Bashier

DISTRICT 13 HOUSING PROJECT, BAHIRDAR (ETHIOPIA): WITH EMPHASIS ON OPTIMIZATION OF SUSTAINABLE PERFORMANCE

Gediwon Yibelo Mesfin

TRANSFORMING EXISTING TRADITIONAL CLASSROOM SPACE: A SMART CLASSROOM DESIGN APPROACH FOR ETHIOPIAN UNIVERSITIES, A CASE OF UNIVERSITY OF GONDAR (ETHIOPIA)

Abdurahman Mahmud Mahammedsied, Fathi Bashier

AN ACADEMIC STAFF RESIDENCE, WOLLEGA UNIVERSITY: AN ENVIRONMENTALLY INTEGRATED DESIGN APPROACHES

Negesse Eshetu

THE IMPACT OF GLASS FACADE ON USER'S COMFORT- THE CASE OF RADIATION VULNERABLE OFFICES IN ADDIS ABABA, ETHIOPIA

Dawit Melaku

TOWARDS USABLE PARKS- LEARNING FROM THE CITY PARKS OF ADDIS ABABA

Semere Zeru, Yohannes Haile

ARCHITECTURAL HERITAGE CONSERVATION IN ETHIOPIA: TRENDS AND CHALLENGES

Sofanit Tegene Tesfaye



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Session Title:

Construction Management and Engineering



**A BRIEF OVERLOOK ON THE OCCUPATIONAL ACCIDENTS OCCURRING DURING THE
GEOTECHNICAL SITE WORKS**

Ozge Akboga Kale, Tugba Eskisar

Ege University, Izmir, Turkey

ABSTRACT

There is an increasing trend among researchers and private company specialists considering the effects and results of occupational accidents. This positive awareness is still somehow limited in research, especially dealing with the details of accidents. The construction industry is in the top three industries that is under the risk of occupational accidents. For this reason, every process of construction needs to be investigated separately to provide continuous occupational safety in site works. The construction industry consists of different branches of civil and environmental engineering works. Among them geotechnical site works constitute the first step regardless of the end use of the newly built structures. Besides, alteration, renovation, and maintenance or repair of structures also need the geotechnical processes to be applied for safe and economical solutions. Geotechnical site works are comprehensive, therefore the potential risk of accidents show diversity from project to project. During the early stages of this study, it was detected that although there has been several accidents ended up with fatalities and injuries, the scope of reporting was scarce and reaching the required information was quite difficult in geotechnical works as the previous regulations did not obligate to report the detailed features of the incidents. In order to fulfil the gap in this topic it is aimed to perform sufficient and accurate data mining of geotechnical site works and to analyse datasets for investigating the root causes of accidents. Occupational Safety and Health Administration (OSHA) is chosen from the available databases as a source because it has a wide data range varying from 1984 to 2013. Also, this administration provides detailed information for each case and right to know for academic purposes. 133 cases that resulted with fatalities are detected during Geotechnical construction works. Descriptive and bivariate statistical analyses, including the numerical outcomes are performed to discuss the created variables such as; end use, project type, the cost of a project, the nature of the accident, occupation of the victim, the cause of an accident and the cause of fatality. According to findings; it is seen that the majority of victims were construction labourers or in special trade constructors who were working on a new project or new additions to an existing project. The geotechnical phase of the projects was whether excavation, landfill, sewer-water treatment, pipeline construction, commercial building or road construction. As the outcomes of the study it is evaluated that excavation, trenching and installing pipe or pile driving were the main causes of the accidents while trench collapse, struck by a falling object / projectile and wall collapse were the main causes of fatality. Moreover, it is established that more than half of the fatalities were due to asphyxia followed by fracture. These findings show that accidents occurred in geotechnical works do not only have high frequency but also high severity. This study emphasizes project specific countermeasures should be taken regarding the nature, cost and importance of the project and the occupations working on the project.



CRITICAL ICT-INHIBITING FACTORS ON IBS PRODUCTION MANAGEMENT PROCESSES IN THE MALAYSIA CONSTRUCTION INDUSTRY

Peniel Ang Soon Ern 1, Zuhairi Abd Hamid 2, Narimah Kasim 3

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ABSTRACT

Industrialized Building System (IBS) is one of the approaches that had been introduced as an alternative to conventional building method where it becomes the new strategy of enhancing the sustainable construction in current industries while spearheading a huge advancement of benefits with green constructions into the existing industries. The IBS approach is actively promoted through several strategies and incentives as an alternative to conventional building methods. Extensive uptakes of modern Information Communication Technology (ICT) applications are able to support the different IBS processes for effective production. However, it is argued that ICT uptake at the organisational level is still in its infancy. This raises the importance to identify critical barriers which are inhibiting the effective uptake of ICT in the IBS production management process. Critical barriers to ICT uptake were identified through an indepth semi-structured interview and questionnaire survey with the IBS industry stakeholders. The qualitative data was analysed with Nvivo software whilst the mean index and critical t-values are generated with the use of the quantitative tool, Statistical Package for Social Sciences (SPSS). The top ten priority ranked barriers reflect the Cost, People and Process elements to ICT uptake. High costs in acquiring the technologies and resistance to change were some main concerns from the findings. Several suggestions are included to enhance ICT uptake in the IBS production management processes. Top management support and commitment and cooperation from the government policy to promote and implement ICT were vital ICT drivers deemed important by the IBS industry players for the acceleration of ICT implementation on the IBS supply chain construction management in Malaysia.



MARKET INNOVATION, RATIONAL HOUSING SUPPLY AND URBAN QUALITY AT THE NEIGHBORHOOD SCALE

Valentina Puglisi, Alberto Celani

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ABSTRACT

Innovation of product, process and markets are the three categories to assess the improvement of a sector. This document is aimed to provide a review of papers about innovation in housing market and analyses solutions adopted by the international market in terms of definition of attributes of housing products. Enlightening aspects linked to quality attributes of housing products and it has been tried to read a common scheme in any study analysed to provide solutions to set innovation hints to enhance market innovation in the sector. The idea of choice, user and buyer categories definition, assessment and rating system is the backbone of the paper, as the parallelism between marketing of industrial goods and services and built environment objects. Quality of the neighbourhood and the idea of an ex-post assessment is the theme behind the last case presented, based on a research made by ABC Department of Politecnico di Milano in a neighbourhood in Milano, aimed to assess its quality.



NUMERICAL SIMULATION OF THE GROUND RESPONSE TO THE TIRE LOAD USING FINITE ELEMENT METHOD

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ABSTRACT

Response of the pavement to the excitation caused by the moving vehicle is one of the actual problems of the civil engineering practice. The load from the vehicle is transferred to the pavement structure through contact area of the tires. Experimental studies show non-uniform distribution of the pressure in the area. This non-uniformity is caused by the flexible nature and the shape of the tire and is influenced by the tire inflation. Several tire load patterns, including uniform distribution and point load, were involved in the numerical modelling using finite element method. Applied tire loads were based on the tire contact forces of the lorry Tatra 815. There were selected two procedures for the calculations. The first one was based on the simplification of the vehicle to the half-part model. The characteristics of the vehicle model were verified by the experiment and by the numerical model in the software ADINA, when vehicle behavior during the ride was investigated. Second step involved application of the calculated contact forces for the front axle as the load on the multi-layered half space representing the pavement structure. This procedure was realized in the software Plaxis and considered various stress patterns for the load. The response of the ground to the vehicle load was then analyzed. Axisymmetric model was established for this procedure. The paper presents the results of the investigation of the contact pressure distribution and corresponding reaction of the pavement to various load distribution patterns. The results show differences in some calculated quantities for different load patterns, which need to be verified by the experimental way when also ground response should be observed.



AN APPLICATION OF 6D BUILDING INFORMATION MODEL ON PRACTICAL EXAMPLE OF BUSINESS-STORAGE BUILDING IN SLOVENIA

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ABSTRACT

Operation and maintenance for the building represents the longest in whole building lifecycle and its duration is highly dependent on regular and timely maintenance. Nowadays, possibilities for more efficient building management can be addressed from the perspective of modern approach to building modelling, named building information modelling (BIM). BIM approach deals with the various dimensions from 3D to 6D and for a period of building operation the 6D BIM is important. The aim of the paper is to present an application of 6D BIM model for real business-storage building in Slovenia. First, features of building maintenance in general are described according to the current Slovenian legislation, and also a general principle of BIM is given. After that, step-by-step activities for modelling 6D BIM are exposed, namely from Element list for maintenance, determination of their lifetime and service measures, cost analysing and time analysing to 6D BIM modelling. Presented 6D BIM is designed in a unique way in which cost analysis is performed by using Vico Office software, integrated with 3D model, whereas time analysis is carried out with the help of Excel (without connection to 3D model). The paper is intended to serve as a guide to the building owners to prepare 6D BIM and to provide an insight into the relevant information about intervals and costs for execution of maintenance works in the whole building lifecycle.



APPLICATION OF GAME THEORY TO THE PROBLEM OF BIDDING FOR CONTRACTS

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ABSTRACT

The authors are concerned with a bidding problem. There are two companies (P1 and P2) bidding for a highway construction project. In order to be more competitive, P1 considers buying a new gravel pit near the construction site. The basic cost of the pit is known to both companies. However, there is also an additional, hidden, cost (C) known only to P1. P2 is uncertain whether the hidden cost is $C = 0$ or $C = x$. P1 plans to bid for the job, but has to decide whether to buy the gravel pit. P2, not having a complete knowledge about C , thus not knowing the strategy choice of P1, has to decide if to bid for the job. In effect we have two payoff matrices, one for the additional cost $C = 0$, and the other one for $C = x$. If the probability of P2 bidding for the project can be estimated by propagating intelligence information through a Bayesian Belief Network, the best strategy for P1 can be readily determined. Otherwise, the solution calls for changing this game of incomplete information (players may or may not know some information about the other players, e.g., their "type," their strategies, payoffs) into a game of imperfect information (players are simply unaware of the actions chosen by other players). This is achieved by introducing an additional "Nature" node which for this problem determines with some probability " p " the additional cost $C = 0$ (thus, $C = x$ with probability $1-p$). The solution of this game turns out to depend on the probability " p ". For some values of p the game is solved with pure strategies, whereas for other values the game is in equilibrium when the players randomly mix their strategies.



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THE INFLUENCE OF PROPERTY DIVISION ON THE TECHNICAL CONDITION OF A BUILDING

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ABSTRACT

In this article, the correlation between a technical condition of a building and a division of the land the building is situated on is analyzed and assessed. In the course of the usage of a building, the process of its degradation and the increase in the demands of property occupants can be observed. There is a direct connection between the difficult technical condition of a building and the fragmentation of the ownership structure. Although not considered in the literature, it is noticeable in expert opinions and building inspections. Due to the above-mentioned connection, the renovations of the property are not very effective and justified from an economical point of view.



FORMAL AND LEGAL ASPECTS OF BUYING AND COMMISSIONING FLATS

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ABSTRACT

Formal and legal aspects of buying flats and their reception is very current topic and touches wide group of buyers. Annually in Poland great amount of flats is being sold and put to use. However, the case of housing purchase requires knowledge of both the construction and the legal aspects each buyer has to encounter. The paper faces the subject of formal and legal aspects, and analyzes accompanying procedure of purchase and reception of housing in Poland. The article presents principles associated with the acquisition of a dwelling, process of works reception, removal of detected faults, fault-free reception, transfer of ownership, warranties, guarantees and possibilities of their enforcement. Contracting parties of the developer agreement were revealed. In addition the entities present in the course of works such as general contractor were mentioned, due to the fact of his direct influence on the results of a contract terms between developer and buyer. Logical connection between three parties (buyer-developer-general contractor) were shown and direct and indirect dependencies were revealed. Existing laws and regulations that govern the relationship between the developer and the buyer of a dwelling were determined showing basic rights and responsibilities of each. The article also presents problems resulting from delaying the completion of works by developers fault and indicates possible legal paths to follow in order claim their rights. Due to the fact, that many of discussed formal and legal aspects in this subject have their origin connected to construction works and design issues, author suggests increased quality control and efficient work organization in order to solve problems before appearance.



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**DESIGN, SPECIFICATION AND CONSTRUCTION OF SPECIALIZED MEASURING SYSTEM IN THE
EXPERIMENTAL BUILDING**

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ABSTRACT

Experimental buildings for "in situ" tests are a very important tool for collecting data on the energy efficiency of energy-saving technologies. One of the most advanced in Poland buildings of this type is the Maloposkie Laboratory of Energy-saving Buildings at Cracow University of Technology. The building itself is used by scientists as a research object to test energy-saving technologies. It is equipped with a specialized measuring system consisting of approx. 3 000 different sensors distributed in technical installations and structural elements of the building (walls, ceilings, cornices) and the ground. The authors of the paper will present the innovative design and technology of this specialized instrumentation. They will discuss issues arising during the implementation and use of the building.



OPTIMIZATION OF COST OF MULTI-STOREY BUILDING WITH CONCRETE SLABS BASED ON THE MATURITY METHOD

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ABSTRACT

The maturity method is a well-known technique for determination of mechanical properties of the concrete (e.g. compressive strength) based on the development of temperature during hardening. The compressive strength of concrete can be used to determine necessary striking time of the formwork. Use of this method for this purpose is economically effective (Carino (2004)) and provides necessary safety measures (Klemczak & Krause (2005)). This method is used in many construction sites (Myers (2000)). Time of formwork striking depends on many factors e. g. class of concrete, grade of cement, type of cement, temperature, size of the element and air humidity. The existing technical standards and scientific research on the striking of formwork present different estimated for the striking time. Striking time for the main structural elements ranges from 14 to 21 days. For structural elements such as slabs or beams with a span of more than 6 m need to reach the minimum of 85% of their designed strength to remove the formwork. During the construction of the buildings in summer concrete acquires the required strength for striking of the formwork faster due to the higher ambient temperature. Knowing the maturity method we are able to estimate the compressive strength of concrete. If concrete have the required strength, the striking time can be shortened. This allows to reduce the overall costs of construction. The more concrete works are done during the construction phase the bigger the generated savings. In this article costs and construction schedule of a multi-storey residential building with concrete slabs was determined. The calculation of costs was based on the prices from the last quarter of 2016. Construction schedule is based on the Katalog Nakładów Rzeczowych (Contractors Estimator for estimates of time and work necessary for construction). The structure was subjected to 30 different simulated weather conditions typical for the Central and Western Europe that varied by localization and starting time of the construction. Based on simulated weather conditions the temperature in structural elements was established. The results allowed to determine the formwork striking time using the maturity method. Presented analysis shows that use of the maturity method on construction site can result in lower overall costs due to shorter time of constructing.



**BIM METHODOLOGY IMPLEMENTATION FOR INFRASTRUCTURE DESIGN AND MANAGEMENT. SS 372
- TELESINA: SANNITI VIADUCT CASE STUDY**

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ABSTRACT

The construction industry's growth and its constant interest in making the building process more efficient have caused Building Information Modelling (BIM) technology to show interesting advances in the last few years. However, BIM for infrastructure did not have the same growth rate compared to vertical constructions. The need for optimizing infrastructure projects have led BIM for infrastructure to be considered one of the most promising developments in the infrastructure sector. Governments around the world have invested in BIM education and research with the goal of including this tool in the design, construction and maintenance phases of infrastructure projects, but results are far to achieve their goals. For this reason, the purpose of the research is to define a strategy for developing BIM methodology in the infrastructure field, taking account of programming and monitoring activities of Construction Management (CM) since the early stages of a project. Research developments was based on the "Sanniti Viaduct" from Telesina State Road 372 doubling project, which is a case study provided by ANAS, an Italian State-run company, actively interested in BIM implementation. Focusing our effort on a limited extension, an analysis from territorial to detailed scale was carried out, which comprise part of the road and the "Sanniti viaduct". A detailed model of the viaduct have been developed, considering the concept stage documentation. Through the application of specialized software, a construction management research considering timing and costs has been done. The analysis is divided into three different phases, with the aim of reaching a clear and reasonable procedure explanation. The first phase regards the infrastructure management from its geographic contextualization to the detailed analysis and observation; a second phase includes investigations about the development and implementation of the BIM procedure for infrastructure parametric objects and viaduct modeling; the third phase describes the viaduct project management analysis, where a work breakdown structure was developed following the construction firm criteria and, based on this, a cost and time project analysis was performed. Model construction steps description, interoperability issues and BIM implementation are described. A final simulation was done with the objective of enabling the visualization of the progress of construction activities and its related costs over time. As results, a BIM methodology process it is possible also for infrastructures. Good interoperability is crucial to obtain the expected results, but it still needs major improvements, especially between modeling software. Best way to handle CM is related to a consistent effort in the early stage of model definition, which comprise the correct parameters and exchange formats selection. In conclusion, it is possible to assume that the usage of precise planning and designing the overall process in detail might decrease the risk of making mistakes later on in the construction process.



REVIEW AND PROSPECT OF BIM POLICY IN CHINA

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ABSTRACT

In the process of architectural design, construction, operation and maintenance, the problem of inefficiency and inaccuracy in information application and exchange has caused substantial waste of resources and risk in construction industry. The emergency of building information modeling (BIM) is an effective tool to address the issue. It has been increasingly applied in design, construction and other digital management in China as its important role in reducing engineering changes, improving engineering quality, shortening project duration, saving project cost, enhancing information sharing among the participants, and so on. As a new technology tool, its development and application needs government regulation to enhance its applications effect and standardize its application. Especially, the government orientation affects the application and development of new technology to a great extent in China. However, relevant policy development cannot keep up with the rapid development of its application in practice in China, which has resulted many problems in construction practice. To clearly figure out the development of BIM policy in China, this paper conducted a comprehensive review about existing BIM policy in China by analyzing its status and problems, comparing it with which in developed countries, like America and European Union country, analyzed its expected development direction in future, and made policy proposal based on its application in practice lastly.



PRELIMINARY EVALUATION OF BIM-BASED APPROACHES FOR SCHEDULE DELAY ANALYSIS

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ABSTRACT

Construction practitioners commonly control their projects merely on an as-planned schedule (baseline schedule), but in some developed countries as-built schedules are usually used in many advanced schedule delay analysis methods. More information used in delay analysis usually produces more accurate and fair analytical results. How to use innovative techniques to improve the quality of schedule delay analysis results have received much attention recently. As Building Information Modeling (BIM) technique has been quickly developed, using BIM and 4D simulation techniques have been proposed and implemented. Obvious benefits have been achieved especially in identifying and solving construction consequence problems in advance. This study performed an intensive literature review to determine the approaches for integrating schedules and BIM models to improve the identification of schedule-related dispute problems. This study found that previous schedule delay analysis approaches consider traditional 2D schedule activities and ignore physical conflicts, which can be dealt with by BIM technique. Research results could be a fundamental of new approach for resolving schedule delay disputes.



BENEFIT EVALUATION OF IMPLEMENTING BIM IN CONSTRUCTION PROJECTS

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ABSTRACT

Since 2014, public construction projects in Taiwan have progressively undertaken steps to promote the use of Building Information Modeling (BIM) technology, where many city governments have even incorporated BIM as part of the procurement and bidding documents. From a contractor's perspective, the use of BIM has therefore become a necessity. However, issues such as the high upfront costs relating to software and hardware setup and BIM user training, combined with the difficulties of incorporating BIM into existing workflow operations and management systems, remain a challenge to contractors. Consequently, the benefits stemming from the BIM implementation in turn will affect the activeness and enthusiasm of contractors to implement BIM. While there have been previous studies abroad where the benefits relating to BIM implementation had been calculated and quantified numerically, a complete benefit assessment framework would require considerations for regional industry practices and characteristics. This study examined numerous benefit assessment case studies from abroad to collect and organize the potential benefits BIM implementation can provide, followed by the use of feasibility assessments to establish a benefit assessment framework and method for the implementation of BIM that would prove most suitable for contractors in Taiwan. The framework indexes were classified into the four major categories of (1) RCR means effects of reducing or eliminating costs associated with rework; (2) SDR means effects of mitigating delays that occur due to construction interface coordination or rework; (3) DPR means percentage of the reduction in penalty costs associated with construction delays or overdue delivery; (4) AQE means effect of the ability to document building material and resource usage with accuracy and precision. This study also performed a benefit assessment calculation of a real world case study construction project using the established indexes. The results showed a 0.2% reduction in rework costs, a 6.8% reduction in delays that occur from construction interface coordination or rework, and a 4.8% reduction in penalty costs associated with delays or overdue deliveries. The results demonstrated the applicability of the benefit assessment framework established in this study for real world construction projects.



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PROBLEMS OF TECHNOLOGY OF ENERGY-SAVING BUILDINGS AND THEIR IMPACT ON ENERGY EFFICIENCY IN BUILDINGS

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ABSTRACT

Introduction of EPBD in legislation of EU member states caused that buildings must meet very stringent requirements of thermal protection and energy efficiency. On the basis of EPBD provisions, EU Member States introduce standard of NZEB (Nearly Zero-Energy Buildings). Such activities cause a need for new, innovative materials and technologies, and new approaches to design, construction and retrofitting of buildings. Indispensable is the precise coordination of the design of structure and technical installations of building, which may be provided in an integrated design process in the system BIM. It is also necessary good coordination and cooperation of all contractors during the construction phase. The article presents the problems and the new methodology for the design, construction and use of energy efficient buildings in terms of energy saving technologies, including discussion of the significant impact of the automation of technical installations on the building energy efficiency.



PERFORMANCE OF RADIANT HEATING SYSTEMS OF LOW-ENERGY BUILDINGS

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ABSTRACT

Buildings are an important part of European culture and heritage, and they play an important role in the energy policy of Europe. Of the total energy consumption of a building, approximately 54% represents heating, and to cover this energy demand, great quantities of fossil fuel are burned, which generates considerable carbon dioxide (CO₂) emissions. Because of the reduction of the world fossil fuel reserves and strict environmental protection standards, one main research direction in the construction field has become the reduction of energy consumption, including materials, technology, and building plans with lower specific energy need, on one hand, and equipment with high performance on the other hand. After the introduction of plastic piping, the application of water-based radiant heating with pipes embedded in room surfaces (i.e., floors, walls and ceilings), has significantly increased worldwide. Additionally, interest and growth in radiant heating and cooling systems have increased in recent years because they have been demonstrated to be energy efficient in comparison to all-air distribution systems. This paper briefly describes the heat distribution systems in buildings, focusing on the radiant panels (floor, wall, ceiling, and floor-ceiling). Main objective of this study is the performance investigation of different types of low-temperature heating systems with different methods. Additionally, a comparative analysis of the energy, environmental, and economic performances of floor, wall, ceiling, and floor-ceiling heating using numerical simulation with Transient Systems Simulation (TRNSYS) software is performed. This study showed that the floor-ceiling heating system has the best performance in terms of the lowest energy consumption, operation cost, CO₂ emission, and the nominal boiler power. The comparison of the room operative air temperatures and the set-point operative air temperature indicates also that all radiant panel systems provide satisfactory results without significant deviations.



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**WATER WELLS MONITORING USING SCADA SYSTEM FOR WATER SUPPLY NETWORK. CASE STUDY:
WATER TREATMENT PLANT URSENI, TIMIS COUNTY, ROMANIA**

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ABSTRACT

The water supply system in Timisoara Municipality is insured with about 25-30 % of the water demand from wells. The underground water headed to the water treatment plant in order to ensure equal distribution and pressure to consumers. The treatment plants used are Urseni and Ronat, near Timisoara, in Timis County. In Timisoara groundwater represents an alternative source for water supply and complementary to the surface water source. The present paper presents a case study with proposal and solutions for rehabilitation /equipment /modernization/ automation of water drilling in order to ensure that the entire system can be monitored and controlled remotely through SCADA (Supervisory control and data acquisition) system. The data collected from the field are designed for online efficiency monitoring regarding the energy consumption and water flow intake, performance indicators such as specific energy consumption KW/m³ and also in order to create a hydraulically system of the operating area to track the behavior of aquifers in time regarding the quality and quantity aspects.



**ACCIDENTS IN BUILDING IN THE COUNTRIES OF THE EUROPEAN UNION DURING THE PERIOD OF
2008 - 2014**

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ABSTRACT

According to the ESAW, an accident at work is an event that results in physical or mental harm to the person doing the work. As a result of this incident, fatal accidents may occur (which in the course of one year lead to death of the victim) or non-fatal accidents (that imply at least four full calendar days of absence from work). In the paper the authors present the number and analysis of the causes of accidents at work in the construction industry in years 2008 - 2014 in 28 countries of the European Union. The descriptive statistics method was used to achieve the intended goal. The accident rate indicator for individual European Union countries has been shown in the analyzed period. The structure and trends of accidents during the period under investigation, divided into two groups: fatal accidents and non-fatal accidents, were presented. Both groups were analyzed for what caused them and what factors affected the quantity (Age of the victim, work experience, month of occurrence). On the basis of the analyzed causes and factors causing accidents in the construction industry in years 2008-2014, the classification of EU countries has been shown in terms of accidents. The paper was concluded with a summary.



THE ANALYSIS AND RISK EVALUATION ON THE CASE OF ALTERATION, REVITALIZATION AND CONVERSION OF A HISTORIC BUILDING IN GDANSK (POLAND)

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ABSTRACT

Each investment plan, including the one concerning a building, is exposed to the consequences of various types of threats taking place. Therefore, in the case of some large-scale, atypical and complicated building ventures, some actions included in the procedure of risk management should be taken (identifications, analysis, measurements, control and supervision of the risk). This will allow for the risk to be eliminated or limited. While preparing a building venture, an investor does not possess full information about the course of events on each stage of investment completion. The identification of the above-mentioned unknowns, subjecting them to quantification and specifying the method of dealing with them, allows an investor to increase the effectiveness of the intended plan. The enterprise discussed in this article and analyzed in the context of risk, concerns alteration, revitalization and conversion for office purposes of two buildings located in Gdansk at 1 and 2 Lastadia Street. These buildings are situated on the area of historical urban layout of Gdansk, in the northern-eastern part of Stare Przemiescie District (Old Suburb), about 800 meters south from Dlugi Targ Street and 200 meters west from The Old Motlawa River. The investor is "Gdanskie Melioracje Ltd.", a limited liability company, which belongs to the Council of Gdansk. In order to increase the effectiveness of the intended investment venture, while organizing the investment process, the investor commissioned preparation of an analysis and risk evaluation connected with the above-mentioned intention. Based on an on-site visit, the opinions of experts, who have been involved in the process of the preparation of the investment, studies of the available monographies about the technical condition of the buildings at 1 and 2 Lastadia Street and their own experiences, the authors identified 54 types of relevant risks, which have been systematized into 10 subject groups (among others- investor's risk due to the designing process, location of the investment, third party or investor business activity, force majeure, political, legal, financial, technical). The scope of the study includes the identification, analysis and risk evaluation connected with planning and completion of alteration, revitalization and conversion of a historic buildings located at 1 and 2 Lastadia Street for the office purposes. The risk has been analyzed from the investor's perspective. The authors used a method of preliminary analysis and risk evaluation PHA (Preliminary Hazard Analysis) and the expert method.



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Session Title:

Construction Materials



FITTING FUNCTION FOR FLEXURAL STRENGTH OF CEMENT PASTE

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ABSTRACT

There are many analytical expressions for compressive strength as functions of porosity of cement-based materials but only a few such expressions exist for flexural strength of these materials. In the present paper a new functional candidate for fitting the data of flexural strength of hydrated Portland cement paste has been tested. The functional candidate has been initially derived for porous polymeric materials on the basis of the percolation theory. The parameters of this function have been optimized for the cement paste by using the Levenberg-Marquardt iterative fitting procedure. The optimized function has been capable of accurate reproducing all the measured flexural data. This fact has been confirmed by a high value of the correlation coefficient and rather low values of statistical uncertainties. It has been shown that this modified fitting function is well applicable to the pastes of ordinary Portland cements and probably to other cementitious materials, too.



RUPTURE STRENGTH AND IRREGULARITY OF FRACTURE SURFACES

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ABSTRACT

Textural irregularities of fracture surfaces of cement-based materials seem to be an interesting source of information on some mechanical properties. Besides compressive strength, the flexural strength is strongly correlated with height irregularities (i.e. roughness) of fracture surfaces of hydrated cement pastes. This correlation has been a subject of experimental study. An analytical relation between flexural strength and height irregularities has been inferred. The formula contains height parameters, which represent basic descriptors of surface irregularities of fracture surfaces of cement pastes. These irregularities are governed by the capillary porosity of cement pastes with different water-to-cement ratios. The relation yields values that are in agreement with the empirical formula published in the technical literature.



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MACRODEFECTS AND MICRODEFECTS WITHIN POROUS CEMENT PASTES

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ABSTRACT

It is shown that the mechanical strength of cement matrix (hydrated cement paste) is a result of competitive interplay between macrodefects and microdefects. The dominance of one of these two kinds of defects depends not only on their sizes but also on their numbers. The cross-over between dominances of macrodefects or microdefects is determined both by a critical number of defects and by their critical size, which depends on the mechanical parameters of the materials.



PROPERTIES OF STEEL AND POLYPROPYLENE FIBRE REINFORCED ULTRA-HIGH PERFORMANCE CONCRETE AT TWO YEARS OF CURING PERIOD

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ABSTRACT

Ultra-high performance concrete (UHPC) is characterized by compressive strength above 120 MPa and high durability. It is a known fact that, the properties of concrete are improved with the addition of fibres. The steel fibre (SF) is generally used for most structural purposes. A lot of research revealed that the steel fibre in concrete could make effectively improve the interfacial transition zone between cement paste and aggregate, and constraint the occurrence and development of concrete crack. A main advantage of steel fibre reinforced concrete is high energy absorption capacity and high toughness. The steel fibres are able to bridge the cracks and transfer the stress across the cracks. The polypropylene fibres (PF) are used to improve mechanical and physical properties, especially splitting tensile strength, flexural strength and long-term concrete shrinkage. The influence of the fiber content and the curing period on the physical and mechanical properties of steel and polypropylene fiber reinforced UHPC were studied by some researchers. No investigation in the literature is currently available on the properties of UHPC with SF and PF after long-term curing. This study has investigated the effect of age on the mechanical properties of hooked-end steel and polypropylene fiber reinforced ultra-high performance concrete. Various physical properties are evaluated, i.e.: absorbability, density, open porosity, velocity of propagation of ultrasonic pulses through concrete. Compressive strength, splitting tensile strength, flexural tensile strength and modulus of elasticity were determined at 28, 56 and 730 days. Comparative strength development of fiber reinforced mixes at 0.5%, 1%, 1.5% and 2% by volume fractions in relation to the mix without fibers was observed. Good correlations between the compressive strength and the ultrasonic pulse velocity, and the compressive strength - tensile strengths are established. Steel and polypropylene fibers significantly increased the compressive strength, splitting tensile strength, flexural tensile strength and modulus of elasticity of UHPC after 2 years. It seems that steel fiber reinforced UHPC has better properties than the polypropylene fiber reinforced UHPC.



**MAINTENANCE AND DURABILITY OF THE CONCRETE EXTERNAL LAYER OF CURTAIN WALLS IN
PREFABRICATED POZNAN LARGE PANEL SYSTEM**

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ABSTRACT

The issue of usability and durability of large-panel building constructed several decades ago is a subject of an in-depth analysis of many domestic and foreign investments. When considering the durability of specific large-panel system, one should consider, among others, the process of executing external walls. The long-term and direct impact of weather conditions on the external layer of curtain walls is significant for the durability of large-panel buildings. For the needs of the presented paper, in 2016, the survey of cracks was conducted and a series of other tests of façade of large-panel, residential buildings constructed in 1986, constructed in Poland, in the PLP process system– Rataje were executed. Several hundred large-size, triple-layer curtain-wall slab with a 6-cm, concrete exterior cladding layer anchored using pins and hangers with the main structural layer, a 9-cm insulation layer made of mineral wool, and a 21-cm structural layer were surveyed. Significant deviations in thicknesses of particular wall layers were proven. Other significant damages and defects of external layers were found. At the second stage, many tests, both non-destructive and destructive, were conducted. They involved determination of mechanical properties of an external layer. The concrete thickness was measured using with a type N Schmidt sclerometer and core samples were taken from this layer in order to mark concrete's compressive strength. In order to determine the condition of the external layer, the range of carbonation (by phenolphthalein method) and the actual location and condition of reinforcement were estimated using a ferromagnetic device. The diagnosis conducted in such a manner was the basis of necessary repair of the walls and their thermal efficiency improvement while ensuring safe conditions of their operation and modern functional and utility requirements. It should be also emphasized that the method of diagnosing the external walls presented in this paper may be popularized when evaluating such facilities both in Poland and other countries of the Central Europe (Germany, Czechia, Slovakia, Lithuania, Bulgaria, and Ukraine). The monoculture of the large panel prevailing in the second half of the 20th century allowed to construct from 40% to 90% of residential buildings in multifamily residential development in many countries. The large-panel buildings still constitute from 30% to 60% of domestic residential resources and are modernized in many directions but not removed in masses.



EVALUATION OF PROPERTIES OF CELLULAR LIGHT WEIGHT CONCRETE

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ABSTRACT

Cellular Light Weight Concrete (CLWC) is relatively a new material having cementitious properties, incorporated with mechanically entrained foam in the cement based slurry or mortar which can manufacture in a varying densities ranging from 300 kg/m^3 to 1850 kg/m^3 . With the increase in future requirement of the construction material, the CLWC is presently believed to have a promising future. CLWC is a versatile material, which is generally used in non-load bearing structural elements, having lower strength than conventional concrete. It is quite renowned for some application for the reason that it's self-weight (which is light in weight) such as reduction of dead load of the structure, thermal insulating materials, acoustic insulating materials and non-structural partitions walls. Since it has low strength, some material is used in order to increase the strength of the CLWC. The applications of CLWC are very limited due least knowledge about its properties and stability. CLWC, fairly a new material as compare to conventional concrete, has become more popular material in construction industry. Fly ash and Silica fume are getting more attention nowadays since their uses usually improve the properties of mixed cement concrete, economical and reduction of harmful environmental effects. The properties of CLWC vary according to a different type of mixture and its composition. This study investigates the mechanical and physical properties of CLWC specifically dry density, water absorption and compressive strength. In this study, the cubes are casted for different target densities 800 kg/m^3 , 1000 kg/m^3 , 1200 kg/m^3 and 1400 kg/m^3 by varying the fly ash content 50% to 80% at the interval of 5% and corresponding decrease in cement content 50% to 20%. The water content of all mixes are kept constant as 40% of weight of cement and fly ash combined. The foam consists of one part of foaming agent diluted with 35 parts of water. As the amount of foam affects the dry density of concrete, hence foam content is varied from 1% to 1.5% to get different target density. After getting the optimum content of fly ash, the cement content is further reduced by adding silica fume. Silica fume is incorporated in the mix 0% to 15% at the interval of 5% by the weight of cement and tested for same mechanical and physical properties.



LABORATORY TESTS OF ADHESION OF STEEL RODS TO CONCRETE IN TERMS OF FREEZE-THAW RESISTANCE

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ABSTRACT

The issue of adhesion of steel to concrete is one of decisive features characterising reinforced concrete. Adhesion constraints to concrete are simplistically presented with tangent stress evenly distributed on the side surface of reinforcement. However, an exact value of this stress depends on many factors and its estimation is very complicated. There is a lot of laboratory methods aimed at testing adhesion of the reinforcement to concrete but they frequently give different results. Sometimes, they are even contrary. In the paper, the state of knowledge on the steel-concrete adhesion, mechanism of its loss, and factors influencing it were reviewed. Own tests were conducted with two methods, pull-out and push-on, aimed at reflecting the operation of reinforced concrete structure and specifying the chemical adhesion, as well as the friction force of the reinforcement to concrete. The impact of the freeze-thaw cycle on this process was also studied. The interfacial transition zone on the steel-concrete boundary was analysed as well. The structure of boundary layer around the reinforcement in concrete is very similar to the zone of aggregate separation from paste. In the Polish and foreign literature, the thickness of the transition zone is estimated as 50-100 μm but only 10-20 μm of this zone has variable mechanical properties. The microstructure of the boundary line depends on the kind of concrete and reinforcement, presence and kind of additions, conditions of curing, and many other factors. In order to describe this phenomenon more precisely, own tests of the steel-concrete interfacial transition zone involving analysis of SEM images and identification of chemical composition of this EDS area were conducted.



MECHANICAL PERFORMANCE OF CONCRETE INCLUDING WASTE ELECTRICAL CABLE RUBBER

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ABSTRACT

Solid waste is one of the most important environmental problem in the world. Consumption of the plastic solid waste covers big portion within the total solid waste. Although a numerous plastic material is subjected to the recycling process, it is not easy to be destroyed by nature. One of the recommended way to prevent is to utilize as an aggregate in cement-based material. There are many researches on use of recycling rubber in concrete. However, studies on recycling of waste electrical cable rubber (WECR) in concrete is insufficient although there are many research on waste tyre rubbers in concrete. In this study, normal aggregate was replaced with WECR which were 5, 10 and 15 % of the total aggregate volume in the concrete and researched workability, unit weight, water absorption, compressive strength, flexural strength, ultrasonic pulse velocity, elasticity modulus and abrasion resistance of concrete. As a result of experimental studies, increase of WECR amount in concrete increases workability due to lack of cohesion between cement paste and WECR while it influence negatively mechanical properties of concrete. It is possible to use WECR in concrete without expecting good mechanical performance or increasing ratio % of WECR.



NATURAL MINERAL ADDITIVES AS MODIFIERS OF PAVEMENT QUALITY CONCRETE COMPOSITION

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ABSTRACT

The article concerns the idea of using selected mineral additives in the pavement quality concrete composition. The basis of the research paper was the modification of cement concrete intended for airfield pavements. The application of the additives: metakaolinite and natural zeolite was suggested. Analyses included the assessment of basic physical properties of modifiers. Screening analysis, assessment of micro structure and chemical microanalysis were conducted in case of these materials. The influence of the applied additives on the change of concrete mix parameters was also presented. The impact of zeolite and metakaolinite on the mix density, oxygen content and consistency class was analysed. The influence of modifiers on physical and mechanical changes of the hardened cement concrete was discussed (concrete density, compressive strength and bending strength during fracturing) in diversified research periods. The impact of the applied additives on the changes of internal structure of cement concrete was discussed. Observation of concrete micro structure was conducted using the scanning electron microscope. According to the obtained lab test results, parameters of the applied modifiers and their influence on changes of internal structure of cement concrete are reflected in the increase of mechanical properties of pavement quality concrete. The increase of compressive and bending strength in case of all analysed research periods was proved.



**STRUCTURAL DESIGN AND ECONOMIC EVALUATION OF ROLLER COMPACTED CONCRETE
PAVEMENT WITH RECYCLED AGGREGATES**

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ABSTRACT

Using recycled aggregates in the concrete offers advantages in many areas such as waste management, saving of energy and natural resources, conservation of ecological balance, low CO₂ emissions, and users are encouraged in this regard to use these materials. In this study, the profit / loss account arising in the structural design phase was investigated when Reclaimed Asphalt Pavement (RAP), which is limited to use in Roller Compacted Concrete (RCC) pavements, was used as coarse aggregate. RAP materials were used as coarse aggregates by 0%, 15% and 20% level and mechanical properties such as compressive strength, flexural strength, splitting tensile strength and modulus of elasticity were investigated. In the last stage, the mechanical properties obtained from these experimental studies were entered into KENSLABS software as input, and the slab layer thicknesses were determined according to three different subgrade conditions and a certain fatigue criterion. According to the results, it has been determined that the use of 20% RAP is a serious reducing effect on mechanical properties and the use of 15% RAP does not bring great economic benefit but it is reasonable to use it as coarse aggregate in RCC mixes in consideration of environmental effects.



COMPARISON OF GLASS POWDER AND FLY ASH EFFECT ON THE FRESH PROPERTIES OF SELF-COMPACTING MORTARS

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ABSTRACT

In this study, it is aimed to obtain the effects of glass powder on fresh properties of self-compacting mortars. Self-compacting mortars incorporating glass powder (SCMGPs) were designed with a water/binder ratio of 0.32 and a total binder content of 550 kg/m³. At first, the control mixture was produced 20% fly ash and % 80 cement of the total binder content without using the glass powder. Then, glass powder was used in the proportions 5%, 10%, 15% and 20% instead of fly ash in the mortars. Slump flow and mini v funnel tests were experimentally investigated on SCMGPs to compare the effect of fly ash and glass powder. With increasing the amount of glass powder used in SCMGPs increased the amount of super-plasticizer to obtain the desired slump flow diameter. So, the use of glass dust reduced the flowability of SCMGPs in comparison to fly ash. Additionally, the compressive strength and modulus of elasticity of the mortar mixtures were determined at 28th day. The test results indicated that the mechanical characteristics of SCMGPs improved when the fly ash was replaced with glass powder in SCMGPs.



POROSIMETRIC, THERMAL AND STRENGTH TEST OF AERATED AND NON-AERATED CONCRETES

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ABSTRACT

The paper presents the results of porosimetry tests of lightweight concretes, obtained with three research methods. Impact of different porosity structures on the basic thermal and strength properties was also evaluated. Tests were performed, using the water column method on fresh concrete mixes, as well as using the mercury porosimetry test and optic RapidAir methods on specimens prepared from mature composites. The study was conducted on lightweight concretes, based on expanded clay aggregate and fly ash aggregate, in two variants: with non-aerated and aerated cement matrices. In addition, two reference concretes, based on normal aggregate, were prepared, also in two variants of matrix aeration. Changes in thermal conductivity λ and volumetric specific heat c_v throughout the first three months of curing of the concretes were examined. Additionally, tests for compressive strength on cubic samples were performed during the first three months of curing. It was found that the column water method, performed on a fresh mix, gave lowered values of porosity, compared to the other methods. The mercury porosity tests showed high sensitivity in evaluation of pores smaller than 30 μm . Unfortunately, this technique is not suitable for analysing pores greater than 300 μm . On the other hand, the optical method is proves good in evaluation of large pores, greater than 300 μm . The paper also presents results of correlation of individual methods of porosity testing. A consolidated graph of the pore structure, derived from both mercury and optical methods, was presented, too. For the all of six tested concretes, differential graphs of porosity, prepared with both methods, show a very broad convergence. The thermal test results indicate usefulness of aeration of the cement matrix of the composites based on lightweight aggregates for the further reduction of the thermal conductivity coefficient λ of the materials. The lowest values of the λ coefficient were obtained for the aerated concretes based of fly ash aggregate. A diminishing influence of aeration on the volumetric heat capacity c_v is clearly seen. Simultaneous aeration of the matrix and use of lightweight aggregates brought about also a significant decrease in the average compressive strength f_{cm} of the tested composites.



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EXPERIMENTAL INVESTIGATION OF THE OPTIMAL DESIGN OF THE ULTRAHIGH EARLY STRENGTH CONCRETE

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ABSTRACT

Comparing with the common concrete, the ultrahigh early strength concrete can be formed in an extremely short time, which can be effectively applied in the field of the fast repair engineering. Based on this point, the design of the optimal mix proportion of ultrahigh early strength concrete was investigated in this study. First, the optimal water-cement ratio was determined through the experiment. Second, the relationship between water reducing agent and concrete strength was investigated, and then the optimal dosage of admixture was determined. The experimental results show that the prepared ultrahigh early strength concrete can obtain the high strength in the early time, which is beneficial for the practical application. Additionally, some other performance are acquired, such as the rapid condensation properties, the permeability resistance and workability etc.



THE PROBLEM OF BIOLOGICAL DESTRUCTION FACADES OF INSULATED BUILDINGS - CAUSES AND EFFECTS

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ABSTRACT

The Regulation of the Minister of Infrastructure on technical conditions of buildings and their location necessitated that the newly designed buildings should have a reduced quantity of heat that is transferred through a barrier. Additionally, this coefficient is to be tightened gradually in the subsequent years. This implies the application of thermal insulation, which encapsulates the building envelope, with appropriate thickness to fulfil the relevant requirements. This has some positive implications in the form of reduced heat loss on account of the transfer through the envelope elements as well as reduced costs incurred on heating the building. However, more investigation into the hydrothermal issues is needed in order to enable elimination of the phenomenon of condensation, i.e. the places inside a barrier or on its surface where water vapour condenses. It is also necessary to provide an efficient ventilation in order to remove moisture from the building. This exposure risk concerns the interior of the building and must be absolutely prevented due to its adverse effect on human health. However, the phenomenon of moisture formation on surfaces, which is followed by invasion of microorganisms at the same places is not only limited to the interior. The most popular methods of thermal insulation of external walls are the lightweight wet method (ETICS – External Thermal Insulation Composite Systems) and the lightweight dry method. The problem of deterioration of façades should be considered beginning with recognition of the organisms that cause it. The chief aggressors are: algae (causing verdant (green) overgrowth), moulds (grey-black mould spots) or lichens produced by the symbiotic growth of algae and fungi (green-black spots). Their structure, mode of reproduction, metabolic processes as well as the effect of metabolic waste products on building materials all constitute the knowledge base for actions aimed at preventing corrosion. For the most part, façades are colonised by bacteria and aerotrophic algae. The incidence and dwelling of microorganisms (algae, fungi) on a façade is commonly related to the occurrence of so-called factors favouring their development, lack of direct exposure of the façade to sunlight, e.g. north-facing walls, high and dense vegetation, other tall buildings in the neighbourhood casting shadows, effect of rainwater on the façade, also water bouncing off pavements, canopies and other flat surfaces, streaks from flashings and other elements mounted on the façade, dust and first on the façade providing nutrients for microorganisms, large concentrations of spores in the environment surrounding the buildings. A major factor is also application of low-quality materials. One of the conditions that allow development of algae and mould is porosity of the façade surface. It facilitates attachment of the growths and gathering of dust and dirt that spores feed on. Most of the plasters applied on façades have a structure with a surface that meets the aforementioned conditions. Additionally, microbiological corrosion is to a large extent a consequence of the quality of the binder used in the production of the plaster and the electrostatic degree of the ready coat on the façade. The choice of a plaster whose composition and properties will ensure the required durability should be preceded by an analysis of the surroundings of the building and the assumed risks related thereto.



CRITICAL VOID VOLUME FRACTION f_c AT VOID COALESCENCE FOR S235JR STEEL AT LOW INITIAL STRESS TRIAXIAL

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ABSTRACT

The paper is concerned with the nucleation, growth and coalescence of microdefects in the form of voids in S235JR steel. The material is known to be one of the basic steel grades commonly used in the construction industry. The theory and methods of damage mechanics were applied to determine and describe the failure mechanisms that occur when the material undergoes deformation. Until now, engineers have generally employed the Gurson-Tvergaard-Needleman model. This material model based on damage mechanics is well-suited to define and analyze failure processes taking place in the microstructure of S235JR steel. It is particularly important to determine the critical void volume fraction f_c , which is one of the basic parameters of the Gurson-Tvergaard-Needleman material model. As the critical void volume fraction f_c refers to the failure stage, it is determined from the data collected for the void coalescence phase. A basic case of uniaxial stress is considered taking into account the effects of spatial stress state. In this study, the parameter of stress triaxiality η was used to describe the failure phenomena. Unnotched round specimens were analyzed to obtain low values of initial stress triaxiality ($\eta = 1/3$ of the range) in order to determine the critical void volume fraction f_c . It is essential to emphasize how unique the method applied is and how different it is from the other more common methods involving parameter calibration, i.e. curve-fitting methods. The critical void volume fraction f_c at void coalescence was established through digital image analysis of fracture surfaces of S235JR steel, which involved studying real, physical results obtained directly from the material tested.



THE INACTIVE MINERAL FILLER AS THE STIFFNESS MODIFIER OF THE COLD RECYCLED BASE LAYER WITH THE FOAMED BITUMEN

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ABSTRACT

The foaming process results in a change of the asphalt binder viscosity and ensures the covering of the aggregate by the bitumen without a need of heating it up to high temperatures. An excellent example of the application of foamed bitumen is HWMA technology (Half Warm Asphalt) in opposite to the traditional technology HMA (Hot Mix Asphalt). Additional benefits of using foaming asphalt technology also relates to mixtures performed in the deep cold recycling technology (RCM - Recycled Cold Mixes). This technology with a foamed asphalt forces the use of optimum amount of the mineral material from the point of view of the silt fraction content (less than 0.063 mm). In accordance with the requirements concerning the optimum particle-size distribution in the cold recycling mixture it is necessary to provide fine fractions, the sieve size less than 0.063 mm, in the range from 4% to 20%. The insufficient silt fraction content in a recycled mixture influences the formation of clusters of free asphalt. In effect it is not possible to produce an appropriate amount of mastic, which plays an important role in mixture. The article presents the results of a cold recycled mix test with a foam bitumen including the addition of the inactive mineral filler as a dust of basalt. Basalt dust was derived from dedusting system by extraction of aggregates in the mine. Assessment of the impact of a basalt dust on the properties of a recycled base layer was carried out in terms of the amount of mineral filler (basalt) in the composition of the mineral mixture. This experiment involved a dosing of mineral filler in range from 5 to 20% with steps of 7.5% in the mineral mixture composition. The foamed bitumen was performed at optimum foaming process settings (i.e. bitumen temperature, air pressure) and at 2.5% of the water content. The amount of a hydraulic binder as a Portland cement was 2.0%. The evaluation of rheological properties allowed to determine whether the addition of inactive mineral fillers can act as a stiffness modulus controller in the recycled base layer. The analysis of the rheological properties of a recycled base layer in terms of the amount of inactive fillers was performed in accordance with given standard EN 12697-26 Annex D. The study was carried out according to the direct tension-compression test methodology on cylindrical samples. The sample was subjected to the oscillatory sinusoidal strain $\epsilon_0 < 25\mu\epsilon$. Studies carried out at a specific temperature set-points: -7°C, 5°C, 13°C, 25°C and 40°C and at the frequency 0.1 Hz, 0.3 Hz, 1 Hz, 3 Hz, 10 Hz and 20 Hz. The obtained results allow to conclude that the use of an inactive filler can reduce the stiffness of an appropriate designed mixes of the cold recycled foundation. In addition, the analysis of the relation $E'-E''$ showed a similar behaviour of a recycled base, regardless of the amount of inactive fillers in the mix composition, at high temperatures/ high frequency of induced load.



THE CHANGES OF PROPERTIES OF BITUMINOUS BINDERS BY ADDITIVES APPLICATION

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ABSTRACT

Requirements for properties of bituminous binders are determined in the European standards. The physico-chemical behaviour of bitumen depends on its colloidal structure (asphaltenes dispersed into an oily matrix constituted by saturates, aromatics and resins) that depends primarily on its crude source and processing. Bitumen properties are evaluated by group composition, elementary analysis, but more often conventional or functional tests. Bitumen for road uses is assessed according to the physical characteristics. For the purpose of improving the qualitative properties of bitumen and asphalts the additives are applied e.g. to increase elasticity, improving the heat stability, improving adhesion to aggregate, to decrease viscosity, increasing the resistance to aging, to prevent binder drainage from the aggregate surface, etc. The objective of presented paper is to assess and compare effect of additives on properties of bitumen binders. In paper, the results of bitumen properties, penetration, softening point, and dynamic viscosity of two paving grade bitumen 35/50, 50/70 and polymer modified bitumen PmB 45/80-75 are analysed and also the changes of these properties by the application of selected additives (Sasobit, Licomont BS100, Wetfix BE and CWM) to improve adhesion to aggregate and improve workability. Measurements of properties have been performed according to the relevant European standards. The laboratory tests showed significantly increasing the softening point of paving grade bitumen 50/70 and 35/50 from 13 to 45 oC. The effect of various additives on bitumen softening point is different. Penetration varies according to type of bitumen and type of used additive. The penetration values of modified bitumen PmB 45/80-75 with additives Sasobit and Licomont BS100 show increase of bitumen stiffness of 16 0.1mm and a shift in the gradation. The changes in penetration and in softening point significantly shown when calculating on Penetration index as a parameter of temperature susceptibility. The additives changed the viscosity of bitumen to lower values mostly with modified bitumen. In case of the additive Wetfix BE mix in 35/50 caused the viscosity increase. The additive changes the properties of original bituminous binders, and that can affect the properties of asphalt mixtures and asphalt layers.



IMPACT OF AIR ENTRAINING METHOD ON THE RESISTANCE OF CONCRETE TO INTERNAL CRACKING

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ABSTRACT

This paper presents the test results of air entrained concrete mixtures made at a constant W/C ratio of 0.44. Three different air entraining agents were used: polymer microspheres, glass microspheres and a conventional air entraining admixture. The aim of this study was to compare the effectiveness of the air entraining methods. Concrete mixture tests were performed for consistency (slump test), density and, in the case of AEA series, air content by pressure method. Hardened concrete tests were performed for compressive strength (fcm), water absorption (nw), resistance to chloride ingress (Q), and freeze-thaw durability – resistance to internal cracking tests were conducted in accordance with PN-88/B-06250 on cube specimens and with the modified ASTM C666 A test method on beam specimens; porosity characteristics (A, A300, L) were determined to PN-EN 480–11:1998. No significant mass and length changes were recorded for the concrete air entrained with the conventional methods or with polymer microspheres. The results indicate that polymer microspheres are a very good alternative to traditional air entraining methods for concrete, providing effective air entrainment and protection from freezing and thawing. The glass microsphere-based concretes showed insufficient freeze-thaw resistance. The test results indicate that both the conventional methods (AEA) and the air entrainment by polymer microspheres are effective air entraining methods. It has to be noted that in the case of the use of polymer microspheres, a comparable value of L and a very good freeze-thaw resistance can be achieved at a noticeably lower air and micropore contents and at lower strength loss.



LOAD TESTING OF GFRP COMPOSITE U-SHAPE FOOTBRIDGE

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ABSTRACT

The paper presents the scope of load tests carried out on an innovative shell composite footbridge. The tested footbridge was manufactured in one production cycle and has no components made from materials other than GFRP laminates and PET foam. The load tests, performed on a 14-m long structure, were the final stage of a research program in the Fobridge project carried out in cooperation with: Gdansk University of Technology (leader), Military University of Technology in Warsaw, and ROMA Co. Ltd.; and co-financed by NCBR. The aim of the tests was to confirm whether the complex U-shape sandwich structure behaves correctly. The design and technological processes involved in constructing this innovative footbridge required the solving of many problems: absence of standards for design of composite footbridges, lack of standardized material data, lack of guidelines for calculation and evaluation of material strength, and no guidelines for infusion of large, thick sandwich elements. Obtaining answers during the design process demanded extensive experimental tests, development of material models, validation of models, updating parameters and extensive numerical parametric studies. The technological aspects of infusion were tested in numerous trials involving the selection of material parameters and control of the infusion parameters. All scientific validation tests were successfully completed and market assessment showed that the proposed product has potential applications; it can be used for overcoming obstacles in rural areas and cities, as well as in regions affected by natural disasters. Load testing included static and dynamic tests. During the former, the span was examined at 117 independent measurement points. The footbridge was loaded with concrete slabs in different configurations. Their total weight ranged from 140 kN up to 202 kN. The applied load at the most heavily loaded structural points caused an effect from 89% to 120%, compared to the load specified by standards (5 kN/m²). Dynamic tests included standard actions (walking, running, synchronous jumps) as well as aggressive tests, all designed to confirm the usability of the footbridge. The performed trials allowed the identification of the modal and damping parameters of the structure. The designated first natural frequency with a value of 7.8 Hz confirmed the correctness of the U-shape cross-section design due to its significant structural rigidity.



RESISTANCE TO INTERNAL CRACKING AND SURFACE SCALING OF CONCRETE AIR ENTRAINED BY MICROSPHERES

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ABSTRACT

The tests were performed for six series of high performance concrete air entrained by polymer microspheres with three diameters - 20, 40 and 80 μm . The tests aimed at determining the influence of the size and dosage of microspheres on the air void system, internal freeze-thaw durability and surface scaling of concrete. The polymer microspheres were added at two levels. The concrete mixtures testing included the slump and density tests. The hardened concrete parameters determined in the tests included: compressive strength (fcm), water absorption (nw), freeze-thaw durability - the resistance to surface scaling - at a 3% NaCl solution in compliance with PKN-CEN/TS 12390-9:2007 and the resistance to internal cracking through the modified ASTM C666 A method on beam specimens, and porosity characteristics (A, A300, L) in compliance with PN-EN 480-11:1998. The scaling resistance of the concrete surface was determined on slabs (the slab test) according to PKN-CEN/TS 12390-9:2007. The test uses a qualitative evaluation of the mass of scaling from the upper surface of the specimen after 7, 14, 28, 42 and 56 cycles of freezing and thawing at a presence of 3% NaCl solution. Four 50x150x150 mm slabs were tested in each of the six series. The freeze-thaw durability test (modified ASTM C666 A) was performed on beam specimens with dimensions 80x80x340 mm. At 28 days of curing the specimens were saturated with water for seven days and, after that, placed in metal containers filled with water. The specimens were subjected to 300 freeze-thaw cycles. The preparation of polished sections and the determination of porosity characteristics by traverse analysis were performed to PN-EN 480-11:1998. Automatic image analysis was made with the use of a setup consisting of a stereoscopic microscope, a CCD camera and a measuring table.



SUSTAINABLE SUPERSULFATED BINDERS OF VOLCANIC ASH AND METALLURGICAL SLAG

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ABSTRACT

The production of Portland cement (PC) has a negative environmental impact due to the large amounts of CO₂ emissions that take more than 7% of the anthropogenic annual emissions; so the development of alternative sustainable binders is of interest. One route to the partial or full replacement of PC by supplementary cementitious materials (SCM) from natural or industrial wastes. Ground granulated blastfurnace slag (GGBFS) is an industrial byproduct that has been widely used to produce various types of binders such as composites with Portland cement, alkaline cements and supersulfated cements. The supersulfated binders are the interest of this investigation, in which the volcanic ash (VA) is proposed as a candidate to undergo sulfatic-alkaline activation to form new hydraulic binders. Composite pastes of supersulfated binders of GGBFS-VA were investigated, with 75-90% of GGBFS +VA contents, while the rest of the compositions were activators composed of variable ratios of CaSO₄:Portland Cement. The GGBFS substituted the VA from 0% to 50%. An experimental design based on an orthogonal array type L18 (Method of Taguchi) was used to formulate the pastes. The specimens were cast in cubic molds of 2.5cm/side, cured at 20°C under dry and under water conditions. The compressive strength was characterized for up to 90 days. The VA is a promising raw material to produce supersulfated binders. All binders showed stability under water and higher GGBFS contents favored the strength. After 90 days binders with 75-80% VA registered and 19 and 24 MPa in dry and under water conditions, respectively; while a binder with 50% replacement of BFS by VA showed 47MPa. The microstructural characterization indicated that the binders had microstructures that revealed partial reaction of the GGBFS and the VA, the chemical composition of the reaction products measured by Energy dispersive spectroscopy indicated the formation of ettringite and C-S-H, which was also confirmed by X-ray diffraction. The binders are promising for various applications in construction and more studies are underway.



ANALYSIS OF CREEP RATE CONCRETE AND FIBRE REINFORCEMENT CONCRETE IN THE FIRST HOURS OF LOAD

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ABSTRACT

The paper presents the results of rheological deformation of concrete compression and tension in the first hours of load. Analysis was performed with normal concrete and fiber concrete at two load levels and at different ages. Experiments show the different dynamics of initial rheological changes depending on the material composition and the age of the concrete. The current norms concentrate only on the final strain creep of concrete after many days the load. Experiments indicate that large differences in the description of the initial deformation of the material, which is very important for estimating the response of the material to sudden load. A comparison of the creep rate in normal concrete (NC) and fiber-cement (FRC) loaded ages show that the strain range of linear creep rate of the concrete (NC) loaded at the age of 24 hours is higher compared to concrete (FRC), and in concrete loaded at the age of 96 - 672 hours initial creep rate of these concretes are similar.

In the high load of the initial creep rate of the young fiber concrete (FRC), loaded at 24 hours it is greater than that of normal concrete (NC). Concretes (NC) and (FRC) loaded at a later age are characterized by different relationships.



NUMERICAL SIMULATION OF THERMAL PERFORMANCE OF GLASS-FIBER-REINFORCED POLYMER

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ABSTRACT

Glass-Fiber-Reinforced Polymer(GFRP), as a developing construction material, has a rapidly increasing application in civil engineering especially bridge engineering area these years, mainly used as decorating materials and reinforcing bars for now. Compared with traditional construction material, these kinds of composite material have obvious advantages such as high strength, low density, resistance to corrosion and ease of processing. There are different processing methods to form members, such as pultrusion and resin transfer molding(RTM) methods, which process into desired shape directly through raw material; meanwhile, GFRP, as a polymer composite, possesses several particular physical and mechanical properties, and the thermal property is one of them. The matrix material, polymer, performs special after heated and endue these composite material a potential hot processing property, but also a poor fire resistance. This paper focuses on thermal performance of GFRP as panels and corresponding researches are conducted. First, dynamic thermomechanical analysis(DMA) experiment is conducted to obtain the glass transition temperature(T_g) of the object GFRP, and the curve of bending elastic modulus with temperature is calculated according to the experimental data. Then compute and estimate the values of other various thermal parameters through DMA experiment and other literatures, and conduct numerical simulation under two condition respectively: (1) the heat transfer process of GFRP panel in which the panel would be heated directly on the surface above T_g , and the hot processing under this temperature field; (b) physical and mechanical performance of GFRP panel under fire condition. Condition (1) is mainly used to guide the development of high temperature processing equipment, and condition (2) indicates that GFRP's performance under fire is unsatisfactory, measures must be taken when being adopted. Since composite materials' properties differ from each other and their high temperature parameters can't be obtained through common methods, some parameters are estimated, the simulation is to guide the actual high temperature experiment, and the parameters will also be adjusted by then.



WAVELET ANALYSIS OF ACOUSTIC EMISSIONS DURING TENSILE TEST OF CARBON FIBER REINFORCED COMPOSITES

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ABSTRACT

In the last years interest of polymer composites has been increasing in technology and everyday life of human. Production of new materials with the polymer matrix with specific characteristics which do not receive traditional construction materials, contributed to the great interest of fibrous composite materials. Wider application of these materials is limited due to the lack of precise knowledge of their properties and behavior under different conditions of exposure, under load. Mechanical degradation of polymer composites, which occurs under the influence of long-term permanent loads causes changes in the structure of a material a local or covering the entire volume of the element. These changes take the form of various types of discontinuities in the form of: debonds, matrix and fiber cracks or delaminations. The article presents an example of application of acoustic emission method based on the analysis of waves using discrete wavelet analysis to assess the progress of the development of destructive processes and the degree of degradation of composite tapes subjected to static tensile load.



ULTRASONIC EVALUATION OF THE PULL-OFF ADHESION BETWEEN ADDED REPAIR LAYER AND A CONCRETE SUBSTRATE

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ABSTRACT

This paper concerns the evaluation of the pull-off adhesion between a concrete added repair layer with variable thickness and a concrete substrate, based on parameter assessed using ultrasonic pulse velocity (UPV) method. In construction practice, the experimental determination of pull-off adhesion f_b , between added repair layer and a concrete substrate, is necessary to assess the quality of repair. This is usually carried out with the use of pull-off method which results in local damage of the added concrete layer in all the testing areas. Bearing this in mind, it is important to describe the method without this disadvantages. The prediction of the pull-off adhesion of the two-layer concrete elements with variable thickness of each layers might be provided by means of UPV method with two-sided access to the investigated element. For this purpose, two-layered cylindrical specimens were obtained by drilling the borehole from a large size specially prepared concrete element. Those two-layer elements were made out of concrete substrate layer and Polymer Cement Concrete (PCC) mortar as an added repair layer. The values of pull-off adhesion f_b of the elements were prepared, before obtaining the samples, using semi-destructive pull-off method. The ultrasonic wave velocity was determined in samples with variable thickness of each layers and was then compared to theoretical ultrasonic wave velocity predicted for those specimens. The regression curve for the dependence of velocity and pull-off adhesion, determined by the pull-off method, was made. It has been proved that together with an increase of ratio of investigated ultrasonic wave velocity divided by theoretical ultrasonic wave velocity, the pull-off adhesion value f_b between added repair layer with variable thickness and a substrate layer also increases.



ALKALINE ACTIVATOR IMPACT ON THE GEOPOLYMER BINDERS

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ABSTRACT

Concrete structures are constantly moving in the direction of improving the durability. Durability depends on many factors, which are the composition of concrete mix, the usage of additives and admixtures and the place, where material will work and carry the load. The introduction of new geopolymer binders for geopolymer structures adds a new aspect, that is type of used activator. This substance with strongly alkaline reaction is divided because of the physical state, the alkaline degree and above all the chemical composition. Taking into account, that at present the geopolymer binders are made essentially from waste materials or byproducts from the combustion of coal or iron ore smelting, unambiguous determination of the effect of the activator on the properties of the geopolymer material requires a number of trials, researches and observation. This paper shows the influence of the most alkaline activators on the basic parameters of the durability of geopolymer binders. In this study there were used a highly alkaline hydroxides, water glasses and granules, which are waste materials in a variety of processes taking place in a chemical plants. As the substrate of geopolymer binders there were used fly ash which came from coal and high calcareous ash from the burning of lignite.



AUTOCLAVED SAND - LIME PRODUCT WITH POLYPROPYLENE

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ABSTRACT

Sand-lime products (silicates) are a popular building material, known for centuries and readily used. Silicate bricks are made from natural and widely available raw materials (sand, lime and water). They have many advantages, for example: high compressive strength, they provide thermal comfort, acoustic insulation and they are environmentally friendly. Sand-lime products are subjected to numerous modifications improving their basic properties and the possibility of wider application. Silicates as well as autoclaved aerated concrete are prone to cracks and scratches, formed during the production, transport or installation. This problem can be eliminated by strengthening the frame structure of the material. Positive impact of polypropylene granules on sand-lime brick properties tends to use reinforcement in the form of a spatial grid made of this material. Polypropylene (PP) is an organic compound, a polymer from the group of polyolefins. PP material is a colorless, odorless and insensitive to water. It is obtained by low-pressure polymerization of propylene. Polypropylene is one of the two (along with polyethylene) most commonly used plastics. It is used for example for the production of packaging, laboratory equipment, automotive components, cables and household items. The aim of the study was to determine the effect of polypropylene mesh on the parameters of physical and mechanical properties and microstructure of sand - lime products in compared to their traditional counterparts. The analysis has been subjected to the results of the compressive strength, water absorption, density and structural features of the material. The resulting product is characterized by improvement of basic functional characteristics compared to traditional products silicate. Applied polypropylene mesh increased compressive strength by 25% while decreasing the density of the product.



THE SITUATION AND PROSPECTS OF DEVELOPMENT STEEL FIBER CONCRETE CONSTRUCTIONS IN UKRAINE

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ABSTRACT

The aim of this work is a brief result's analysis of steel fiber concrete research as a material and steel fiber concrete designs that were made in Ukraine and develop recommendations for choosing further areas of research that could ensure a wide implementation in practice of construction of this material in our country. Since Ukraine was the part of the Russian and then Soviet Empire, the development of concrete began from that period. In 1907, engineer V. Nekrasov proposed to add steel fiber from thin wire in the concrete mix. He described the mechanical properties of this material for free and directional orientation of the fibers. Experimental and theoretical researches of steelfiberconcrete, which took place in researching and educational institutions of Kazakhstan, Latvia, Russia and Ukraine, were the basis for the implementation of this material in the construction of tank's bottoms, trays for communications, pile foundations, ribbed panels 3?6 meters, folds, made by the method of bending newformed sheet metal. However, the implementation of the steel fiber concrete structures was minor and took place in the experimental building. In the USSR in 1987 were issued "Recommendations for design and manufacture steel fiber concrete constructions. A feature of these recommendations was that the method of structures calculation by limit state was developed on the analogy of ferroconcrete structures. For the ultimate limit state (ULS) was taken rectangular stress distribution in the stretched and compressed parts of the cross section, and fiber reinforcement led to an equivalent directed with the factor orientation , anchoring and the probability of a dangerous intersection fiber section . For fibers with the tensile and fiber reinforcement coefficient by volume strength value of concrete in tension is: To calculate the moment of crack formation, the width of the disclosure, deflections the cross section led to steel in the compressed zone of concrete, rod and fiber reinforcement, but in the tension - only rods and fiber. According to these recommendations in Ukraine were developed and entered into force in 2009, the standard DSTU-N B V. 2.6-78:2009 Guide for the design and manufacture steelfiberconcrete constructions. In Russia the same standard adopted in 2006. Significant drawback of Ukrainian standard is that there are no provisions dealing with the calculation and design of prestressed structures. Therefore, intensification of research in this direction is relevant. In Ukraine, since 1991, intensive research of the steel fiber concrete constructions are held at the Kyiv National University of Construction and Architecture, Lutsk National Technical University, National University of Water Management and Nature Management, Lviv National Agrarian University. This contributed to establishing production in Ukraine of the anchor, wavy fibers and fibers with tapered ends sizes from 0,50x30mm to 1,00x60mm according to the European standard EN 14889-1: 2006. At the moment, the steel fiber concrete in Ukraine is widely used for floors in industrial buildings and shopping centres, also preparing to release steel fiber concrete non-pressure pipes. The analysis of researches of steel fiber concrete in Ukraine has shown that it is helpful to: a. go to the deformation method of calculation steelfiberconcrete structures using detailed diagrams stress strain in tension and compression, including transformed under different force effects, that are variables in time; b. in parallel with experimental and theoretical research work of steel fiber concrete elements with different types start to the development of a combined reinforced load-bearing structures; c. develop a range of promising prestressed steel fiber concrete constructions and start their research work under load; d. adapt and upgrade the factories equipment of precast concrete constructions for the steel fiber concrete structure's production.



THERMAL PERFORMANCE OF PRECAST CONCRETE SANDWICH PANEL (PCSP) DESIGN FOR SUSTAINABLE BUILT ENVIRONMENT

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ABSTRACT

Malaysia's awareness of performance criteria in construction industry towards a sustainable built environment, using precast concrete sandwich panel (PCSP) system is applied in the building's wall to study the structural behavior. However, very limited studies are conducted on the thermal insulation of exterior and interior panels in PCSP design. In hot countries such as Malaysia, proper designs of panel are important to obtain better thermal insulation for building. This study is based on thermal performance of precast concrete sandwich panel design for sustainable built environment in Malaysia. In this research, three full specimens, which are control specimen (C), foamed concrete (FC) panels and concrete panels with added palm oil fuel ash (FC+ POFA), where FC and FC+POFA sandwiched with gypsum board (G) were produced to investigate their thermal performance. Temperature difference of exterior and interior surface of specimen was used as indicators of thermal-insulating performance of PCSP design. Heat transfer test by halogen lamp was carried out on the three specimens where the exterior surface of specimens was exposed to the halogen lamp. The temperature reading of exterior and interior surface for the three specimens were recorded with the help of thermocouple. Other factors also studied the workability, compressive strength and axial compressive strength of the specimens. From this study, it had proved that FC + POFA specimen has the strength nearer to normal specimen (C + FC specimen). Meanwhile, the heat transfer results show that the FC+POFA has better thermal insulation performance compared to C and FC specimens with the highest temperature difference, 3.4°C compared to other specimens. The results from this research are useful to be implemented in construction due to its benefits such as reduction of energy consumption in air-conditioning, reduction of construction periods and eco-friendly materials.



INFLUENCE OF GRID REINFORCEMENT PLACED IN MASONRY BED JOINTS ON ITS FLEXURAL STRENGTH

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ABSTRACT

The paper presents the test results of the flexural strength of masonry when plane of failure is perpendicular to the bed joints. Comparison tests of unreinforced specimens and specimens reinforced with steel wire, glass and basalt fiber grids applied in masonry bed joints showed the higher flexural strength and crack resistance of masonry reinforced in this manner and so loaded. Reinforced masonry exposed plastic character after cracking allow for large horizontal displacements and transfer the considerable loads perpendicular to their surface. The strengthening of masonry was observed in most tests of reinforced specimens leading to occurrence of the maximum load in after cracking phase.



World Multidisciplinary

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Civil Engineering-Architecture-Urban Planning Symposium - WMCAUS

DAMAGING OF MASONRY WALLS SUPPORTED ON DEFLECTED STRUCTURE

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ABSTRACT

The paper presents some selected results of experimental tests on masonry walls in the full-scale with openings and solid walls made of silicate masonry units. The walls were subjected to simultaneous incrementing vertical compression loads and deflection of the structure supporting the masonry. The work describes mechanism of damaging the walls depending on the way of their perforation and presents the in-plane stiffness and values of deflection and wall distortion angle at which the first cracks are formed and when wall failure takes place.



THE AIR PERMEABILITY OF RENOVATION PLASTERS EVALUATED WITH TORRENT'S METHOD

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ABSTRACT

Currently used technical instructions contain detailed requirements for renovation plasters properties. There are three basic parameters, which provide the proper work of renovation plaster system. One of them is high open porosity, which allows storing up harmful salts. Plaster pores are gradually filled up with crystallized salts. The end of this action means renovation plaster destruction. However, it is estimated that the average durability of the renovation plasters can last at least a dozen or so years. The aim of research was to determine the air permeability of renovation plasters, as this feature is not contained in currently used technical instructions. Well-known and successfully used Torrent's method is intended to the research of the structural concrete. Nevertheless, based on main principles of this method, it was decided to use it and try to determine the air permeability of renovation plaster. The scope of this research included three renovation plaster systems. Each of them was applied on experimental, masonry element and had a different rendering coat. Permeability measurements were performed after 28 days of curing in a natural state. In order to calculate the coefficient of air permeability (kT), the partial data was registered during the measurements. Receiving the kT value for such highly porous material required different way of calculation in comparison to standard procedure applied in case of ordinary concrete. The test results indicate the possibility of setting the coefficient of air permeability kT in relation to renovation plasters. At the same time results confirm the high porosity of renovation plasters. The relationship between the kT value and the open porosity of tested plasters suggests possibility of Torrent's method application to assess the durability of renovation plaster systems. Determination of a highly probable correlation between these two properties would enable to control the degree of the salts accumulation process advancement in renovation plaster pores. The smaller air permeability value would be identified with smaller renovation plasters porosity. Due to the practical easiness of measurements by Torrent's method, it would be possible to monitor the permeability of renovation plaster systems applied on real buildings. Control measurements in established time intervals will enable to register the decrease of permeability values, caused by processes which occur during the exploitation of renovation plaster system. Therefore, it will be possible to predict the potential durability of renovation plaster.



**NON-DESTRUCTIVE ASSESSMENT OF RESIDUAL STRENGTH OF THERMALLY DAMAGED CONCRETE
MADE WITH DIFFERENT AGGREGATE TYPES**

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ABSTRACT

In case of concrete exposed to high temperature, both mechanical and physical properties undergo changes. Non-destructive parameters, used for concrete quality assessment after fire, are highly dependent on its composition, thus the calibration procedures are required. The aggregates, representing a considerable proportion of volume in concrete have a vital influence on concrete behaviour as well as on destructive and non-destructive parameters (i.e. rebound index, Ultrasonic Pulse Velocity and resonant frequency) used for concrete damage assessment. The paper presents the results obtained on four concretes made with four different aggregate types: basalt, granite, dolomite and riverbed gravel. In this study the cement paste and mortar compositions and their volumes remained the same for all the four concretes, that allows a clear comparisons and the conclusions of aggregate type effect. Moreover, the aggregate particle size distribution is chosen to be quasi identical for all concretes so that this factor does not affect the concrete behaviour. The residual material properties (after heating and cooling down) are performed with the use of destructive and non-destructive testing methods for each concrete type being not thermally damaged and after thermal exposure at temperature of 200 °C, 400 °C, 600 °C, 800 °C and 1000 °C. Residual mechanical properties are compared with diagnostic parameters obtained with NDT methods. The aim of this study is to provide and compare the regression curves between selected nondestructive diagnostic parameters and the residual values of mechanical properties. The NDT methods used in this experiment are: surface hardness, Ultrasonic Pulse Velocity, and resonance method.



THE EVALUATION OF FOAMING PERFORMANCE OF BITUMENS WITH ADDITION OF SURFACE ACTIVE AGENT

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ABSTRACT

The article presents the analysis of the performance of foamed bitumens modified using surface active agents. Although, bitumen foaming permits production of asphalt concrete and other asphalt mix types without using chemical additives in significantly reduced temperatures, the decrease in processing temperatures still impacts the adhesion performance and bitumen coating of aggregates in final mixes. Therefore, in some cases it may be feasible to incorporate adhesion promoters and surface active agents into warm and half-warm mixes with foamed bitumen to increase their service life and resilience. Because of the various nature of the available surface active agents, varying bitumen compatibility and their possible impact on the rheological properties of bitumen, the introduction of surface active agents may significantly alter the bitumen foaming performance. The tests included basic performance tests of bitumens before and after foaming. The two tested bitumens were designated as 35/50 and 50/70 penetration binders, which were modified with a surface active agent widely used for improving mixture workability, compactibility and adhesion in a wide range of asphalt mixes and techniques, specifically Warm Mix Asphalt. Alongside to the reference unmodified bitumen, binders with 0,2%, 0,4% and 0,6% surface active agent concentration were tested. The analysis have shown a positive influence of the modifier on the foaming performance of both of the base bitumens increasing their maximum expansion ratio and bitumen foam half-life. In the investigations it was found that the improvement was dependent on the bitumen type and modifier content. The improved expansion ratio and foam half-life has a positive impact on the aggregate coating and adhesion, which together with the adhesion promoting action of the modifier will have a combined positive effect on the quality of produced final asphalt mixes.



THE IMPACT OF THE AGEING ON VISCOELASTIC PROPERTIES OF BITUMEN WITH THE LIQUID SURFACE ACTIVE AGENT AT OPERATING TEMPERATURES

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ABSTRACT

The paper presents the influence of the ageing on viscoelastic properties of the bitumen at road pavement operating temperatures. The ageing process of bituminous binders causes changes in physical and mechanical properties of the bitumen. This phenomena takes place in all stages of bituminous mixtures manufacturing, namely: mixing, storage, transport, placing. Nevertheless, during the service life it occurs the increase in stiffness of asphalt binder that is caused by the physical hardening of bitumen as well as the influence of oxidation. Therefore, it is important to identify the binder properties at a high and low operating temperatures of asphalt pavement after simulation of an ageing process. In the experiment as a reference bitumen, the polymer modified bitumen PMB 45/80-65 was used. The liquid surface active agent FA (fatty amine) was used as a bitumen viscosity-reducing modifier. It was added in the amount of 0,2%, 0,4% and 0,6% by the bitumen mass. All binder properties have been determined before ageing (NEAT) and after long-term ageing simulated by the Pressure Ageing Vessel method (PAV). To determine the binder properties at high temperatures the dynamic viscosity at 60°C was tested. On the basis of test results coming from the dynamic viscosity test it was calculated the binder hardening index. The properties at a low temperature were determined by measuring the creep modulus using Bending Beam Rheometer (BBR) at four temperatures: -10°C, -16°C, -22°C and -28°C. The stiffness creep modulus "S" and parameter "m" were determined. On the basis of dynamic viscosity test it was found that the ageing process caused a slight decrease in a dynamic viscosity. The level of a hardening index considerably increased at 0.6% fatty amine content. The long-term ageing process had a minor effect on stiffening of a polymer modified bitumen with FA additive regardless of a low temperature and an amount of fatty amine content.



HYGROTHERMAL SIMULATION OF WOOD EXPOSED TO THE EFFECT OF EXTERNAL CLIMATE

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ABSTRACT

The article is focused on simulation of moisture transfer in wood of norway spruce (*Picea abies* L.). Experimental specimen was exposed to the northern climatic conditions in Lund University, Sweden. The moisture content of wood was measured 10 mm from the surface for nearly three years. The ABAQUS program was used for numerical modelling of moisture transfer simulation in 3D. The surface sorption of wood was simulated using user defined subroutine DFLUX developed by VTT Research Centre of Finland Ltd. for the needs of European Project Durable Timber Bridges. Climate data for the analysis was used from in-situ measurement nearby realized by weather station. The temperature, relative humidity of the air and precipitation data was record each hour. Numerical analysis took into account influence of rain effect on different parts of specimen surface.



THE PARAMETERS OF CONCRETE MODIFIED FLOUR GLASS AND POWDER CHALCEDONITOWYM

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ABSTRACT

Additives used for the production of concrete mixtures affect the rheological properties of hardened concrete and parameters include the compressive strength, water resistance, durability or shrinkage of hardened concrete. With their use can reduce the use of cement and reduce production costs. The scheduled program of laboratory tests included the six series of concrete mixtures with the addition of powdered glass and dust chalcedonitowego. Mineral dust is a waste product derived from mine crushed aggregate of grain size below 0,063mm. The main ingredient is silica dust chalcedonitowego. Meal glass used in the study is a material that has a very fine grain size of less than 0,63mm. Such a particle size of from 60% to 90% of the sample. Additives replaced cement concrete compositions in an amount of 15% and 25%. The amount of aggregate left unchanged. The study used Portland cement CEM I 42.5R. Concrete mixes were formed with a constant $w/s = 0.4$. The aim of the study was to identify the effect of the addition of dust chalcedonitowego and / or powdered glass on the parameters of hardened concrete, ie. Compressive strength, water absorption and capillarity. Additives used in the laboratory significantly affect the compressive strength. The largest decrease in compressive strength of concrete samples were recorded for that substitute 50% of cement additives. This decrease is 34,35%. The smallest decline in strength have concrete with the addition of 15% of dust chalcedonitowego or 15% crushed glass, and it amounts to an average of 15%. The study of absorption shows that all concrete with the addition of dust and powdered glass chalcedonitowego obtained the percentage weight gain between 2.7 - 3.1% for the test series. This is a very good result, which is associated probably seal the grout. The capillary is pulled up for the test series the percentage weight gain samples ranges from 4.6% to 5.1%. However, the reference concrete obtained the lowest water absorption as compared to other batches.



PARAMETERS MORTAR WITH HIGH ALUMINA CEMENT AND PORTLAND WITH THE ADDITION OF POWDER CHALCEDONITE

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ABSTRACT

Aluminous cement is a binder quickly binds with special properties. It is used primarily to make non-standard monolithic components exposed to high temperature + 1300C. There is also a component of adhesives and mortars. It has a very short setting time. It is characterized by a rapid increase in the mechanical strength and resistance to aggressive sulphate. It can be used in reinforced concrete structures. Laying of concrete, mortar construction of alumina cement can be carried out even at temperatures to -10 ° C. The article concerns the comparison of the parameters of hardened mortar made of alumina cement GARKAL 40 and Portland cement CEM I 42.5. Mortars added with dust chalcedonitowy pozzolanic properties and a particle size of less than 0,063µm. The dust was added in an amount of 5% and 20% by weight of cement. Chalcedonite flour used in the laboratory is waste material, resulting in a mine aggregate chalcedonitowego. It has the same properties as the rock with which it comes. We compared parameters of hardened mortar i.e. Compressive strength, water absorption and capillarity. The addition of 20% of dust with a mortar chalcedonitowego aluminous cement will decrease the strength of 6.1% relative to the aluminous cement mortar without the addition of dust. Considering the results obtained during the test absorbency it can be stated that the addition of dust chalcedonitowego reduces weight gain in mortars made with cement CEM I 42.5 R and aluminum. Use of the alumina cement mortars without the addition of dust reduces weight gain of 5.1% compared to the mortar of Portland cement without addition in the study of absorption. The addition of particulate chalcedonitowego not cause increased weight gain in the test capillary action. For the alumina cement mortar reported less weight gain of 24.7% compared to the mortar of Portland cement after 28 days of ripening



**THE RESEARCH OF THE FROST RESISTANCE OF THE TILE ADHESIVE ON A CEMENT BASIS WITH
THE APPLICATION OF AMORPHOUS ALUMOSILICATES AS A MODIFYING ADDITIVE**

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ABSTRACT

Information is given on the possibility of using amorphous aluminosilicates as a modifying additive in the formulation tile cement adhesive. In the article the data on the preparation of an additive based on amorphous aluminosilicates, on its microstructure and chemicals composition. Are presented the information on the change in the porosity of cement stone with the introduction of amorphous aluminosilicates. The formulation of a dry building mix on a cement base is proposed with the use of an additive based on amorphous aluminosilicates as a modifying additive. Recipe of dry adhesive mixes includes Portland cement M400, mineral aggregate in the ratio fractions 0,63-0,315:0,315-0,14 respectively 80:20 (%) and the filling density of 1538.2 kg /m³, a plasticizer Kratasol, redispersible powder Neolith P4400 and amorphous aluminosilicates. The developed formulation can be used as a tile adhesive for finishing walls of buildings and structures with tiles. Are presented the results of the evaluation of frost resistance of tile cement adhesives with the use of amorphous aluminosilicates as a modifying additive. Installed the mark on the frost resistance of tile glue and frost resistance of the contact zone of tile glue. The established that the adhesive layer based on the developed formulation of the dry glue building mixture is crack-resistant, frost-resistant and resistant to peeling for the conditions of Penza and the cities of Russia in the moisture zone-3 (dry) and climatic subareas IIB in accordance with Building codes and regulations 23-01 -99 *.



**THE ASSESMENT OF THE IMPACT OF CHALCEDONY DUST TO REACTION OF ALKALI- AGGREGATE
IN CEMENT MORTAR**

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ABSTRACT

Today the development of the technology of building materials is not only to improve their properties, but also care for the existing structures. Destruction of the materials of construction can either be due to the aggressive action of environment and corrosion of the inner material. One of the more dangerous interaction is the alkali-silica reaction. The product of this reaction is sodium potassium- silicate gel or potassium- sodium- calcium silicate gel. It appears in the cleavage planes aggregate within its pores and on the surface of the grains. The essence of the impact of alkali aggregate is unrestricted swelling of the products of the reaction due to absorption of moisture. Widely developed technologies make it possible to limit such adverse effects through the use of suitable mineral additives. Chalcedony dust properly fragmented can be used as a mineral additive to cement or concrete. This material can act as a pozzolan, and to prevent expansion induced alkali- silica reaction. The paper presents the research cement mortar with reactive aggregate as opal and different amount of additive chalcedony dust of long-term method according to ASTM C227. Petrographic analysis was performed to aggregate opal and examination of the potential reactivity of chemical method ASTM C 289. The paper also presents the study of the microstructure of cement mortar with chalcedony dust and opal. Studies have shown the positive effect of the addition of chalcedony dust to limiting the expansion induced alkali- silica reaction in relation to the cement mortar without this additive. Addition of chalcedony dust to the cement mortar in an amount of 20% can reduced expansion to a safe level exceeding to 0.1% after 360 days (according to ASTM C227).



INFLUENCE OF ENVIRONMENT FACTORS ON HUMIDITY CONDITIONS OF SELECTED EXTERNAL WALL SOLUTIONS IN A HEATED BUILDING

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ABSTRACT

Contemporary single-family houses in Poland are often built during 3 quarters of a year (spring to autumn) and are usually settled in a winter season. It is a special case when exploitation humidity coincides with technological one, causing unfavourable humidity conditions during the first years of exploitation. In consequence, thermal parameters of partitions differ from those assumed in the project. In construction stage the humidity state of a wall stabilizes as a result of water: associated with storage, entered technologically during wall construction and plastering, coming from rainfall. Thermo-insulation materials are built-in at dry state. During erection and exploitation of a building their thermal conductivity is changing depending on humidity conditions. According to building rules, construction humidity should be removed from a partition before the building transfer to usage, because it lowers the thermal partition insulation ability and increases air humidity of building interior. Walls are plastered and insulated in condition of simultaneous presence of atmospheric and technological humidity which cause special humidity condition during first years of exploitation. As a consequence heating costs are substantially higher. In this article the results of simulation are shown performed with WUFI @PRO 5 software, which was intended to define the time necessary for reaching the stabilised humidity in selected solutions of two-layer walls applied in a heated building. In the research performed, the partition orientation along geographic directions, short and long wave radiation, and environment humidity (air humidity, driving rain) coincidence with technological humidity in assumed wall solutions were taken into account.



THE EFFECT OF MINERAL POWDERS DERIVED FROM INDUSTRIAL WASTES ON SELECTED MECHANICAL PROPERTIES OF CONCRETE

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ABSTRACT

In recent years concrete has been the most popular construction material. The main component of the concrete is cement. However, its production and transport causes significant emissions of CO₂. With reports in the literature show that in many laboratories are attempts to modify the composition of the concrete using various additives. These attempts are primarily designed to eliminate parts of cement. The greater part of the cement will be replaced with the selected additive, the more significant is the economic and ecological effect. Most attempts relate to the replacement of the selected additive in an amount of from 10 to 30% by weight of cement. Mineral powders, which are waste material producing crushed aggregate, are increasingly used for this purpose. Management of the waste carries significant cost related to their storage and disposal. With this in mind the aim of this study was to evaluate the effect of mineral powders derived from industrial wastes on selected mechanical properties of concrete. In particular, the aim is to determine the effect of quartz and quartz-feldspar powders. For this purpose, 40, 50, 60% by weight of the cement is replaced by the selected powders. The results obtained were analyzed and compared with previous attempts to replace the selected additive in an amount of from 10 to 30% by weight of cement.



DEPENDENCE OF CAPILLARY PROPERTIES OF CONTEMPORARY CLINKER BRICKS ON THEIR MICROSTRUCTURE

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ABSTRACT

Contemporary clinker bricks are applied for outer layers of walls built from other materials and walls which should have high durability and esthetic qualities. The intended effect depends not only on the mortar applied but also on clinker properties. Traditional macroscopic tests do not allow to predict clinker behaviour in contact with mortars and external environment. The basic information for this issue is open porosity of material. It defines the material ability to absorb liquids: rain water (through the face wall surface) and grout from mortar (through base surface). The main capillary flow goes on in pores with diameters from 300 to 3000nm. It is possible to define pore distribution and their size using the Mercury Intrusion Porosimetry method. The aim of these research is evaluation of clinker brick capillary properties (initial water absorption and capillary rate) and analysis of differences in microstructure of the face and base wall of a product. Detailed results allowed to show pore distribution in function of their diameters and definition of pore amount responsible for capillary flow. Based on relation between volume function differential and pore diameter, a differential distribution curve was obtained which helped to determine the dominant diameters. The results obtained let us state that face wall of bricks was characterized with the lowest material density and open porosity. In this layer (most burnt) part of pores could be closed by locally appearing liquid phase during brick burning. Thus density is lower comparing to other part of the product.



A CASE STUDY ON COMPARISON OF SEALANT ADHESION TESTED IN LABORATORY AND IN-SITU

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ABSTRACT

The authors of presented case study believe that existing testing procedures intended for testing of bonded and sealed joints do not fully reflect the abrupt weather changes exterior surfaces are subject to, moreover, they also often prescribe unsuitable geometry of the testing samples. Based on previous experiences a unique geometry of testing sample was used for this purpose allowing the testing of a so-called real joint. The aim of the authors was to create a testing sample of such a shape that would correspond as much as possible to the real implementation of the sealed joint and subsequently to put it through tests that would verify the impact of the external environment on its rheological and mechanical properties. A group of test samples was subjected to two normalized test procedures that may influence the resulting behaviour of the real joint in the exterior since these methods simulate weather changes. The second group of test samples was exposed to the external environment for a particular period. The obtained results of tests show that the standardized methods are able to simulate a real outdoor environment, however, only to a certain extent. Unfortunately, these methods do not consider the possibility that the sealed joint might be damaged already during the application itself. While laboratory environment is clean and often dust free, it is not possible to ensure the same conditions in-situ. Moreover, in some cases it was monitored that sealants tested in an external environment aged rapidly compared to the ones cured and stored in the laboratory.



BASIC PERFORMANCE OF FIBRE REINFORCED ASPHALT CONCRETE WITH RECLAIMED ASPHALT PAVEMENT PRODUCED IN LOW TEMPERATURES WITH FOAMED BITUMEN

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ABSTRACT

During the reconstruction of road pavements the reclaimed asphalt pavement (RAP), which is obtained through milling of the worn out existing asphalt, is commonly used for producing new base courses in cold recycling processes. Two of these techniques are most popular: one using mineral-cement-emulsion mixes and one utilizing mineral cement mixes with foamed bitumen. Additionally some amounts of RAP can be incorporated into traditional hot mix asphalt. The demand for energy efficient and environmentally friendly solutions however, results in a need for development of new techniques that would result in cheaper and more reliable solutions with smaller carbon footprint. The reduction of processing temperatures with simultaneous incorporation of reclaimed material is the most efficient way of obtaining these objectives, but it often results in the overall decrease of bituminous mix quality. The paper presents the possibility of using RAP for producing asphalt concrete in warm mix asphalt (WMA) production process by the use of foamed bitumen modified with Fischer-Tropsch synthetic wax and polymer-basalt fibers. Additionally a series of reference mixtures were produced to investigate the effects of the additives and of the warm process. The carried out analyses and tests shown that the experimental warm mix asphalt produced with RAP and foamed bitumen returned satisfactory performance. The introduction of synthetic F-T wax in the warm foam bitumen mixes resulted in a significantly improved compaction levels and moisture and frost resistance and the addition of polymer-basalt fibers has further improved the permanent deformation resistance of the mixes, All of the designed and tested mixes have fulfilled the requirements for binding course asphalt concrete with medium traffic loads.



INFLUENCE OF AGGREGATE GRADATION ON THE LONGITUDINAL WAVE VELOCITY CHANGES IN UNLOADED CONCRETE

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ABSTRACT

Diagnosis is an important factor in the assessment of structural and operational condition of a concrete structure. Among diagnostic methods, non-destructive testing methods play a special role. Acoustic emission evaluation based on the identification and location of destructive processes is one of such methods. The 3D location of AE events and moment tensor of fracture analysis are calculated by longitudinal wave velocity. Therefore, determining the velocity of longitudinal wave of concrete and the impact of the material and destructive factors are of essential importance. This paper reports the investigation of the effect of aggregate gradation on the change in wave velocity of unloaded concrete. The investigation was carried out on six $150 \times 150 \times 600$ mm elements. Three elements contained aggregate fraction 8/16 mm and the other three were made with aggregate fraction 2/16 mm. Two acoustic emission sensors were used on the surface of the elements, and the wave was generated by the Hsu – Nielsen source. Longitudinal wave velocities for each group of elements were calculated and statistical test of significance was used for the comparison of two means. The results of the test indicated a substantial effect of the aggregate grain size on the change in longitudinal wave velocity. The average wave velocity in the concrete containing 8/16 mm fraction was 4672 m/s. In the concrete with 2/16 mm fraction, the velocity decreased to 4373 m/s. The velocity of the wave decreases at larger quantities of aggregate. The propagating longitudinal wave encounters more aggregate grains on its way and is reflected, also from air voids, multiple times and so its velocity is noticeably lower in the concrete with the 2/16 fraction. Thus, to be able to accurately locate AE events and analyse moment tensor during concrete structure testing, the aggregate grain size used in the concrete should be taken into account.



THERMOGRAPHIC RESPONSE IN CONCRETE BLOCKS PREPARED WITH ASH

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ABSTRACT

Background: The ash is a waste coming from different commercial activities. In the case of the paper industry, the coal is used for combustion process and generates ash with the consequent difficulties in the disposal; due to this, the ash has been used in the production of concrete blocks. This study aims to compare the thermographic response of concrete blocks made with this ash. Secondary aim is to evaluate the mechanical performance of blocks prepared industrially when the ash is included as a substitute of cement using different percentages. **Methods:** In this work, concrete blocks were using the industrial formula. For doing that, were prepared blocks using 10%, 20 %, 30% and 40 % of ash as replacement of cement. Quality control of the production was made according with the standard production process in a factory. **Results:** Specialized tests such as X-ray diffraction and microscopy analysis shown the absence of toxic substances in the ash then this waste can be used apparently without further risks in other materials. Regarding thermal response reveals that an increase in the proportion of ash shown an ability to absorb heat increases. In general, the mechanical strength of the blocks produced with cement substitutions yielded superior compression resistance higher than 10 Mega pascals. **Conclusions:** It also finds that the use of industrial waste is a reasonable alternative for the control of environmental impacts that may be used in the production of other materials. Furthermore, this study showed that substitutions up to 40 % ash for cement shed comparable compression response similar to the resistance offered by the industry. On the other hand, it is observed that the addition of ash improved capacity of heat absorption of the tested blocks, demonstrating that this kind of block is a viable material to improve thermal comfort in a housing.



EVALUATION OF DEVELOPMENT OF THE BOND STRENGTH BETWEEN TWO CONCRETE LAYERS

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ABSTRACT

The paper shows the analysis of the development of bond strength in composite members type concrete-to-concrete. The experimental study was performed to evaluate the development of the bond strength between two concrete layers in which the concrete of a new generation was used. The essence of the composite concrete members is to ensure the best possible cooperation between jointed concretes. The main factor influencing the bearing capacity in composite members is bond strength between concretes as only effective joint between substrate and overlay ensures their full structural cooperation. It is important not only in already finished composite members but also in stages of realization, when the bonded overlay hasn't yet reached the full strength. The paper shows the analysis of development of bond strength between jointed concretes with non-reinforced interface. In the study two different types of concrete were used - normal concrete (NC) and high-performance concrete (HPC). Composite specimens of the substrate and overlay type NC-HPC and HPC-HPC and reference NC-NC were made. The analysis of the bond strength was performed on composite cubes of size 150x150x150 mm which were subjected to splitting tension tests after 3, 7, 14 and 28 days of curing of the concrete overlay. The results of the conducted studies show that the basic phenomenon that allows for the bond strength is adhesion between concretes, developing with the process of curing of concrete overlay. The highest increase of value of tensile bond strength was observed in the first 3 days of curing of composite specimens. In this period the NC-NC composite reaches 53% of its 28-day tensile bond strength, the NC-HPC specimen - 67% and the HPC-HPC - 74%. The conducted studies have shown the presence of different modes of interface failure depending on the configuration type of concrete in composite specimens. In the case of composite specimens of NC-NC and HPC-HPC the dominant interface failure mode was observed to occur within the overlay transition zone. For composite specimens NC-HPC interface failure mode was observed both in the overlay transition zone and substrate failure made of NC. The studies didn't show the changes of observed modes of bond mechanism failure from time curing of composite specimens. The obtained results were compared with the existing studies in the literature related to the study of bond strength in composite concrete members.



DAMAGED CONCRETE VIADUCT IN AN ITALIAN HIGHWAY: CONCRETE CHARACTERIZATION AND COMPARISON OF POSSIBLE AND STRENGTHENING TECHNIQUES BY FRP APPLICATIONS

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ABSTRACT

In Italy, many of bridges and highways built in the early seventies are in poor condition of conservation and they need urgent interventions of structural rehabilitation. In this paper, the seriously damaged reinforced concrete slab of the "Fornello" viaduct in the Italian Orte-Ravenna highway (E45) has been widely characterized to evaluate the level of damage and to identify the causes of degradation. No-destructive tests, as those based on ultrasonic waves, as well as chemical, physical and mechanical destructive tests have been carried out on specimens drawn from deteriorated and not deteriorated zones of the R/C bridge decks. Into the slab thickness, the concentration distribution of main anions has been quantified by ion chromatography. Porosimetry tests have been carried out to detect the resistance to freeze-thaw cycles of cement paste. Finally, possible strengthening techniques by FRP applications have been compared.



**EFFECT OF THE TYPE OF SURFACE TREATMENT AND CEMENT ON THE CHLORIDE INDUCED
CORROSION OF GALVANIZED REINFORCEMENTS**

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ABSTRACT

Among the possible methods for improving the corrosion resistance of reinforcements in concrete structures, the use of galvanized reinforcement bars should be considered due to their low cost compared with other preventive protective systems and their efficacy to delay the corrosion initiation of reinforcing steel. However, open issues on galvanized steel reinforcements remains the efficacy of the protective action in concrete containing chlorides, the compatibility with the high alkalinity of european cements, harmless but equally effective agents for surface zinc passivation alternative to that based on harmful hexavalent chromium. The purpose of this work is to investigate the effect of a new passivation treatments obtained by immersion of the galvanized reinforcements in a trivalent chromium salts based solution on the corrosion behavior induced by chlorides of galvanized rebars embedded in concretes specimens. Moreover, to investigate also the effect of cement alkalinity on corrosion behavior of reinforcements, three different European cements were used and compared: portland cement (CE I 52.5R), composite portland cement (CE II/B-M 32.5R), pozzolanic cement (CE IV/B 32.5R). The results obtained from this work show that the alternative treatment based on hexavalent chromium-free baths form effective protective layers on the galvanized rebar surfaces. The higher corrosion rates of zinc coating in concrete manufactured with Portland cement compared to those recorded for bars in concrete manufactured with pozzolanic cement depends strongly on the higher chloride content at the steel concrete interface.



THE COMBINED USE OF A SHRINKAGE REDUCING ADMIXTURE AND CaO IN CEMENT BASED MATERIALS

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ABSTRACT

The combined addition of a Shrinkage-Reducing Admixture (SRA) with a CaO-based expansive agent (CaO) has been found to have a synergistic effect to improve the dimensional stability of cement based materials. In this work, aimed to further investigate the effect, mortar and self compacting concrete specimens were prepared either without admixtures, as reference, or with SRA alone and/or CaO. Their performance was compared in terms of compressive strength and free shrinkage measurements. Results showed that the synergistic effect in reducing shrinkage is confirmed in the specimens manufactured with SRA and CaO. In order to clarify this phenomenon, the effect of SRA on the hydration of CaO as well as cement was evaluated through different techniques. The obtained results show that SRA induces a finer microstructure of the CaO hydration products and a retarding effect on the microstructure development of cement based materials. A more deformable mortar or concrete, due to the delay in microstructure development by SRA, coupled with a finer microstructure of CaO hydration products could allow higher early expansion, which might contribute in contrasting better the successive drying shrinkage.



ANALYSIS OF TRANSPARENT CONCRETE AS AN INNOVATIVE MATERIAL USED IN CIVIL ENGINEERING

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ABSTRACT

Concrete from the dawn of history is one, right after stone and bricks, of the oldest building material. The ancient Romans took advantage of its opportunities. They were constructed an amazing architectural objects, which survived centuries as a whole buildings or parts of them. Concrete is so ubiquitous that when we are walking in a newer districts we are virtually surrounded by concrete from everywhere. Sometimes we don't realize how many cases and the various ways concrete is used in towns and cities. As we know, human curiosity and quest for search newer and newer solutions and capabilities does not leave so amazing material such as concrete, alone. There are many varieties of concrete, depending on what people wanted to achieve. By changing its chemical composition, process and conditions of the creation and matching various other materials and combine it into a single whole, we receive various concrete types. We use them to create a durable supporting structures, create a variety of concrete resistant to constant moisture or different chemical types. In architecture, concrete is also used in aspects of aesthetics. The aim of this paper is to analyze and describe one of the particular type of architectural concrete - transparent concrete. This material is becoming more popular due to its unusual properties. High strength and its transparency character are related with aesthetic value of concrete. Some examples of applications of this material are shown in the paper. The origin, properties and problems of use of this material are broadly described.



LABORATORY INVESTIGATION ON THE EFFECTS OF NATURAL FINE AGGREGATES AND RECYCLED WASTE TIRE RUBBER IN PERVIOUS CONCRETE TO DEVELOP MORE SUSTAINABLE PAVEMENT MATERIALS

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ABSTRACT

Pervious concrete pavement is a recognized sustainable solution for urban roads. Its porous structure allows water to percolate and naturally recharge the subsoil and to mitigate the climate of the surroundings after evaporating. At same time, its clear color permit a reduction of urban heating effect. The great void content produces noise adsorption and made the pavement a natural filter for contaminants. Moreover, the elimination of water runoff, lead to a more comfortable infrastructure for all the type of users and generally higher safety. To enhance mechanical properties of pervious concrete material, in order to allow wider use of this technology, a lot of studies are going on all over the world. The use of a little percentage of fine aggregates is proven to increase the material resistance without an excessive reduction of permeability. Some studies, are going on about the use of recycled fine aggregates in substitution of the virgin sand. One of the most innovative areas of research is the one of the re-use of recycled tire rubber in pervious concrete. In fact, during last few years many investigators are trying to analyze the effects of recycled tire rubber in civil engineering applications in particular in asphalt mixtures and portland concrete. This study aimed to evaluate the effect of replacing the fine virgin aggregates with recycled tire rubber. 14 different mixes were analyzed in terms of indirect tensile strength resistance, void content and density. Two different dimensions of crumb rubber were studied, as well as two different dosages, which were applied to different no-fine control mixes. All results were compared with the same control mixes containing natural fine aggregate. The mixes had a fixed granulometric curve but varied in water/cement ratio; this in order to evaluate the effect of recycled rubber depending to w/c ratio of the mix. An image analysis was also conducted to verify the rubber distribution in the mixture and the cracking surfaces. The experimental analysis showed that a correct proportioning of fine sand significantly increased the strength of the material. Moreover, the use of recycled waste tire rubber, gave interesting improvements respect to the no-fine control mixes, even though the developed resistance was lower respect to mixes containing mineral sand. This result was expected because of the cementing property of mineral sand. Although, the important result was that it was possible to use waste tire rubber in pervious concrete, with an appropriate dosage and granular dimension, for increasing the performance of traditional mix design, in order to achieve pavement materials more and more sustainable.



INVESTIGATION OF EFFECT ADDITIVE PHASE CHANGE MATERIALS ON THE THERMAL CONDUCTIVITY

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ABSTRACT

The aim of worldwide policy is to reduce the amount of consumed energy and conventional fuels. An important branch of the economy that affects the energy balance of the country is construction industry. A today's adult spends most of his or her life in a closed area where he or she wants to feel comfortable. In order to ensure thermal comfort of the room, people design heating and cooling systems that consume a lot of energy. In Poland, since January 1st, 2017 new limit values have been valid regarding energy saving and thermal insulation of buildings. To meet the requirements of more and more stringent technical and environmental standards, new technological solutions are currently being looked for. When it comes to the use of new materials, phase-change materials are being widely introduced into construction industry. Thanks to phase-change materials, we can increase the amount of heat storage. Great thermal inertia of the building provides more stable conditions inside the rooms and allows the use of unconventional sources of energy such as solar energy. A way to reduce the energy consumption of the object is the use of modern solutions for ventilation systems. An example is the solar chimney, which supports natural ventilation in order to improve internal comfort of the rooms. Numerous studies are being carried out in order to determine the optimal construction of solar chimneys in terms of materials and construction parameters. One of the elements of solar chimneys is an absorption plate, which affects the amount of accumulated heat in the construction. In order to carry out the research on the thermal capacity of the absorption plate, the first research work has been already planned. The work presents the research results of a heat-transfer coefficient of the absorption plates samples made of cement, aggregate, water, and phase-change material in different volume percentage. The work also presents methodology and the research process of phase-change material samples.



ANALYSIS OF WITHIN-TEST VARIABILITY OF NON-DESTRUCTIVE TEST METHODS TO EVALUATE COMPRESSIVE STRENGTH OF NORMAL VIBRATED AND SELF-COMPACTING CONCRETES

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ABSTRACT

Non-destructive tests (NDT) have been used in the last decades for the assessment of in-situ quality and integrity of concrete elements. An important step in the application of NDT methods concerns to the interpretation and validation of the test results. In general, interpretation of NDT results should involve three distinct phases leading to the development of conclusions: processing of collected data, analysis of within-test variability and quantitative evaluation of property under investigation. The analysis of within-test variability can provide valuable information, since this can be compared with that of within-test variability associated with the NDT method in use, either to provide a measure of the quality control or to detect the presence of abnormal circumstances during the in-situ application. This paper reports the analysis of the experimental results of within-test variability of NDT obtained for normal vibrated concrete and self-compacting concrete. The NDT reported includes the surface hardness test, ultrasonic pulse velocity test, penetration resistance test, pull-off test, pull-out test and maturity test. The obtained results are discussed and conclusions are presented.



**IMPACT OF MODIFICATION OF AUTOCLAVED AERATED CONCRETE WITH HIGH-IMPACT
POLYSTYRENE**

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ABSTRACT

Autoclaved aerated concrete (AAC) is one of the most frequently used building materials. Its advantages can include low bulk density, high thermal insulation and high fire resistance. This material also has a relatively high compressive strength, but not to a high enough in this respect was competitive with other construction materials. One of the directions for the improvement of physical and mechanical properties of autoclaved aerated concrete is a modification of its composition. Due to the significant improvement of the properties (ie. the compressive strength and water absorption) modified autoclaved aerated concrete high-impact polystyrene was decided to continue the research on the effects of this additive. The aim of this article is to present the impact of high-impact polystyrene dust on phase composition and physical and mechanical properties of AAC. The modified product was analyzed X-ray examination and sound insulation and frost resistance. The tests show that the addition of the high impact polystyrene has a better effect on the improvement of AAC properties. The additive increased the sound insulation and higher frost resistance. The results of research performed on the modified autoclaved aerated concrete products are presented and compared with the properties of the traditional AAC elements. The impact of introduced polymer on the microstructure of resulting products is briefly featured.



MODELING OF THE ASPHALT CONCRETE STIFFNESS MODULUS IN THE LINEAR VISCOELASTIC RANGE

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ABSTRACT

The stiffness modulus is a fundamental parameter that can be used in modeling of the viscoelastic behavior of bituminous mixtures. On basis of the master curve in the linear viscoelasticity range, the mechanical properties of asphalt concrete at a different loading time and temperature can be predicted. This paper presents the form master curve constructed using rheological mathematical models ie. sigmoidal function model (MEPDG), fractional model, and Bahia and co-workers model. These results were confronted with the master curve results using mechanistic rheological models ie. generalized model Huet-Sayegh, generalized Maxwell model and Burger's model. For the purposes of this analysis, the reference asphalt concrete mix (denoted as AC16W) intended for the binder coarse layer and the traffic category KR3 ($5 \times 10^5 < ESAL_{100kN} < 2.5 \times 10^6$) was performed. Measurement of the stiffness modulus of asphalt concrete in steady-state straining pattern was performed using the simple axial compression- tensile test at controlled strain level. The strain level was constant and was set to 25×10^{-6} guaranteeing that the stiffness modulus of asphalt concrete will be tested in a linear viscoelasticity range. The master curve was formed using the leading of time-temperature superposition principle (TTSP). The stiffness modulus of asphalt concrete was determined at temperatures of 10 °C and 20 °C and 40 °C at a loading time (frequency) of 0.1, 0.3, 1, 3, 10, 20 Hz. The model parameters were matched to adopted rheological models using authorial programs which were based on the nonlinear least squares sum method. As a result, it was found that all rheological models with satisfactory accuracy can predict changes in a stiffness modulus of a reference asphalt concrete. In the case of the fractional model and the generalized Maxwell model their accuracy depend on a number of elements in series. The best fit distinguished Bahia and co-workers model, generalized Maxwell model and fractional model. In the case of predicting of the phase angle parameter, the largest discrepancies between experimental and modeled results were obtained using a fractional model. With the exception of the Burger's model, the model matching quality were obtained as a value greater than 0.985 (determination coefficient) at the root mean squared error less than 10%. From the point of view of their practical application, it is best to apply a generalized Huet-Sayegh model and sigmoidal model.



INVESTIGATION OF EFFECT ADDITIVE PHASE CHANGE MATERIALS ON THE THERMAL CONDUCTIVITY

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ABSTRACT

The aim of worldwide policy is to reduce the amount of consumed energy and conventional fuels. An important branch of the economy that affects the energy balance of the country is construction industry. A today's adult spends most of his or her life in a closed area where he or she wants to feel comfortable. In order to ensure thermal comfort of the room, people design heating and cooling systems that consume a lot of energy. In Poland, since January 1st, 2017 new limit values have been valid regarding energy saving and thermal insulation of buildings. To meet the requirements of more and more stringent technical and environmental standards, new technological solutions are currently being looked for. When it comes to the use of new materials, phase-change materials are being widely introduced into construction industry. Thanks to phase-change materials, we can increase the amount of heat storage. Great thermal inertia of the building provides more stable conditions inside the rooms and allows the use of unconventional sources of energy such as solar energy. A way to reduce the energy consumption of the object is the use of modern solutions for ventilation systems. An example is the solar chimney, which supports natural ventilation in order to improve internal comfort of the rooms. Numerous studies are being carried out in order to determine the optimal construction of solar chimneys in terms of materials and construction parameters. One of the elements of solar chimneys is an absorption plate, which affects the amount of accumulated heat in the construction. In order to carry out the research on the thermal capacity of the absorption plate, the first research work has been already planned. The work presents the research results of a heat-transfer coefficient of the absorption plates samples made of cement, aggregate, water, and phase-change material in different volume percentage. The work also presents methodology and the research process of phase-change material samples.



PREDICTING COMPRESSIVE AND FLEXURAL STRENGTH OF NANO-SILICA (NS) MODIFIED HIGH-VOLUME FLY ASH (FA) MORTARS AT ELEVATED TEMPERATURES USING ARTIFICIAL NEURAL NETWORK (ANN) AND MULTIPLE LINEAR REGRESSION (MLR) MODELS

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ABSTRACT

This paper concentrates on the results of some experimental researches on the compressive and flexural strength of Nano-Silica (NS) modified high-volume fly ash (FA) mortars at elevated temperatures. This work focused on concrete mixes has water/binder ratio of 0.4, which contained constant total binder content of 440 kg/m³, respectively. The concrete mixes had different dosages of a superplasticizer based on polycarboxylic with the constant dosage of 0.8 kg/m³ polypropylene fiber. In experimental research that is used in this paper, cement was replaced by high-volume FA combined with colloidal NS to access high strength mortars with high residual strength after exposure to high temperatures of 400 °C and 700 °C. Based on the experimental results, the existing equations for anticipating the compressive and flexural strength of NS modified high-volume FA mortars at elevated temperatures were not exact enough. Therefore, it is decided to use artificial neural networks (ANN) for anticipating the compressive and flexural strength of this kind of mortar. The conclusion was that the multi-layer perceptron (MLP) networks could predict compressive and flexural strength in all conditions, but MLR models were not exact enough in some circumstances. On the other hand, MLP networks were more users friendly and they converged to the final networks quicker.



THE USAGE OF CRUSHED CONCRETE FINES IN DECORATIVE CONCRETE

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ABSTRACT

The article is devoted to the questions of usage of crushed concrete fines from concrete scrap for the production of high-quality decorative composite materials based on mixed binder. The main problem in the application of crushed concrete in the manufacture of decorative concrete products is extremely low decorative properties of crushed concrete fines itself, as well as concrete products based on them. However, crushed concrete fines could have a positive impact on the structure of the concrete matrix and could improve the environmental and economic characteristics of the concrete products. Dust fraction of crushed concrete fines contains non-hydrated cement grains, which can be opened in screening process due to the low strength of the contact zone between the hydrated and non-hydrated cement. In addition, the screening process could increase activity of the crushed concrete fines, so it can be used as a fine aggregate and filler for concrete mixes. Previous studies have shown that the effect of the usage of the crushed concrete fines is small and does not allow to obtain concrete products with high strength. However, it is possible to improve the efficiency of the crushed concrete fines as a filler due to the complex of measures prior to mixing. Such measures may include a preliminary mechanochemical activation of the binder (cement binder, iron oxide pigment pigment, microsilica and crusher concrete fines), as well as the usage of polycarboxylate superplasticizers. The development of specific surface area of activated crushed concrete fines ensures strong adhesion between grains of binder and filler during the formation of cement stone matrix. The particle size distribution of the crushed concrete fines could achieve the most dense structure of cement stone matrix and improve its resistance to environmental effects. The authors examined the mechanisms of structure of concrete products with crushed concrete fines as a filler. The results of studies of the properties of the crushed concrete fines were provided. It is shown that the admixture of the crushed concrete fines has little effect on the color characteristics of the decorative concrete products. The preferred options to improve the surfaces of decorative concrete are also proposed.



CHARACTERISTICS OF RECYCLED CONCRETE AGGREGATES FROM PRECAST SLAB BLOCK BUILDINGS

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ABSTRACT

Prefab slab block buildings (PSBB) typically and frequently occur in Central and Eastern Europe, as well as elsewhere in the world. Some of these buildings are currently used beyond their service life capacity. The utilization of recycled materials from these buildings with regard to applying the principles of sustainable construction and using recycled materials will probably be significant in the following years. The use of recycled concrete aggregates (RCA) in new concrete requires verification/testing of the mechanical properties of recycled aggregates. The properties of recycled materials of prefabricated slab block buildings executed between 1950s to 1990s are not sufficiently known. The reason is the documentation of the manufacturing processes is not available, and also it is difficult to declare technological discipline during the execution of these buildings. The demolition of these buildings is a very rare today, but it can be assumed an increase in demolitions of these buildings in the future. The aim of the contribution is to present a case study of the demolition of slab block building with emphasis on RCA using. The paper presents the results of the tests according to European standards for determining the mechanical properties of the RCA. The paper describes and evaluates tests such as Determination of particle size distribution - Sieve Analysis, Aggregate fines particles analysis, and Determination of particle density and water absorption. The results of the tests are compared with the properties of natural aggregate. The general boundary conditions of RCA particular tests are presented. The article concludes by establishing methodology for testing process of recycled aggregates applicable for slab block buildings demolition processes.



THE CULTIVATION OF BAMBOO AS A WAY TO IMPROVE ENVIRONMENTAL QUALITY ON THE TROPICAL COAST OF GRANADA, SPAIN AND ITS APPLICATIONS IN CONSTRUCTION

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ABSTRACT

The Tropical Coast of Granada presents the singularity of enjoying the unique subtropical climate of all continental Europe. This has improved its agricultural exploitation for centuries, helping to his valuable landscape and agricultural ecosystem. The recent transformation brought about by the progressive abandonment of traditional crops, the rise of greenhouse agriculture and urban growth could accelerate the consequences of the effects of climate change on this territory. This work is part of a line of research on the use of new materials, namely woody bamboos (*Bambuseae*). It intends to corroborate the hypothesis of the suitability of the cultivation of these subtropical species in the region as a measure of adaptation to the climate change, environmental improvement and economic alternative. The hypothesis is based on the capacities of these species to adapt themselves to the soil of the old sugarcane crops that are currently untapped, their ability to exert powerful CO₂ sinks and their suitability to regenerate both soil and Biodiversity, not forgetting that woody bamboos generate a material with a demand for exponential growth due to its physical and aesthetic qualities. A second hypothesis within this line of research is to demonstrate the applicability of *Guadua Angustifolia* (*Bambuseae*) as a construction material in Spain. The vernacular architecture of the tropical regions where bamboo is grown has always been used as a building material. At present, due to its high strength, rapid growth and lightness, bamboo has been applied in construction in a masterful way in countries like Colombia, Mexico, China or Germany. In Spain the construction with bamboo has not yet been developed, with the curved roof of Barajas Airport T4 being the largest construction in which bamboo has been applied, although without structural purposes. For this study we start with a preliminary information such as the preexistence of specific bamboo crops, the reproduction of local bamboo, the analysis of soil samples at different points in the Tropical Coast to verify the suitability of the land, with positive results (*Bambusa vulgaris* species) obtaining values similar to those of *Guadua Angustifolia*, the design and construction of a prototype of bamboo structure, with study and application of structural connections and the recent patent for a constructive system of walls and wooden decks by *Guadua Angustifolia* in Mexico by the architect João Caeiro, whom we maintains direct contact with, among other studies. The objectives of this research are several, such as the demonstration of the adaptation of the bamboo *Guadua Angustifolia* on the Tropical Coast to be used as local material and the suitability of the bamboo *Guadua Angustifolia* as a structural building material.



COMPARISON OF FAILURE PROCESS OF BENDED BEAMS REINFORCED WITH STEEL BARS AND GFRP BARS

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ABSTRACT

Fiber Reinforced Polymer (FRP) composite rebar has been used in structures for several years. It has many characteristics, which not only are equal to those of steel rebar, but significantly surpass them. This type of rebar has high corrosion resistance, much higher tensile strength and electromagnetic neutrality. Also, because of their low weight and easy processing composite rebar is convenient in logistics and use. Development of architectural concrete technology in past years opens new, interesting perspectives for use of composite rebar. However, implementation of those concretes in structures is often burdened with many issues, especially concerning faulty performance. One of it is rebar corrosion, visible on the surface of the element as rusty stains. Even in case of properly developed structure which meets all the requirements for texture, porosity or color uniformity, rusty stains can completely destroy the final decorative effect of concrete's surface. Despite many advantages, use of composite rebar in reinforced constructions creates significant number of new "behaviors" of construction in its different stages. Constructions reinforced with steel rebar will behave differently than ones with composite FRP rebar under continuous load, in case of a fire, exposure to aggressive environment or breaking. In the latter, significant role plays its linear-elastic behavior in the whole tensile range till rupture. This means that the FRP rebar does not show plastic deformation and bearing capacity failure is abrupt, not providing any preceding signs, which needs to be included as additional reduction coefficient during designing. The article presents results of research and analysis of destructive tests of concrete beams reinforced with traditional steel rebar and beams reinforced with composite rebar (GFRP) made of glass fiber and braided with basaltic. Four single-span simply supported beams under static load were tested. The top bars ($\Phi 8$ mm) as well as stirrups ($\Phi 6$ mm) were made of B500A steel. The bottom bars were made from the steel in first two beams and GFRP in the other two, all of them with 8 mm diameter. In both cases the reinforcement ratio was the same. The use of composite rebar propagates the occurrence of much bigger cracking than use of steel rebar with the same diameter. Observed cracks from the start are deeper and wider. The cracking of the elements reinforced with GFRP has untypical development and can cause issues in the evaluation of the strain. The cracks in beams reinforced with GFRP from the very start had the same width or were wider than limit width (0,4 mm) even though the ratio of failure moment to cracking moment (M_{Rd}/M_{cr}) was over 3.



INFLUENCE OF METAKAOLIN AND SILICA FUME ON EARLY AGE COMPRESSIVE STRENGTH AND HEAT OF HYDRATION OF HIGH-PERFORMANCE CONCRETE

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ABSTRACT

High-performance concrete (HPC) which contains bigger amounts of both higher grade cement and pozzolanic additives generates more hydration heat than the normal concrete. Prolonged period of action of the elevated temperature influences the rate of hydration process in result affecting the development of early-age strength and subsequent mechanical properties. The purpose of the presented research is to determine the relationship between the kinetics of the heat generation process and the compressive strength of early-age high performance concrete. All mixes were based on the Portland Cement CEM I 52,5 with between 7,5% to 15% of the cement mass replaced by the silica fume and metakaolin. Two characteristic for HPC water/binder ratios of $w/b = 0.2$ and $w/b = 0.3$ were chosen. A superplasticizer was used to maintain a 20-50 mm slump. Compressive strength was determined at 8h, 24h, 3, 7 and 28 days on 10x10x10 cm specimens that were cured in a calorimeter in a constant temperature of $T = 200C$. The temperature inside the concrete was monitored continuously for 7 days. The study determined that the early-age strength ($t < 24h$) of concrete with reactive mineral additives is lower than concrete without them. This is clearly visible for concretes with metakaolin which had the lowest compressive strength in early stages of hardening. The amount of the superplasticizer significantly influenced the early-age compressive strength of concrete. Concretes with additives reached the maximum temperature later than the concretes without them.



INVESTIGATION OF HYDRAULIC BINDING CHARACTERISTICS OF LIME BASED MORTARS USED IN HISTORICAL MASONRY STRUCTURES

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ABSTRACT

In the historic masonry structures, hard and large rock fragments were used as the construction materials. The hydraulic binder material prepared to keep this used material in its entirety is a different material than the cement used today. Khorasan mortar made by using aggregate and lime exhibits a more flexible structure than the concrete. This feature allows the historic building to be more durable. There is also a significant industrial value because of the use of Khorasan mortar in the restoration of historic masonry structures. Therefore, the calculation of the ideal mixture of Khorasan mortar and the determination of its mechanical and physical properties are of great importance in terms of preserving historic buildings. In this study, the mixtures of different lime and brick fractions were prepared. It was determined that Khorasan mortar showed the highest compressive strength in mixtures with water/lime ratio of 0.55 and lime/aggregate ratio of 0.66. By keeping the mixing ratio constant, it was observed that the strengths of the samples kept in the humidity chamber for different curing times increased day by day. The early strength values of samples with the high lime/aggregate ratio (l/a: 0.83) were higher than those with the low lime/aggregate ratio (l/a: 0.5). For the samples with low lime/aggregate ratio, there was an increase in the strength values depending on the curing period. As the cure duration increases, a chemical reaction takes place between the lime and the brick fracture, and as a result of this reaction, the strength values are increased.



THE USAGE OF THREE DIFFERENT FLY ASHES FOR PREVENTING EXPANSION IN MORTAR DUE TO ALKALI-SILICA REACTION

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ABSTRACT

Fly ashes are preferred raw or additive materials in cement manufacturing and producing concrete due to its pozzolanic activity and cementitious properties. The strength and workability of concrete can successfully be increased by the addition of fly ash. In this study, fly ashes of three different coal-burning power plants and distinctive combustion furnace of them were used for preventing expansion due to alkali-silica reactions in a mortar. In this direction, fly ashes of Kangal (Sivas), Soma (Manisa) and Cayirhan (Ankara) coal-burning power plants were added in different proportions (fly ash replace from 10 to 40 percent of the Portland cement) in mortar including chert (reactive aggregate) and the developing of alkali-silica reactions in mortar was observed. Standard test method for potential alkali reactivity of aggregates (ASTM C 1260-Mortar bar test) was applied in tests. The expansions in mortar bars were reduced from 0.27% to 0.01% by addition of fly ash. At least expansion in mortar bar tests was achieved when fly ash at 40 percent was used in the mix. However, the fly ash usage can always not prevent expansion due to alkali-silica reactions in a mortar and sometimes fly ash additive increase's expansion in a mortar. Fly ashes of coal-burning power plants contain different types of minerals and chemical compositions because coal sources of power plants are different. At the end of mortar bar tests, thin sections were prepared for fluorescence microscopy examinations. The developing of alkali-silica gel in the mortar bar was observed by fluorescence microscopy under the ultraviolet light.



PERFORMANCE OF HYDROPHOBISATION TECHNIQUES IN CASE OF RC STRUCTURES

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ABSTRACT

Concrete is, unchangeably, one of the most frequently applied building materials, also in the case of bridges, overpasses or viaducts. Along with the aging of such structures, the degradation of concrete, which may accelerate the corrosion of reinforcing steel and drastically decrease the load-bearing capacity of the structure, becomes an important issue. The paper analyzes the possibilities of using deep hydrophobisation in repairing reinforced concrete engineering structures. The benefits of properly securing reinforced concrete structures from the damaging effects of UV radiation, the influence of harmful gases, or progression of chlorine induced corrosion have been presented, especially in regards to bridge structures. The need to calculate the costs of carrying out investments along with the expected costs of maintaining such structures, as well as the high share of costs connected with logistics, has also been indicated in the total costs of repair works.



RESEARCH OF LIGHTWEIGHT CONCRETE BASED ON SINTERED LIGHTWEIGHT AGGREGATE

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ABSTRACT

Dynamic growth of the standard of living depends on the intensive development of a number of sectors of the economy. However, without sufficient energy productions it would be impossible. Production of a huge amount of energy requires to process respectively large quantities of a variety of fuels. One of the most popular are hard coal and brown coal. As a result, there are formed "waste products" also known as Coal Combustion By-Products (CCBs) surging in landfills or used in many industries, including construction. While fly ash has been applied for a long time, the ashes and slags surging in landfills have not. In recent years, one can notice that there appear artificial aggregates on the market which are obtained by sintering, inter alia, such types of raw materials. This paper presents the results of the research (conducted at the Institute of Building Engineering, University of Warmia and Mazury) on the possibility of the use of sintered aggregate in lightweight concrete technology. Lightweight aggregates (LWA) have been successfully used as a filler in concrete compositions for a long time (lightweight concrete). The article presents the tests results of mixture and concrete containing the aggregate obtained from the long-time piled ashes (3 different in terms of particle size aggregate composition) with dispersed reinforcement and superplasticizer admixture. This study contains the results of the concrete mixture as well as the hardened concrete.



DEVELOPMENT OF ADHESIVE FREE ENGINEERED WOOD PRODUCTS

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ABSTRACT

Engineered wood products (EWP) are now widely used in modern construction with more than 5,000,000 m³ of glulam and CLT produced annually alone. Those EWP often carry a more desirable economic impact on a building project than standard milled wood due to ease of installation and reduced labour costs. They also offer relatively longer design life in comparison to traditional sawn timber as they are not as susceptible to rot or similar atmospheric or environmental effects to the same extent. Despite of these positive aspects, unfortunately they do hold some drawbacks. EWP have a higher degree of chemical use incorporated in their manufacturing process compared to standard sawn timber. This chemical use mainly involves the adhesives being used to bond the wood laminates and finger joints in order to make laminations of the required length. In general, the production of one cubic meter of glulam timber requires 5 kg of phenol-resorcinol-formaldehyde (PRF) and 1 kg of melamine-urea formaldehyde (MUF). These adhesives tend to be organic adhesives that use aldehydes in their base chains. Throughout the extended life span of these products from manufacture to disposal, they emit formaldehyde and other volatile organic compounds (VOCs). The manufacturing process for those products is also complicated with attributing to a higher embodied energy count, 10.75 MJ/kg for EWP as opposed to 7.60 MJ/kg for sawn timber. Certain air emissions contribute to global warming, acid rain, and smog formation throughout the life cycle of a current engineered wood product. Recycling is generally difficult for such wood products (structures) due to their composition (adhesives and metallic fasteners) and the end of life is typically disposal in landfill sites, which is considered an emission to land. In addition, structural EWP and sawn timber elements are usually connected by steel plates or dowels and the manufacture of these traditional fasteners uses large amounts of energy. This in turn produces significant emissions of CO₂. This paper is to tackle the above problems, with an alternative and more environmentally friendly method of connecting wood laminates and joining structural members by using compressed wood (CW) dowels and fasteners. This form of connection and joining systems helps to achieve EU targets for delivering 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 and CO₂; easy to reuse, recover and recycle; improved fire protection; improved joint tightness (due to moisture-dependent swelling); low self-weight. Therefore, the proposed research 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.



EXPERIMENTAL STUDY ON MODIFICATION OF CONCRETE WITH ASPHALT ADMIXTURE

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ABSTRACT

Durability of engineering structures made of cement concrete with high compressive strength is a very vital issue, especially when they are exposed to different aggressive environments. Concrete resistance to weathering actions and chemical attack can be improved by combined chemical and mechanical modification of concrete microstructure. Asphalt admixture in the form of asphalt paste (AP) was used for chemical modification of cement composite microstructure. Concrete structure was formed using special technology of compaction. A stand for vibro-vibropressing with regulated vibrator force and pressing force was developed. The following properties of the modified concrete were tested: compressive strength, water absorption, freeze-thaw resistance, scaling resistance in the presence of deicing agents, chloride migration, resistance to CO₂ and corrosion in aggressive solutions. Corrosion resistance was tested in 1.8% solutions of NH₄Cl, MgSO₄, (NH₂)₂CO and CaCl₂ which were altered every 7 days; the experiment lasted 9.5 months. Optimum compaction parameters in semi-industrial conditions were determined: ratio between piston stress (Q_p) and external top vibrator force (P_o) in the range 0.4–0.5; external top vibrator force 4 kN. High strength concretes with compressive strength $f_{cm}=60\text{--}70$ MPa, very low water absorption (<1%) and high resistance to aggressive environments were obtained in this study. AP content was reduced from 10% (previous investigations) to 2-4% of cement mass thanks to the special compaction method. Excellent chloride ion penetration resistance and carbonation resistance of concrete containing AP admixture is due to the asphalt barrier formed in pores of cement hydrates against dioxide and chloride ions. Concrete specimens containing AP 4% c.m. and consolidated by vibro-vibropressing method proved to be practically resistant to highly corrosive environment. Vibro-vibropressing compaction technology of concrete modified with AP can be applied in prefabrication plants for production of elements for road, bridge and hydraulic engineering constructions.



THORIUM AND URANIUM IN THE ROCK RAW MATERIALS USED FOR THE PRODUCTION OF BUILDING MATERIALS

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ABSTRACT

Thorium and uranium are constant component of all soils and most minerals thereby rock raw materials. They belong to the particularly dangerous elements because of their natural radioactivity. Evaluation of the content of the radioactive elements in the rock raw materials seems to be necessary in the early stage of the raw materials evaluation. The rock formations operated from deposits often are accumulated in landfills and slagheaps where the concentration of radioactive elements can be many times higher than under natural conditions. In addition, this phenomenon may refer to buildings where rock raw materials are often the main component of the construction materials. The global control system of construction products draws particular attention to the elimination of used construction products containing excessive quantities of natural radioactive elements. In the presented study were determined the content of thorium and uranium in rock raw materials coming from the Belchatow lignite deposit. The Belchatow lignite deposit extracts mainly lignite and secondary numerous accompanying minerals with the raw material importance. In the course of the field works within the framework of the carried out work has been tested 92 samples of rocks of varied petrographic composition. Were carried out analyses of the content of radioactive elements for 50 samples of limestone of the Jurassic age, 18 samples of kaolinite clays, and 24 samples of siliceous raw materials, represented by opoka-rocks, diatomites, gages and clastic rocks. The measurement of content of natural radioactive elements thorium and uranium based on measuring the frequency counts of gamma quantum, recorded separately in measuring channels. At the same time performed measurements on volume patterns radioactive: thorium and uranium. The studies were carried out in Mazar spectrometer on the powdered material. Standardly performed ten measuring cycles, after which were calculated the concentration of radioactive elements in the sample. The highest concentration of thorium and uranium has been found in the clay raw material. Their value was respectively from 8 to 12 ppm for thorium and from 2.3 to 3.5 ppm for uranium. In carbonate sediments the content of thorium was at the level from 0.5 to 2.1 ppm and uranium from 0.5-2.2 ppm. From a group of siliceous raw materials the diatomites had a highest concentrations of radioactive elements where the content of thorium was from 1.5 to 1.8 ppm and uranium from 1.3 to 1.7 ppm.



ANALYSIS OF CONCENTRATION OF TOXIC ELEMENTS IN THE MESOZOIC SILICEOUS ROCKS IN TERMS OF RAW MATERIAL IMPORTANCE

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ABSTRACT

As part of an integrated system of environmental protection at every stage of the product life cycle such as: raw material extraction, its transportation and processing as well the subsequent use and development is required to carry out actions towards reducing or completely eliminating products that contain harmful substances to the environment. The purpose of the presented paper is an analysis of concentration of toxic elements in the extracted siliceous minerals at the initial stage of the raw material recognition. The research material is constituted by rocks collected from the Mesozoic bedrock from the Belchatow lignite deposit. A group of studied rocks is represented by diatomites, gaizes, opoka-rocks and light opoka-rocks, enriched with minerals from the group of SiO₂. Most of the recognized petrographic sediments has a real possibility of potential applications in the building materials industry, but it needs to carry out a detailed and thorough research. The studies of the chemical composition was determined by atomic absorption spectroscopy (AAS) using a Philips PU 9100Xi Camera SX-100 spectrometer and an atomic emission spectroscopy with inductively coupled plasma (ICP AES) using PLASMA 40 spectrometer. In the studied barren sedimentary rocks were carried out a chemical analyses and determined the content of some toxic elements: Pb, Cr, Cd, Ni, Zn, Cu, Co, As, Sr, Ba, Zr. Analysis of the results draws attention to the high content of cadmium in the case of studied sediments. The concentration of this element in the described rocks is an average of 0.22 ppm - diatomites, 0.05 ppm - gaizes, 0.4 ppm -opoka-rocks, 2.23 ppm -light opoka-rocks . It was moreover registered varied concentration of arsenic in diatomites, that is formed in the range of 0.05 ppm - 9.6 ppm, an average of 6.3 ppm. The content of the other designated elements with toxic properties in the analysed groups of rocks does not exceed the limit values. An increased concentration of cadmium and arsenic should be considered as an important information in resource research of the studied rocks. The both elements belong to the easily soluble elements as a result of weathering processes. Cadmium is one of the most dangerous toxicological environmental elements. It is easily absorbed and relatively long stopped in humans and animals organism. It also seems that the increased concentration in the siliceous rocks results from the nature of the lignite from the Belchatow lignite deposit, outstanding higher cadmium content in relation to the observed lignite of the world.



INVESTIGATION OF THE INFLUENCE OF WASTE BASALT POWDER ON SELECTED PROPERTIES OF CEMENT PASTE AND MORTAR

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ABSTRACT

Concrete is the most widely used man-made construction material in civil engineering applications. The consumption of cement and thus concrete, increases day by day along with the growth of urbanization and industrialization and due to new developments in construction technologies, population growing, increasing of living standard. Concrete production consumes much energy and large amounts of natural resources. It causes environmental, energy and economic losses. The most important material in concrete production is cement. Cement industry contributes to production of about 7% of all CO₂ generated in the world. Every ton of cement production releases nearly one ton of CO₂ to atmosphere. Thus the concrete and cement industry changes the environment appearance and influences it very much. Therefore it has become very important for construction industry to focus on minimizing the environmental impact, reducing energy consumption and limiting CO₂ emission. The need to meet these challenges has spurred an interest in the development of a blended Portland cement in which the amount of clinker is reduced and partially replaced with mineral additives - supplementary cementitious materials (SCMs). Many researchers have studied the possibility of using another mineral powder in mortar and concrete production. The addition of marble dust, basalt powder, granite or limestone powder positively affects some properties of cement mortar and concrete. This paper present an experimental study on the properties of cement paste and mortar with basalt powder. It is the waste from the preparation of aggregate used in asphalt mixture production. Previous studies have shown that analysed waste used as a fine aggregate replacemnet, has a beneficial effect on some properties of mortar and concrete, i.e. compressive strength, flexural strength and freeze resistance also. The present study shows the results of the research concerning the modification of cement paste and mortar with basalt powder. The modification consists in that the powder waste is added as partial replacement of cement. Four types of common cement were examined, i.e. CEM I, CEM II/A-S, CEM II/A-V and CEM II/B-V. The percentages of basalt powder in this research are 0%, 1%, 2%, 3%, 4%, 6%, 8% and 10% by mass. The addition of basalt powder was found to improve the strenght of cement mortar. The use of mineral powder as the partial substitution of cement allows for the effective management of industrial waste and improves some properties of cement mortar.



THE NEED OF IDENTIFICATION OF THE CONCRETE PARAMETERS IN THE WEAKEST ZONE OF INDUSTRIAL FLOOR

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ABSTRACT

The method of the industrial floors exploitation leads to requirements of the highest strength of their upper zone. Physical phenomena occurring during the compaction and hardening of the concrete cause different strength distribution. In the top zone of industrial floors the strength is significantly lower (over a dozen MPa) than the strength in the bottom zone (several dozen MPa). Standard test of control samples do not detect this fact. Processes of the application and finishing of embedded mineral-aggregate hardeners (dry shakes) can be regarded as uncontrolled. The effects of the use of dry shakes are not checked. In combination with the phenomenon of bleeding, they often fail by delamination. This paper presents the results of industrial floor testing. The ultrasonic pulse velocity method with dry point contact transducers was used. The results show how upper layer strength was reduced, and how dry shakes application affected on the strength of the floor. The strength distribution in hardened concrete, which delaminated from the rest of the floor was presented as well. The extension of compulsory control tests of concrete samples was proposed. In authors opinion particular attention should be paid for 3 centimeters of the upper layer.



MATHEMATICAL METHODS OF SYSTEM ANALYSIS IN CONSTRUCTION MATERIALS

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ABSTRACT

System attributes of construction materials are defined: complexity of an object, integrity of set of elements, existence of essential, stable relations between elements defining integrative properties of system, existence of structure, etc. On the basis of cognitive modeling (intensive and extensive properties; the operating parameters) materials (as difficult systems) and creation of the cognitive map the hierarchical modular structure of criteria of quality is under construction. It actually is a basis for preparation of the specification on development of material (the required organization and properties). Proceeding from a modern paradigm (model of statement of problems and their decisions) of development of materials, levels and modules are specified in structure of material. It when using the principles of the system analysis allows to considered technological process as the difficult system consisting of elements of the distinguished specification level: from atomic before separate process. Each element of system depending on an effective objective is considered as separate system with more detailed levels of decomposition. Among them, semantic and qualitative analyses of an object (are considered a research objective, decomposition levels, separate elements and communications between them come to light). Further formalization of the available knowledge in the form of mathematical models (structural identification) is carried out; communications between input and output parameters (parametrical identification) are defined. Hierarchical structures of criteria of quality are under construction for each allocated level. On her the relevant hierarchical structures of system (material) are under construction. Regularities of structurization and formation of properties, generally are considered at the levels from micro to a macrostructure. The mathematical model of material is represented as set of the models corresponding to private criteria by which separate modules and their levels (the mathematical description, a decision algorithm) are defined. Adequacy is established (compliance of results of modeling to experimental data; is defined by the level of knowledge of process and validity of the accepted assumptions). The global criterion of quality of material is considered as a set of private criteria (properties). Synthesis of material is carried out on the basis of one-criteria optimization on each of the chosen private criteria. Results of one-criteria optimization are used at multicriteria optimization. The methods of developing materials as single-purpose, multi-purpose, including contradictory, systems are indicated. The scheme of synthesis of composite materials as difficult systems is developed. The specified system approach effectively was used in case of synthesis of composite materials with special properties.



EFFECT OF INDUSTRIAL WASTE ON PHYSICAL AND TECHNICAL PROPERTIES OF FINE-GRAINED CONCRETE

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ABSTRACT

The peculiarities of climatic latitudes in Russia characterized with a wide range of freeze-thaw temperature determine the increasing of strength and frost resistance as one of the main tasks to be addressed when producing concrete compositions. At the same time, one of the current trends in construction materials science is utilization of industrial waste in the production of building composites. The use of waste of fabricated rubber and asbestos cement products as modifying additives of the structure and properties of fine-grained concrete improves physical and mechanical characteristics of materials, contributes to the expansion of the resource base and reducing the anthropogenic load on the ecosystem. The research focuses on the effect of ground waste of asbestos cement products on the properties and structure of cement composition. Using man-made additive improves the physical and mechanical characteristics of the composite, including flexural strength, due to reinforcing the cement matrix. The study also considers the changes in the physical and mechanical properties of concrete caused by adding rubber crumb from recycled automobile tires. Crumb together with Portland cement is previously subjected to mechanical activation. Using man-made polymer additive as a fine aggregate in cement concrete and mortars contributes to the formation of a damper and an increase in bending forces when the material is loaded. It is shown that, depending on the time of mechanical activation of the composition, the strength characteristics of set cement increase. The use of rubber crumb provides prerequisites for improving the durability of materials based on mineral hydraulic binders. The research has found that, disperse man-made additives being used jointly, synergistic effect is provided by reinforcement with asbestos fibers, absorption of dynamic loads and various deformations by rubber fraction. This results in simultaneous inhibition and prevention of cracks appearance, which are stress points contributing to a significant increase in the physical and mechanical characteristics of cement composite.



REVIEW ON THE TRADITIONAL USES AND POTENTIAL OF TOTORA (SCHOENOPLECTUS CALIFORNICUS) AS CONSTRUCTION MATERIAL

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ABSTRACT

The recent advances in the wood construction field have demonstrated the feasibility and advantages of using wood-based materials in tall buildings structures and other constructive uses, which could lead to a net reduction in CO₂eq emissions of the construction sector by replacing high-energy consuming materials like concrete or steel, with wood and biomass-based materials. Among these biomass-based materials are the Non-Timber Forest Products (NTFP) which are plants that can provide important contributions to the construction sector and help to reduce the net CO₂eq emissions of the building industry. One of these plants is the totora (*Schoenoplectus Californicus*) that has been long used by several communities for making handicrafts and as construction material. Recent studies on this plant have analyzed its properties and its feasibility to be used for producing materials of interest to the contemporary building industry. The totora is a bulrush that grows in lakes and marshes in America from California to Chile and some of the Pacific islands. It grows from the sea level to 4500masl, it can grow in fresh water and estuaries, and it is resistant to water level changes and drought. This bulrush has been used by many cultures as medicine, food, forage, material for building houses, boats and different handicrafts. The most important examples of the use of totora in the world are the floating islands of the Uros in Lake Titicaca. The Uros people have developed traditional techniques for building their homes, boats, and even the artificial islands where they live on with methods based almost exclusively on the totora. This way of living and production system has been maintained for more than 500 years. This review is about the main constructive techniques that have been used for traditional construction in totora and some of the recent researches that have been recently made on this subject. Experiments in architecture and industrial design objects made with totora have shown its versatility, durability and high aesthetic value which is exploited in object design and architectural finishes. Additionally, recent studies on the insulating capacity of totora samples have determined an average conductivity of 0,06W/mK, which is comparable to some of the common insulating materials in the current market. The review of the historical uses and recent studies on this material indicate its potential in the contemporary construction field along with other environmental benefits. One of the key features is the totora productivity that can be as much as 56 tons of dry matter per hectare per year, which is near 5 times the average production of a conifer plantation. Therefore, to foster the research about its feasible applications in the contemporary construction field could lead to the reduction of the pressure on wood forests and plantations by developing a new material source for the construction industry.



MODIFICATION OF LIME MORTARS WITH SYNTHESIZED ALUMINOSILICATES

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ABSTRACT

The increasing attention for restoration of buildings of historical and architectural importance has increased the interest for lime-based binders, which could be applied for manufacturing repair mortars and plasters compatible with historical heritage. Different additives, admixtures or fibers may be incorporated to improve mechanical and thermal features of such materials. In this study synthesized silicates (SA) were applied as an additive for lime mortar. The technology of synthesis consisted in the deposition of aluminosilicates from a sodium liquid glass by the aluminum sulphate $Al_2(SO_4)_3$. The goal of this investigation was to develop a new method of aluminosilicates synthesis from a sodium liquid glass and using this new material as a component for lime mortar. Aluminosilicates were precipitated from the solution of aluminum sulfate $Al_2(SO_4)_3$ and sodium silicate. SA were then used as an additive to calcareous compositions and their influence was tested. Mortars were prepared with commercial air lime and siliceous river sand. Air lime binder was replaced by 5 and 10 wt.% of SA. Calcareous composition specimens were formed at water/lime ratio 1.0. The following analysis were made: grain size distribution of SA, X-ray diffraction analysis (XRD), sorption properties, plastic strength and compressive strength of lime mortars. XRD pattern of the SA shows the presence of thenardite, gibbsite and amorphous phase represented by aggregate of nano-size cristobalite-like crystallites. Application of SA leads to increase of compressive strength after 90 days of hardening by 28% and 53% at SA content 5 and 10% respectively comparing to specimens without this additive. Contents of chemically bound lime in the reference specimens after 28 days of hardening in air-dry conditions was 46.5%, while in specimens modified with SA contained 50.0-55.3% of bound lime depending on filtrate pH. This testifies to high activity of calcareous. The new blended lime mortar was developed based on SA. The following conclusions can be pointed out: a. the best synthesis parameters are: aluminum sulfate solution pH=1.5, liquid glass modulus 2.88 and filtrate pH=5; b. SA in lime composites are effective as structure-forming additives; c. the chemical interaction between SA and lime is proved based on chemically bound lime; d. both plastic and compressive strength increased after addition of SA.



REVIEW OF THE AIR-COUPLED IMPACT-ECHO METHOD FOR NON- DESTRUCTIVE TESTING

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ABSTRACT

The article presents the general idea of Air-Coupled Impact-Echo (ACIE) method which is one of the non-destructive testing (NDT) technique used in construction industry. One of the main advantages of the general Impact Echo (IE) method is that it is sufficient to access from one side to that of the structure which greatly facilitate research in the road facilities or places which are difficult to access and diagnose. The main purpose of the article is to present state-of-the-art related to ACIE method based on the publications available at Thomson Reuters Web of Science Core Collection database (WOS) with the further analysis of the mentioned methods. Deeper analysis was also performed for the newest publications published within last 3 years related to ACIE for investigation on the subject of main focus of the researchers and scientist to try to define possible regions where additional examination and work is necessary. One of the main conclusions that comes from the performed analysis is that ACIE methods can be widely used for performing NDT of concrete structures and can be performed faster than standard IE method thanks to the Air-coupled sensors. What is more 92,3% of the analysed recent research described in publications connected with ACIE was performed in laboratories, and only 23,1% in-situ on real structures. This indicates that method requires further research to prepare test stand 100% ready perform analysis on real objects outside laboratory conditions. Moreover algorithms that are used for data processing and later presentation in ACIE method are still being developed and there is no universal solution available for all kinds of the existing and possible to find defects, which indicates possible research area for further works. Authors are of the opinion that emerging ACIE method could be good opportunity for ND testing especially for concrete structures. Development and refinement of test stands that will allow to perform in-situ tests could shorten the overall time of the research and with the connection of implementation of higher accuracy algorithms for data analysis better precision of defects localization can be achieved.



EFFECT OF RESISTANCE TO POLISHING OF AGGREGATE ON SKID RESISTANCE OF WEARING COURSE MADE OF STONE MASTIC ASPHALT MIXTURE

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ABSTRACT

SMA (Stone Mastic Asphalt) is one of the most popular mixture intended for wearing courses of road pavement for very heavy traffic loads. The primary advantage of wearing course made of SMA is better resistance to permanent deformation than conventional dense-graded asphalt mixtures. This is possible because the SMA is characterized by a strong skeleton due to the high content of coarse aggregate in the mineral mixture (from 70 to 80%). Furthermore wearing course should meet the required threshold of skid resistance, which is related to macrotexture and microtexture. Wearing course made of SMA mixtures have a high macrotexture. But low amount of fine aggregates in mineral mixtures causes that microtexture is almost completely related to resistance to polishing of coarse aggregates. This paper presents the comparison of skid resistance of wearing course made of SMA mixtures which differ resistance to polishing of coarse aggregate. Dolomite, limestone, granite and melaphyre were taken for investigation. SMA mixtures have the same aggregate of nominal size (11 mm) and very similar aggregate particle-size distribution in mineral mixtures. Tested SMA11 mixtures were designed according to EN 13108-5 and Polish National Specification WT-2: 2014. Evaluation of the skid resistance has been performed using the FAP (Friction After Polishing) test equipment also known as the Wehner/Schulze machine according to standard EN 12697-49. Laboratory method enables to compare the skid resistance of different types of mixtures under specified conditions simulating polishing processes. Tests were performed on both the specimens made of each coarse aggregate and SMA 11 mixtures to which they were used. Measuring of friction coefficient was conducted before and during polishing process up to 180 0000 passes of polishing head. Additionally, resistance to polishing of aggregate were made by the PSV (Polished Stone Value) test method according to standard EN 1097-8. Comparison of the results showed differences in prone to polishing between particular mixtures which depend on the petrographic properties of rock used to produce aggregate. Limestone and dolomite tend to have a fairly uniform texture with low hardness which makes these rock types susceptible to rapid polishing. This caused lower coefficient of friction for SMA 11 mixtures with limestone and dolomite in comparison with other test mixtures. These significant differences were already registered at the beginning of the polishing process. Despite the differences in structure and mineralogical composition between the granite and melaphyre slightly different values of the friction coefficient at the end of polishing were obtained. Images of the surface were taken with the optical microscope for better understanding of the phenomena occurring on the surface of mixtures. Results are valuable information during the selection of aggregate to asphalt mixtures at the stage of its design and maintenance of existing road pavements.



EVALUATION OF FIELD PERFORMANCE OF PAVEMENTS CONSTRUCTED USING COLD MIX TECHNOLOGY

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ABSTRACT

Bitumen emulsion based cold mix technologies are alternative to conventional hot mix technology. The main difference between cold mix and hot mix is that aggregates and emulsion are mixed at ambient temperature (10°C-30°C) in cold mix technology and aggregates and bitumen are mixed at high temperature (140°C-160°C) in hot mix technology. The consumption of fuel oil in cold mix technology is only 100 liters whereas the consumption of fuel oil in hot mix technology is 1600 liters approximately for construction of 1 km length rural road. Hence there is a considerable reduction in Green House Gases (GHG) emissions using cold mix technology compared to hot mix technology. However, lack of awareness and skepticism of field performance is shying more contractors and agencies from using cold mix technology extensively. This paper attempts to evaluate the field performance of pavement constructed using cold mix technology from Mulyagaon to Palethi road in Devprayag block of Tehri Gharwal, Uttarakhand for length 7.78 km. The pavement evaluated in this study were constructed and placed at ambient temperature about 20°C at high altitude region. Pavement was evaluated after considerable exposure to weather elements and traffic. Mainly visual observation was used to evaluate the performance of the cold mix section. Samples were also collected from the site periodically and tested in the laboratory for determination of Bitumen Content by Ignition Method and also for determination of recovered binder properties. The results of the study indicate that in spite of the several monsoons and temperature change, for which pavement were exposed. Pavement condition was found good, without much distress after two years of construction.



EVALUATION OF DIFFERENT FILLER AGGREGATES FOR ASPHALT MIXTURES

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ABSTRACT

Mineral filler aggregates play an important role in asphalt mixtures because they fill voids in paving mix and improve the cohesion of asphalt binder. Lime powder containing over 90% of CaCO_3 is the most frequently used type of a filler. Waste material from the production of coarse aggregate can be successfully used as a mineral filler aggregate for hot asphalt concrete mixtures as the lime powder replacement. This paper presents the experimental results of selected properties of mineral filler aggregates which were obtained from rocks with different mineral composition and origin. Five types of rocks were used as a source of the mineral filler aggregate: melaphyre, granite, gabbro, quartz sandstone and rocks from post-glacial deposits. Limestone filler was used in this study as the reference material. The following tests were performed: grading (air jet sieving), quality of fines according to methylene blue test, water content by drying in a ventilated oven, particle density using pycnometer method, voids content of dry compacted filler, Delta ring and ball test, Bitumen number, fineness determined as Blaine specific surface area. Mineral filler aggregates showed significant differences when they were mixed with bitumen and stiffening effect in Delta ring and ball test was evaluated. The highest values were achieved when gabbro and granite fillers were used. Additionally SEM analysis of grain shape and size was carried out. Significant differences in grain size and shape were observed. The highest non-homogeneity in size was determined for Quartz sandstone, gabbro and granite filler. Their Blaine specific surface area was lower than $2800 \text{ cm}^2/\text{g}$, while for limestone and post-glacial fillers with regular and round grains it exceeded $3000 \text{ cm}^2/\text{g}$. All examined mineral filler aggregates met requirements of Polish National Specification WT-1: 2014 and could be used in asphalt mixtures.



NANO INSULATION MATERIALS USED IN nZEB

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ABSTRACT

The energy efficiency of Nearly Zero Energy Buildings, whose construction will be compulsory in the near future across the European Union, impose among other improvements of the actual common practice, the thermal behaviour optimisation of the elements that define the building envelope. In order to satisfy the nZEB requirements, the resulted conventional thermal insulation has increased thickness, which is inconvenient in several cases. In the paper it is presented an alternative solution, given by nano insulation materials, such as aerogel and vacuum insulation panels, which have very good thermal insulating properties at reduced thickness. The research is conducted by reviewing several scientific articles regarding this subject. There are presented the properties and the improvement needs of the nano insulation materials. Due to the novelty of this research field the article is a starting point for further studies following the integration of these materials into nZEB components. In the paper it is represented the state of the art of several nano thermal insulation materials emphasizing, the advantages and disadvantages of these materials and their main applications in building components. At the same time, there will be highlighted the properties describing these materials and also their vulnerabilities, which have to be reduced or eliminated. The discussions are made based on the studied materials. There are discussed comparisons of several advanced insulation materials, e.g. nano insulation materials, gas insulation materials, vacuum insulation materials and dynamic materials. The possibility of their usage in the nZEB field will also be discussed. One of the targets regarding the future of thermal insulation materials is the development of materials with very low thermal conductivity. Another key aspect is given by their durability, i.e. thermal conductivity value, should remain the same for as long as possible in order to maintain its thermal insulating properties. There are some challenges for these materials, like moisture issue or vacuum loss, which have to be addressed. Also, the focus should be on the issues regarding mechanical strength and fire protection, in order to meet the design criteria for both nZEB and energy retrofitted buildings.



SAND- LIME PRODUCTS DOPED OF LITHIUM AND POLYMER CHEMICAL AGENT

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ABSTRACT

In the era of rapid development in the construction industry particular attention is focused on harmless and natural materials. Some of the best materials for building masonry walls are sand-lime products. Silicates are obtained from a mixture of quartz, sand and a small amount of water. They emerge as a result of the hydrothermal treatment conducted under high pressure and at a temperature app. 203 °C. Silicates was modified of different kinds of aggregates or plastics, what changed the content of dry ingredients. The paper describes the studies where the most advanced technology was used with elements of nanotechnology of polymer, silicate and lithium compounds of the highest silicate modules. Microstructure of the products was analyzed using SEM and XRD methods. The application of chemical agent shows a huge effect on the changes in the internal structure and the physico - chemical properties.



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INFLUENCE OF CURING CONDITIONS ON LONG-TERM COMPRESSIVE STRENGTH OF MORTARS WITH ACCELERATING ADMIXTURES

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ABSTRACT

One of disadvantages of accelerating admixtures usage is possibility of significant decline of long-term compressive strength of concrete in comparison to non-modified one. Described tests were intended to define scale of lowered long-term compressive strength of mortars caused by accelerating admixtures in different curing conditions. Portland cement and blended cement with ground granulated blast furnace slag (GGBFS) addition and four types of non-chloride accelerating agents were used. Compressive strength was tested after 7 up to 360 days. Curing conditions were designed to simulate probable conditions close to reality. Such conditions are simulation of internal concrete elements, external elements cast on start of summer and external elements cast on start of winter. Results had shown that it is invalid to state that every accelerating admixture will cause drop of long-term compressive strength in every conditions and for every cement type. Change of curing conditions even after a long time (in this case half of the year) leads to significant differences in compression strength



**MICRO-FILLER FROM CRUSHED CONCRETE WASTE INFLUENCE ON PROPERTIES OF NEW
CONCRETE MADE FROM CONCRETE WASTE**

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ABSTRACT

The micro-filler researched in the work was gotten by crushing concrete and reinforced concrete waste and sieving gotten particles. Researched crushed particle size was smaller than 0.125 mm. Main micro-filler characteristics were determined. After doing research according to the special research method and according to the gotten results it can be stated that additive (micro-filler) made from crushed concrete waste is active. It was determined that when using concrete waste for concrete mixture mixing a higher amount of water is needed since part of the water is absorbed by used waste filler moistening. Big amount of this excess water is probably absorbed by smaller mixture particles gotten during the crushing process. Due to this reason W/C ratio changes. Research was done that showed how the requirement of water is changed with smaller mixture particles of which size is 0-0.125 mm. 5 %, 10 %, 15 %, 20 %, 25 % and 30 % MBA was put in and mixed with water up to normal thickness dough. Research results showed that by changing the cement part with micro-fillers W/C ratio rises, normal thickness cement dough gotten when W/C is 0.27, and when gradually rising micro-filler amount the requirement for water rises proportionally. Wanting to evaluate micro-filler additive effect to self-binding material's hydration process calorimetry research was carried out. Cement and cement with micro-filler compositions" (85% CEM II+15% MBA) calorimetry curves were compared. When researching the hydration process electrical conductivity research was also carried out as well micro-filler influence on concrete strength properties. According to cement composition strength property results it can be stated that micro-fillers lower cement strength properties. After conducting research it was determined that used filler from crushed concrete waste has to be sieved and separated from very small particles, which are smaller than 0.125 mm, since micro-particles that appear between large (4/16) and small (0.125/4) fraction in the mixture change the hardened concrete structure by rising the distance between fillers. Due to this even a small amount can significantly change gotten sample physical and mechanical characteristics (compression strength is lowered 25-32%, density - 8-11% and rises absorption 31-39%) and influences sample resistance to cold when comparing with concrete made using natural fillers.



THE INFLUENCE OF MAGNETITE DUST ON RHEOLOGICAL AND MECHANICAL PROPERTIES OF SELF-CONSOLIDATING MORTARS

Mateusz Techman, Maria Kaszynska

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ABSTRACT

Magnetite has been used in civil engineering for many years for production of heavyweight concretes. Heavyweight concretes mainly are used for their shielding properties from harmful ionizing radiation. Magnetite aggregate thanks to high content of iron oxides is perfectly suitable for production of shielding elements. Literature shows that the bigger the aggregate's grade in concrete the better its shielding properties. Magnetite dust is created both during mining of the ore and as a waste product in industrial processes. Study tries to implement the magnetite dust in design of self-consolidating mortars used as a step in production of self-consolidating concretes. Study was conducted on 10 mortars, made with two different types of cement, in which the aggregate was partially replaced with different amount of magnetite dust. Paper presents the influence of the magnetite dust addition on the rheological properties of mortars, their bulk density and compressive and tensile strength. The results were compared to reference mortar without magnetite dust. The samples were stored under two different conditions to determine the influence of curing on the properties of mortars with magnetite dust. The addition of magnetite dust increases the compressive and tensile strength of mortars. Increase content of the magnetite dust reduces the rheological properties of prepared mortars and imposed increased use of chemical admixes. Increase of the dust amount increases mortars' viscosity in the same time increasing segregation resistance. The study has shown that the magnetite dust can be successfully used in self-consolidating mortars.



IMPROVING MECHANICAL PROPERTIES OF HOT MIX ASPHALT USING FIBRES AND POLYMERS IN DEVELOPING COUNTRIES

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ABSTRACT

The enhancement of mechanical properties and long term performance of hot mix asphalt (HMA) should be considered as a goal in order to achieve a transport infrastructure really sustainable. However, this issue becomes a difficult task, if conventional HMA are used. In fact, performance of conventional HMA, usually presents poor long term performance and functional distresses related to high and low temperatures, which in turn implies higher maintenance costs and superior carbon footprints. To overcome this weaken, bitumen industry has been developing new polymer modifiers, additives to improve HMA behaviour. One of the techniques most used in developed countries to enhance HMA behaviour is the use of modified bitumen. Modifying the bitumen, and then producing modified HMA requires specific equipment and facilities that may be time-consuming, expensive and hard to manage. For instance, to warranty a successful modifying process, storage and handling of the modified bitumen are issues very complex to handle. On the other hand, producing a polymer modified HMA by adding polymers and additives directly during the bitumen/aggregate mixing process may offer very interesting advantages since the economical, production and sustainability standpoint. This paper aimed to determine the feasibility of the incorporation of fibres and plastomeric polymers into different types of HMA by means of the "dry process" (to add polymers during the mixing of aggregate and bitumen in the HMA plant) to produce polymer modified mixes. Thus, laboratory tests including Marshall Stability, Indirect Tensile Stiffness Modulus, Repeated load test and Indirect Tensile Strength test were performed to assess the effect of the inclusion of fibres and plastomeric polymers on mechanical and volumetric properties of selected mixes. Results showed that the modification of bituminous mixtures following the "dry process" could be used to improve the performance and long term properties of HMA.



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**PLASTICIZER AND SUPERPLASTICIZER COMPATIBILITY WITH CEMENT WITH SYNTHETIC AND
NATURAL AIR-ENTRAINING ADMIXTURES**

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ABSTRACT

When increasing the degree of fluidity of previously aerated cementitious mixtures, there is a problem of maintaining their correct aeration. Most of the available superplasticizers cause a significant increase of the air content of concrete mixtures. The problem of compatibility of superplasticizer and air-entraining admixture increases in case of multicomponent Portland cement, due to different effects of these additives. It comes down to achieving a compatibility of the three variables mentioned in the title of paper, due to the required air entrainment and consistency of mixture. Achieving compatibility of such a system requires a series of experimental studies that were presented in the paper together with their resulting indications. In case of previously air-entrained concrete that is made with an air-entraining cement, after the addition of new generation SP occurs very large increase in air entrainment. The air-content of mixture according EN 480-1 may be higher than 13%.



INCREASE OF WORKABILITY OF CONCRETE MIXTURES FOR BALLASTLESS SLAB TRACK

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ABSTRACT

Basic requirements for fresh concrete and hardened concrete for ballastless slab track are considered in the paper. The compositions of high-workability concrete mixtures with low consumption of expensive superplasticizer are developed. Influence of quantity of superplasticizer as well as the fineness and quantity of the micro-filler on workability of concrete mixtures is shown. The results of the research can be recommended for high performance concrete of ballastless slab track in Russia.



THE INFLUENCE OF MAGNETITE DUST ON RHEOLOGICAL AND MECHANICAL PROPERTIES OF SELF-CONSOLIDATING MORTARS

Mateusz Techman, Maria Kaszyńska

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ABSTRACT

Magnetite has been used in civil engineering for many years for production of heavyweight concretes. Heavyweight concretes mainly are used for their shielding properties from harmful ionizing radiation. Magnetite aggregate thanks to high content of iron oxides is perfectly suitable for production of shielding elements. Literature shows that the bigger the aggregates grade in concrete the better its shielding properties. Magnetite dust is created both during mining of the ore and as a waste product in industrial processes. Study tries to implement the magnetite dust in design of self-consolidating mortars used as a step in production of self-consolidating concretes. Study was conducted on 10 mortars, made with two different types of cement, in which the aggregate was partially replaced with different amount of magnetite dust. Paper presents the influence of the magnetite dust addition on the rheological properties of mortars, their bulk density and compressive and tensile strength. The results were compared to reference mortar without magnetite dust. The samples were stored under two different conditions to determine the influence of curing on the properties of mortars with magnetite dust. The addition of magnetite dust increases the compressive and tensile strength of mortars. Increase content of the magnetite dust reduces the rheological properties of prepared mortars and imposed increased use of chemical admixes. Increase of the dust amount increases mortars' viscosity in the same time increasing segregation resistance. The study has shown that the magnetite dust can be successfully used in self-consolidating mortars.



HOW IS THE STRENGTH OF ROCK AFFECTED BY THE CRYSTAL SIZE?

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ABSTRACT

Texture is of great importance in understanding the mechanical properties of rocks. The aim of this study was to investigate the physical and mechanical characteristics and correlate them with the rock types examined, with particular reference to the texture. In order to understand better the geotechnical behaviour of the rocks, a series of laboratory tests on rock samples having different textures (small and large grain sizes), were conducted. All geotechnical properties of the rocks showed increasing as the grain size decreased. Statistical significance of the differences between the mean values of the geotechnical parameters of rocks with the texture of small and large grain size was tested by using the Student's t test. According to the t values, all the differences in geotechnical characteristics associated with textural variations were statistically significant, except E / σ_u and point load strength. The geotechnical properties of the examined rocks are closely related to the grain size, and attributable to the interlocking efficiency of the rains. Consequently, the results demonstrate that the texture, especially grain size and shape, is an important parameter controlling the differences in mechanical properties of the rocks.



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ROCK JOINT ASPERITIES AND MECHANICAL STRENGTH OF CONCRETE

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ABSTRACT

Mechanical interactions between concrete foundations of large civil engineering structures (tunnels, bridges or dams) and the asperity surfaces of rock masses represent a useful topic for investigation. It is obvious that such heavy objects exert huge pressures on bedrocks and this might result in surprising variations of mechanical properties of the materials used in foundations. The present contribution evaluates possible changes of the compressive strength concrete caused by the invasive acting of asperity-like needles penetrating into the volume of this material. The experimental arrangement simulates mechanical interactions between sharp asperities of bedrocks and the cement-based materials placed in the foundations of large civil engineering structures.



INNOVATIVE ADDITIVE FOR BITUMEN BASED ON PROCESSED FATS

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ABSTRACT

Various additives, admixtures and modifiers are used to improve technical properties and strength characteristics of building materials. Manufacturers of waterproofing materials, concrete, ceramics and bitumen have to use innovative, increasingly complex and costly additives, admixtures or modifiers. As a result, simple and inexpensive substances have been replaced by complex, long chain polymers, multi component resins or plastics. For economic and ecological reasons waste materials are more frequently used as additives, admixtures and modifiers. Nowadays the most commonly used physical modifiers of bitumen belong to the group of polymers - large molecular organic compounds of natural origin or being the result of planned chemical synthesis. Polymers are substances that do not chemically react with bitumen, they act as fillers or create a spatial network within bitumen (the so called physical cross-linking). The development of organic chemistry has allowed the synthesis of a number of substances chemically modifying bitumen. The most promising are heterocyclic organic compounds belonging to the group of imidazolines. The aim of the study presented in this paper was to demonstrate the suitability of processed natural and post-refining fat waste (diamidoamine dehydrate) as bitumen modifier. This paper discusses the impact of adding technical imidazoline on selected bitumen characteristics. Samples of bitumen 160/220, which is most commonly used for the production of waterproofing products, were analysed. For base bitumen and bitumen modified with technical imidazoline the following measurements were taken: measurement of the softening point by Ball and Ring method, determination of the breaking point by Fraass method and needle penetration measurement at 25°C. Later the samples were aged using TFOT laboratory method and the basic characteristics were determined again. The results showed that a small amount of imidazoline improved bitumen thermoplastic parameters at low temperatures and had a significant impact on weakening bitumen oxidation and ageing. The addition of technical imidazoline prevents bitumen from hardening, thus increasing its flexibility and its resistance to mechanical damage. Due to many difficulties in the production of polymer bitumens and in order to find cheaper, more environment friendly solutions, the authors proposed an ecological bituminous modifier which, due to chemical reaction with binders, creates a stable and firm in time product. Imidazolines have a negative impact on bitumen softening point, which makes them impossible to use as an independent modifier. Therefore, at a later stage of the research, the authors will attempt to create a hybrid bitumen modifier which will combine the beneficial effect of polymers and imidazoline on the characteristics of bituminous binders.



INFLUENCE OF EXPOSURE CONDITIONS ON THE EFFICACY OF LITHIUM NITRATE IN MITIGATING ALKALI SILICA REACTION

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ABSTRACT

Lithium nitrate is known to have the highest potential to inhibit alkali silica reaction in concrete. It is well soluble in water and does not increase the pH of concrete pore solution. The extent to which the alkali silica reaction is mitigated is affected by the amount of the applied lithium ions, exposure conditions and by the kind of reactive aggregate. It is known that some lithium compounds such as lithium carbonate or lithium fluoride, when used in insufficient amount, may increase expansion due to alkali silica reaction. This effect was not detected in the presence of lithium nitrate. The aim of this study was to determine the effect of lithium nitrate on alkali silica reaction in mortars exposed to different conditions. Expansion studies were conducted in accordance with the accelerated mortar bar test (ASTM C1260) and the standard mortar bar test (ASTM C227). It was observed that the long-term expansion results are different from the values obtained in the accelerated mortar bar test. Lithium nitrate does not reduce ASR-induced expansion when mortars are stored under conditions specified in ASTM C 227. The microstructure of the mortar samples exposed to different conditions was examined and X-ray microanalysis was performed. The microstructure and compositions of the alkali-silica reaction products varied. The amount of alkali silica gel in mortars with lithium nitrate in which the expansion was high was greater than that in the mortar bars tested by accelerated method.



ALKALI SILICA REACTION IN THE PRESENCE OF METAKAOLIN - THE SIGNIFICANT ROLE OF CALCIUM HYDROXIDE

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ABSTRACT

Reducing the internal corrosion, which is the result of reactions between alkalis and reactive aggregates is especially important in ensuring durability properties of concrete. One of the methods of inhibiting the reaction is using some mineral additives which have pozzolanic properties. This paper presents the efficacy of high-reactivity metakaolin in reducing expansion due to alkali-silica reaction. It was demonstrated that metakaolin in the amount from 5% to 20% by mass of Portland cement reduce linear expansion of mortar bars with opal aggregate. Nevertheless, the safe expansion level in the specimens, classified as non-destructive to concrete, was recorded for the mortars prepared with 20% addition of metakaolin. Depletion of free calcium hydroxide content was considered as one of the most beneficial effects of metakaolin in controlling alkali silica reaction. Based on thermogravimetric analysis (TGA) performed on mortar bars with and without metakaolin the differences in portlandite content were determined. Microstructural observation of the specimens containing metakaolin indicated the presence of a reaction products but fewer in number than those forming in the mortars without mineral additives.



**MODIFIED PAVEMENT QUALITY CONCRETE AS MATERIAL ALTERNATIVE TO CONCRETE APPLIED
REGULARLY ON AIRFIELD PAVEMENTS**

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ABSTRACT

The work presents test results of two series of hardened cement concrete intended for airfield pavements. Concrete types designed on the basis of regularly used materials were included in the first series. Granite, quartzite, basalt aggregate, gravel and amphibolite aggregate were used in concrete mixes. Cement CEM I 42,5, fine aggregate (washed sand), water, admixtures (air entraining agent and plasticizer) were also included in the mix composition. Basic parameters for the designed mixes (consistency class, air contents and mix density) were specified. The influence of aggregate type on parameters of hardened concretes was assessed. Concrete density, compressive strength, fracturing strength and bending strength were analysed. The analysis was conducted during diversified research periods in order to assess the joint influence of aggregate type and the length of curing on the change of concrete parameters. In case of the second series, the material alternative based on the modification of concrete composition of the first series using ceramic modifier was discussed. The applied additive was described and the influence thereof on the change of parameters of mixes and hardened concretes was assessed. According to the obtained parameters of mixes and hardened concrete it was proved that the used modifier in the form of dust has significant impact on the analysed parameters. Increased mechanical (compressive strength, tensile strength and fracture strength) and physical parameters of concrete were proved. Curing concretes were also analysed during diversified research periods. Favourable influence of the suggested modifier on the changes of internal structure of cement concrete was proved. Changes in cement matrix structure, contact layers between cement matrix and grains of aggregate and modifier and porosity characteristics were observed. The analysis of different microstructure of modified concrete and the obtained parameters of hardened modified concrete proved the purposefulness of using the ceramic modifier in the composition of concrete mixes intended for airfield pavements.



A LOW SHRINKAGE CEMENT CONCRETE INTENDED FOR AIRFIELD PAVEMENTS

Malgorzata Linek

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ABSTRACT

The work concerns the issue of hardened concrete parameters improvement intended for airfield pavements. Factors which have direct or indirect influence on rheological deformation size were of particular interest. The aim of lab testing was to select concrete mixture ratio which would make hardened concrete less susceptible to influence of basic operating factors. Analyses included two research groups. External and internal factors were selected. They influence parameters of hardened cement concrete by increasing rheological deformations. Research referred to innovative cement concrete intended for airfield pavements. Due to construction operation, the research considered the influence of weather conditions and forced thermal loads intensifying concrete stress. Fresh concrete mixture parameters were tested and basic parameters of hardened concrete were defined (density, absorbability, compression strength, tensile strength). Influence of the following factors on rheological deformation value was also analysed. Based on obtained test results, it has been discovered that innovative concrete, made on the basis of modifier, which changes internal structure of concrete composite, has definitely lower values of rheological deformation. Observed changes of microstructure, in connection with reduced deformation values allowed to reach the conclusion regarding advantageous characteristic features of the newly designed cement concrete. Applying such concrete for airfield construction may contribute to extension of its operation without malfunction and the increase of its general service life.



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Session Title:
Goetechnics



LARGE ROCK RELIEFS AND THEIR 3D RECONSTRUCTIONS

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ABSTRACT

Rock reliefs are used for assessing joint rock coefficients that serve in geotechnical engineering for computing shear strength of rock joints. The three-dimensional reliefs of small rock joints amounting to several centimetres may be digitally reconstructed in laboratories but large joints whose sizes reach several meters have to be reconstructed in terrains and require a specially adapted technique for three-dimensional reconstruction. This contribution describes one of the devices capable of performing digital reconstructions in terrains. This device has been developed in our laboratory on the basis of affordable components.



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ROCK JOINT COEFFICIENTS DERIVED FROM THE THREE-DIMENSIONAL FOURIER RELIEFS

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ABSTRACT

Coefficients of rock joints serve in geotechnical practice for determining shear strength of rock masses. Evaluation of the stability of rocky terrains containing joints is important from the viewpoint of safety. Larger surface irregularities of joints contribute to a better mechanical stability of rock masses. One of the possible ways of evaluating joint rock coefficients is based on the numerical assessment of surface morphology. The comparison of morphologies between the relief of the investigated rock joint and the reliefs of standard specimens whose coefficients are known enables to assign a proper coefficient to the investigated joint. The Fourier digital reliefs are useful auxiliary tools for such a comparative technique. The technique is however accompanied by some rigors that are necessary to know and avoid them. This contribution discuss some problems associated with the comparative technique used for determining joint rock coefficients.



FRACTAL ANALYSIS OF ROCK JOINT PROFILES

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ABSTRACT

Surface reliefs of rock joints are analysed in geotechnics when shear strength of rocky slopes is estimated. The rock joint profiles actually are self-affine fractal curves and computations of their fractal dimensions require special methods. Many papers devoted to the fractal properties of these profiles were published in the past but only a few of those papers employed a convenient computational method that would have guaranteed a sound value of that dimension. As a consequence, anomalously low dimensions were presented. This contribution deals with two computational modifications that lead to sound fractal dimensions of the self-affine rock joint profiles. These are the modified box-counting method and the modified yard-stick method sometimes called the compass method. Both these methods are frequently applied to self-similar fractal curves but the self-affine profile curves due to their self-affine nature require modified computational procedures implemented in computer programs.



INVESTIGATING THE NUMERICAL MODELLING OF THE CONSTRUCTION EXCAVATION OF AN ACTUAL SUPER SHALLOW LARGE-SPAN TUNNEL

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ABSTRACT

Owing to the complexity of structural characteristics, it is difficult to accurately model the super shallow large-span tunnel. In this study, aiming at an actual tunnel, we investigate the refined modelling of super shallow large-span tunnel. First, the three-dimension finite element model of this actual tunnel is established considering the disturbance of the surrounding rock, construction sequence and the change of stress state of structure during the construction process. Second, with the generated finite element model, the variation rules of the crown displacement and the initial lining stress are analyzed numerically. Finally, the results of the numerical simulation are compared with the measured. The results show that the established model can simulate the construction excavation accurately.



NUMERICAL INVESTIGATION OF THE OPTIMAL CONSTRUCTION SEQUENCE OF AN ACTUAL SUPER SHALLOW LARGE-SPAN TUNNEL

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ABSTRACT

The construction process of super shallow large-span tunnel is quite complicated comparing with the construction technique of regular tunnels; therefore it is deserved to investigate the optimal construction sequence which determines the schedule and safety management of the tunnel excavation. To address this issue, the optimal excavation procedure of the super shallow large-span tunnel is investigated using numerical analysis in this study, based on a practical tunnel project. First, the analytical finite element model of an actual tunnel structure is established to implement the numerical simulation of different tunnel excavation. Second, some numerical results are analysed for the selection of the optimal construction excavation, such as the variation rules of the surface settlement, crown displacement and side wall deformation etc. The analytical results show that the ground surface heaves with the tunnel excavated and the crown displacement improves gradually. Finally, the optimal excavation scheme is determined by comparing the deformation of the tunnel structure and the law of surface subsidence.



**CORRELATION OF STANDARD AND CONIC PENETRATION TESTS: A CASE STUDY FROM TEKİRDAĞ
(TURKEY)**

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ABSTRACT

In geotechnical engineering, the Standard Penetration Test (SPT-N value) is often used as in situ test. The Cone Penetration Test (CPT) is based on design and cone resistance (q_c) is becoming widespread. However, there is also a need for a SPT-CPT correlation association that can be used in the basic design. In this study, the values of the SPT-CPT tests applied to the ground were compared and tried to generate certain statistical data. Besides, SPT and CPT experiments were performed side by side to determine the soil properties. Formulas have been developed using various statistical methods and correlation coefficients were established between the data obtained for "high-medium-low plastic clay" and "sand and sandy clayed soils". Finally, obtained data were compared with the studies in the literature.



SOIL OVERCONSOLIDATION CHANGES CAUSED BY DYNAMIC REPLACEMENT

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ABSTRACT

In the dynamic replacement method (DR) the soil is improved by initially dropping a large weight (typically 8-20 t) pounder from a significant height up to 25m. The created crater is filled with a stronger material (gravel, rubble, stone aggregate, debris), and the pounder is dropped once or multiple times again. The construction of dynamic replacement pillars influences the parameters of the adjacent soil. It results from the energy generated by dropping a pounder into the soil. In the current practice, these changes are not taken into the account during the design. This paper focuses on the changes of overconsolidation ratio (OCR) and in situ coefficient of lateral earth pressure (K) values estimated base on cone penetration test (CPTU) and Dilatometric test (DMT) performed at a test site. A single column was constructed and the ground around the column was examined using CPTU and DMT, performed at different distances from the column centre (2, 3, 4 and 6m) and at different time intervals (during construction and 1, 8, 30 days later). The column was constructed in so-called transition soils (between cohesive and cohesionless). While interpreting the results of the research, the authors addressed the matter of choosing the procedure of OCR and K indication for transition soils (in this case described as silts and/or sandy silts). Overconsolidation changes may differ depending on the chosen analysis procedure (for cohesive or cohesionless soils). On the basis of the analysis presented in the paper and the observation of soil (acknowledged as cohesive according to macroscopic observations) during column excavation, it was decided that for more detailed analyses methods dedicated to cohesive soils should be applied. Generally, it can be stated that although the changes were complex, DR pillar formation process resulted in the increase of these parameters. The average increases of OCR and K values were 25% and 10% respectively. The post installation values are not significant from the engineering point of view, but they represent the influence of the formation process of only a single column. The described results indicate that Priebe's column dimensioning method should be applied with caution, as it assumes the value $K=1$ which was not obtained in the described research. The results from the conducted tests indicate that different mechanisms occur during stone column formation with vibro-replacement and dynamic replacement. As the authors did not manage to find literature describing the results of K tests in the surrounding of a DR stone column, the presented results should be acknowledged as significant for designers who will apply the dynamic replacement method.



SOIL PARTICLE SIZE ANALYSIS BY LASER DIFFRACTOMETRY: RESULT COMPARISON WITH PIPETTE METHOD

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ABSTRACT

Soil texture as the basic soil physical property provides a basic information on the soil grain size distribution as well as grain size fraction representation. Currently there are several of methods of particle dimension measurement available that are based on different physical principles. Pipette method based on the different sedimentation velocity of particles with different diameter is considered to be one of the standard methods of individual grain size fraction distribution determination. Following the technical advancement, optical methods such as laser diffraction can be also used nowadays for grain size distribution determination in the soil. According to the literature review of domestic as well international sources related to this topic, it is obvious that the results obtained by laser diffractometry do not correspond with the results obtained by pipette method. The main aim of this paper was to analyze 132 samples of medium fine soil, taken from the Nitra River catchment in Slovakia, from depths of 15-20 cm and 40-45 cm, respectively, using laser analyzers: ANALYSETTE 22 MicroTec plus (Fritsch GmbH) and Mastersizer 2000 (Malvern Instruments Ltd). The results obtained by laser diffractometry were compared with pipette method and the regression relationships using linear, exponential, power and polynomial trend were derived. Regressions with the three highest regression coefficients (R^2) were further investigated. The fit with the highest tightness was observed for the polynomial regression. The average difference between the calculated and the measured percentage distributions for fraction of clayey particles ($< 0,01$ mm) was 8% (Analysette 22 MicroTec plus) and 22% (Mastersizer 2000) for soil sample depth of 15-20 cm, respectively 7% (Analysette 22 MicroTec plus) and 14% (Mastersizer 2000) for soil sample depth of 40-45 cm). Since the percentage representation of clayey particles (2nd fraction according to the methodology of Complex Soil Survey held in Slovakia) in soil is the determinant for soil type specification we recommend to use the derived relationships in soil science when the soil texture analysis is done according to laser diffractometry. The advantages of laser diffraction method comprise the short analysis time, usage of small sample amount, application for the various grain size fraction and soil type classification systems, and a wide range of determined fractions. Therefore it is necessary to focus on this issue further to address the needs of soil science research and attempt to replace the future the standard pipette method with more progressive laser diffraction method.



LANDSLIDE: MINERALOGICAL AND PHYSICAL INVESTIGATION

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ABSTRACT

If land has moved, on an area with old landslides, in order to construct a road bed foundation, there is a high chance of it moving again. The investigation was made in a region with hilly relief, in which the parent materials of soils are argillaceous marls of Pliocene age. Because the slope is scarped and the versant has been cut, the soil mass slide favoured of the particle-size distribution dominated by heavy clay. With a reiterated percolative moisture regime, the soil material is saturated in water a long period (700-800 mm precipitation /year), and that can increase the slope mass, thereby increasing the driving forces. In a soil profile situated on the top of the hill, with landslide for about 40 m length of the road, disturbed and undisturbed soil samples were analysed physico-chemical and mineralogical. For the heavy and light minerals from sand fraction is used polarized light analyser, and for clay minerals are used X-ray, differential thermal, and infrared absorption method. The particle-size distribution in the soil profile is dominated by the clay fraction, which reached 53.2% in the ABt horizon and 63.0% in the Bt horizon (67-93 cm depth). The structure of the light minerals, consist of quartz (41-58%); feldspar (10.16-18.10%); muscovite 14.10-26.04). The heavy minerals are oxides (2.61-15.26%), hornblende (0.58-2.87%) and biotite (0.51-2.68%). It must be mention the presence of the metamorphic minerals, with the source of the Poiana Rusca Mountains. These minerals are epidote (1.01-1.86%), disthene (0.70-1.86%), staurolite (0.73-2.46%) and sillimanite (0.35-0.45%). The clay minerals, inherited from parent material or formed during soil-forming process are dominated by smectites, which represent (71-85%) from the total clay minerals, illite 10-21%, and Kaolinite, 4-12%. Rheological properties, like plastic index (53.8%), activity index (1.01%) and consistency index (0.99-1.00%) shows that the shrinkage – swelling processes are active, and provoke landslide. We propose some technical measures for decrease the driving force and increase the resisting forces on the slope, like as: drainage net with track ditch and inspection chamber, driven pile a 10 m depth, and so on.



INCLINED BUILDINGS – SOME REASONS AND SOLUTIONS

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ABSTRACT

To straighten a leaning building is never easy. There are no standard solutions. On the other hand there are several, usually historical, leaning structures which have not been rectified, mostly because in the current shape they are a touristic attraction - the best example being the famous Leaning Tower of Pisa. This does not mean however that inclination of load bearing walls can be ignored. Even though in some cases the problem can be treated in terms of serviceability limit states (the deformation is only decreasing the comfort of "normal use" of the building), in the others - it may be a signal of the forthcoming structural failure. The situation must always be treated individually - if the problem concerns a residential building, then cracks on the walls, not-opening doors or tilted ceilings, which often coincide with the leaning of the external walls, are always the reason of worry and such a building needs to be straightened. The reasons of the problem lie usually in uneven settlement of the ground, which in turn, may be caused by various problems, such as the presence of too soft, too weak, unconsolidated or expansive soils under the building, varying groundwater table, mining activity etc. Solving of the problem by just straightening the building is often not enough. To prevent further deformations a detailed analysis of the possible causes is necessary. Sometimes it may be helpful to review similar cases. The paper contains a general overview of selected inclined buildings: starting with the well-known historical examples and ending with individual houses from the Region of Silesia. Since the problem of instability mostly affects structures with critical height to width ratio, tall and narrow structures (towers) are dominating in the work. The aim of the study was to describe the reasons of the problems and present solutions that could / have been successfully applied. In the opinion of the Authors, this paper may be helpful to engineers and designers in preventing similar situations.



SIG CONTRIBUTION IN THE MAKING OF GEOTECHNICAL MAPS IN URBAN AREAS

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ABSTRACT

The use of Geographic Information Systems (GIS), has spread to several science areas, from oceanography to geotechnics. Its application in the urban mapping was intensified in the last century, which allowed a great development, due to the use of geographic database, new analysis tools of and more recently free open source software. Geotechnical cartography struggle with a permanent and large environment re-organization in urban area, due to new building construction, trenching and the drilling of sampling wells and holes. This creates an extra important and largest volume of data at any pre-existence geological map. The main problem results on the fact that the natural environment is covered with buildings and communications system. The purpose of this work is to create a viable geographic information base for geotechnical mapping through a free GIS computer program and open source, with non-traditional cartographic sources, giving preference to open platforms. QGIS was used as software and "Google Maps", "Bing Maps" and "OpenStreetMap" were applied as cartographic sources using the module "OpenLayers plugin". Finally, we also pretend to identify and delimit the degree of granite's change and fracturing areas using a "Streetview" platform. This model has cartographic input which is a geological map study area, open cartographic web archives and the use of "Streetview" platform. The output has several layouts, such topography intersection (roads, borders, etc.), with geological map and the bordering area of Guarda Urban Zone. The use of this platforms types decrease the collect data time and, sometimes, a careful observation of pictures that were taken during excavations may reveal important details for geological mapping in the study area.



**PERSPECTIVE ASSESSMENT OF SECONDARY RISKS OF EMERGENCY SITUATIONS ON
GEOTECHNICAL CONSTRUCTION SITES**

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ABSTRACT

During the construction of buildings with a developed underground part and underground structures in the current cramped conditions of megacities there often remain undervalued financial costs associated with the need to reconstruct and strengthen surrounding buildings, caught in the zone of influence of new construction. Only the project decisions of the object of new construction are worked out and evaluated without additional design solutions for the reconstruction and strengthening of surrounding buildings and as resulted possible additional costs that may arise. The article deals with the construction of buildings with a subterranean part in the cramped conditions of megacities, namely the risk of accidental deformation of existing buildings near the deep pits. To assess the possibility of accidental deformation of the existing buildings the author has done numerical calculations using finite element method in three-dimensional formulation. On the basis of calculations for deep pits 56 buildings under construction entering the zone of influence together with 198 existing buildings plots of strain based on the dependence on the distance to these buildings from the edges of the pit. With consideration of many years of observation experience the buildings near the deep pits and existing normative literature calculations were performed for buildings located at a distance 0Hk (directly on the edge of the pit) to 5Hk. For a more detailed analysis the charts were divided into intervals containing not more than ten points. For each interval average values of deformations were determined and dispersion equation and the standard deviation of the standard were recorded. Conducted studies have allowed us to develop a classification of accident-prone zones around the deep pits on the degree of exposure of the surrounding buildings to excess deformation. The author offers to use 5 main areas within a range from 0Hk to 5Hk: from 0.0Hk to 0.5Hk - a potentially dangerous area; from 0.5Hk to 1.0Hk - dangerous zone; from 1.0Hk do 1.5Hk medium dangerous zone, from 5.0 to 1.5Hk Hk - low degree of danger zone; more than 5Hk - safe zone. Depending on the technical condition of buildings, structures located in these zones a conclusion about the probable need to strengthen the construction of these buildings or for reconstruction can be made. The proposed method, based on the zoning of surrounding buildings, allow a preliminary assessment of the possible excessive deformation of surrounding buildings in the zone of influence of deep pits and on the early stages of design lay in the costs associated with the construction the necessary finance on the reconstruction and strengthening of structures.



APPLICATION OF SOIL NAILING TECHNIQUE FOR PROTECTION AND PRESERVATION OF HISTORICAL BUILDINGS

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ABSTRACT

Soil nailing is one of the recent in situ techniques used for soil improvement and stabilizing slopes. This method has rapidly developed during the last 35 years and has been used in a variety of civil engineering projects. The process of soil nailing consist in reinforcing the natural ground with relatively small steel bars or metal rods, grouted in the predrilled holes. The reinforcement, installed horizontally or sub horizontally, improves the mechanical properties of the soil. The tensile forces are developed in the soil nail by the frictional interaction between the soil and the ground. This method has a wide range of applications for stabilizing deep excavations and steep slopes. It has been also used successfully in landslides stabilization and retaining wall construction. Soil nailing has become recently a very common method of slope stabilization especially where it is situated beneath or adjacent to historical buildings. It can be also used as remedial construction to repair old masonry walls after of just before failure caused by the movements behind. In this case the nails are drilled through the structure, so there is no need of demolition and restoration and historical wall remain its original appearance. Soil nailing allows existing historical structures to be stabilised without rebuilding, saving costs and maintaining serviceability. Architectural features can often remain unaffected by soil nails, as the nails can be sited to pass around or between obstacles. In the paper the concept of application of soil nailing technology to stabilize and improve the slopes of the Castel Hill in Sandomierz is presented. Sandomierz is one of oldest and historically most important cities in Poland. The Castle was erected on the place of the former fortress from the 10th century. It was rebuilt several times over centuries. Now it is the seat of the Sandomierz Regional Museum. In 1990s last century the numerous vertical cracks in the castle walls appeared. These damages were caused by potential slope failure imaged by ground deformation in the southern part of Castle Hill. It seriously affect the stability of the Southern Tower, the oldest preserved part of the castle. The loss of bearing capacity of subsoil was caused by a rise of soil moisture in Castle Hill and the traffic vibration in close neighborhood. The results of deformation measurements indicated the absolute necessity of soil stabilization in the southern slope of the hill. Therefore the classical ground stabilization technique using reinforced concrete trestle piles, joined together with concrete caps, was applied in the neighborhood of the base of the tower. In the paper the alternative solution of slope stabilization with soil nailing method was presented. An analysis of the slope stability before the stabilization is presented and next: the analysis of the slope stabilized with nailing and with the palisade. The cost of those two solutions were also compared. Some advantages of soil nailing especially for protection historical buildings were emphasized.



**THE DETERMINATION OF MATRIC SUCTION AND SATURATION DEGREE FOR UNSATURATED SOILS.
COMPARATIVE STUDY: NUMERICAL METHOD VERSUS ANALYTICAL METHOD**

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ABSTRACT

Matric suction is a soil parameter which influences the behavior of unsaturated soils in both terms of shear strength and permeability. It is a necessary aspect to know the variation of matric suction in unsaturated soil zone for solving geotechnical issues like unsaturated soil slopes stability or bearing capacity for unsaturated foundation ground. Mathematical expression of the dependency between soil moisture content and its matric suction (soil water characteristic curve) has a powerful character of non linearity. This paper presents two methods to determine the variation of matric suction along the depth included between groundwater level and soil level. First method is an analytical approach to emphasize one direction steady state unsaturated infiltration phenomenon that occurs between the groundwater level and the soil level. There were simulated three different situations in terms of border conditions: precipitations (inflow conditions on ground surface), evaporation (outflow conditions on ground surface), and perfect equilibrium (no flow on ground surface). Numerical method is finite element method used for steady state, two-dimensional, unsaturated infiltration calculus. Regarding boundary conditions there were simulated identical situations as in analytical approach. For both methods, was adopted the equation proposed by van Genuchten-Mualem (1980) for mathematical expression of soil water characteristic curve. Also for the unsaturated soil permeability prediction model was adopted the equation proposed by van Genuchten-Mualem. The fitting parameters of these models were adopted according to RETC 6.02 software in function of soil type. The analyses were performed in both methods for three major soil types: clay, silt and sand. For each soil type were concluded analyses for three situations in terms of border conditions applied on soil surface: inflow, outflow, and no flow. The obtained results are presented in order to highlight the differences/ similarities between the methods and the advantages / disadvantages of each one.



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Civil Engineering-Architecture-Urban Planning Symposium - WMCAUS

DESIGNING COMMUNICATION EMBANKMENTS WITH COHESIVE SOILS

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ABSTRACT

For economic reasons resulting from the need to replace a large number of cohesive soils on land currently used to support drainage mesh polyester tapes welded called ParaDrain. ParaDrain is a new generation of geogrid which combine two features: reinforcement and drainage in one product. They were developed specifically for the weak performance of permeable soil. Replacing non-bearing soil degradation causes the access roads to the construction site. Designing consists in the selection of the grid with suitable parameters of mechanical and hydraulic dependent on cohesive soils



SHEAR WAVE VELOCITY FOR EVALUATION OF STATE OF COHESIONLESS SOILS WITH FINES

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ABSTRACT

The paper concerns evaluation of cohesionless soils containing fines. In clean sands, state of soil is usually quantified by relative density DR with use of field techniques like static or dynamic probes. However, in cohesionless soils containing considerable amount of fines, relative density alone, which is based solely on void ratio values, is not representative. This results from the fact that in case of cohesionless soil there is no unique intrinsic compressibility line, like it is in case of cohesive soils. Thus state of soil depends not only on void ratio but also state of stress. For this reason it is necessary to look for an alternative means to quantify state of soils with fines. The paper concerns possibility of evaluation of state of soil containing various amount of fines on the basis of shear wave velocity measurement. The idea rests on the fact that void ratio and state of stress are the major factors which contribute to a state of soil and shear wave velocity as well. When measured shear wave velocities are normalised with respect to stresses the resulting values might be strictly correlated to void ratio. To validate this approach, an experimental test programme (based on series of sophisticated triaxial tests) was carried out on 4 kinds of sandy material containing various amount of fines up to 60%. The experimental data made possible to establish basic correlation between soil state and shear wave velocity for each kind of soil. Normalized shear wave velocity was compared with void ratio and state parameter as well. The obtained results revealed that determination of void ratio on the basis of shear wave velocity in a certain range of fines can be much more adequate than for clean sands. However, if the fines content exceeds certain value, the obtained correlation is no longer as good.



EVALUATION CRITERIA AND RESULTS OF FULL SCALE TESTING OF BRIDGE ABUTMENT

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ABSTRACT

Structures of reinforced soil can be evaluated for their safety based on a load testing. Measurement results are essentially evaluated by displacements of surcharge (mainly in vertical direction) and protective elements (mainly in horizontal direction). Displacements are within several tenths to several millimeters and they can be taken by common geodetic equipment. Due to slow soil consolidation (progress of displacements) under constant load, observations should be made over several days or even weeks or months. A standard procedure of heating of geotextiles, used in laboratory conditions to simulate a long term behavior cannot be used in a natural scale. When the load is removed, the soil destressing occurs. Both the progress of displacements and soil destressing after unloading of the structure are the key presumptions for evaluating its safety (stability). Assessment of measuring results must be preceded by assuming even the simplest model of the structure, so as it could be possible to estimate the expected displacements under controlled load. In view of clearly random nature of soil parameters of retaining structure composed of reinforced soil and due to specific erection technology of reinforced soil structure, the assessment of its condition is largely based on expert's judgment. It is an essential and difficult task to interpret very small displacements which are often enough disturbed by numerous factors like temperature, insolation, precipitation, vehicles driven close to testing site, etc. In the presented paper, the authors tried to establish and juxtapose some criteria for a load test of a bridge abutment and evaluate their suitability for decision making. Final remarks are based on authors experience from a real full scale load test.



SOME REMARKS ON PRACTICAL ASPECTS OF LABORATORY TESTING OF DEEP SOIL MIXING COMPOSITES ACHIEVED IN ORGANIC SOILS

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ABSTRACT

Results of laboratory testing of organic soil-cement samples are presented in the paper. The research program continues previously reported authors experiences with cement-fly ash-soil sample testing. Over 100 of compression and a dozen of tension tests have been carried out altogether. Several samples were waiting for failure test over one year after they were formed. Several factors, like: the large amount of the tested pieces, long observation time, carrying out the tests in complex cycles of loading and the possibility of registering the loads and deformation in the axial and lateral direction - have made it possible to take into consideration numerous interdependencies, three of which have been presented in this work: the increments of compression strength, the stiffness of soil-cement in relation to strength and the tensile strength. Compressive strength, elastic modulus and tensile resistance of cubic samples were examined. Samples were mixed and stored in the laboratory conditions. Further numerical analysis in the Finite Element Method numerical code Z_Soil, were performed on the basis of laboratory test results. Computations prove that cement-based stabilization of organic soil brings serious risks (in terms of material capacity and stiffness) and should be not recommended by means of Deep Soil Mixing technology. The numerical analysis presented in the study below includes only one type of organic and sandy soil and several possible geometric combinations. Despite that, it clearly points to the fact that designing the DSM columns in the organic soil may be linked with a considerable risk and the settlement may reach too high values. During in situ mixing, the organic material surrounded by sand layers surely mixes with one another in certain areas. However, it has not been examined and it is difficult to assume such mixing already at the designing stage. In case of designing the DSM columns which goes through a thin layer of organic soil it is recommended to carry out each time the core drilling which checks the degree of material mixing and their strength.



BASIC ASPECTS OF DEEP SOIL MIXING TECHNOLOGY CONTROL

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ABSTRACT

Improving of soil - is a process of increase in physic-mechanical properties of soil, without change of natural structure of soil. Improvement of characteristics of soil of the basis is reached by means of the knitting materials, or other methods when strong connection of particles of soil is established. The method of DSM (Deep Soil Mixing) columns has been invented in Japan in 1970s. The main reason of designing cement-soil columns is to improve properties of local soils (such us strength and stiffness) by mixing them with various cementitious materials. The most common binders which are used are cement and calcium. However new research undertaken worldwide proves that despite these materials we can also successfully implement gypsum or fly ashes. As the Deep Soil Mixing is still being developed, anticipating mechanical properties of columns in particular soils and the usage of cementitious materials in formed columns is very difficult and often inappropriate. That is why a research is carried out in order to find out what binders and mixing technology should be used. The paper presents several remarks on the testing procedures related to quality and capacity control of Deep Soil Mixing columns. Soil improvement methods and their advantages and limitations are briefly described. The authors analyze the suitability of selected testing methods on subsequent stages of design and execution of special foundations works. Chosen examples from engineering practice form the basis for recommendations according to control procedures. Presented case studies concerning field capacity testing and laboratory procedures on various categories of Soil-cement samples were picked from research and development and consulting works offered by Wroclaw University of Science and Technology. Special emphasis is paid to climate circumstances which may affect the availability of performing and controlling of DSM techniques in polar zones, with a special regard to sample curing.



INFLUENCE OF FINES CONTENT ON CONSOLIDATION AND COMPRESSIBILITY CHARACTERISTICS OF GRANULAR MATERIALS

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ABSTRACT

Majority of scientific papers dealing with granular materials concerns clean homogeneous sands. However, in natural and man-made subsoils, rarely exists strata which fulfill the condition of homogeneity. It creates many problems in interpretation of geotechnical tests. It concerns in situ and laboratory tests as well carried out on cohesionless materials. The major problems with test interpretation arises from change of compressibility in layered soils. For instance in field static or dynamic probe tests, change of penetration resistance is usually interpreted as result of change in state of soil. However, this is not always true since major penetration resistance change is an effect of compressibility change resulting from different fins content. Fines content differentiates the behavior of soils which from classification point of view are between cohesive and cohesionless materials and therefore are perceived as the transitional soils and difficult to describe. The paper presents experimental data from laboratory tests carried out in large diameter consolidometer. 5 granular soils of various fines content ranging from 10 to 97% were tested. The soil was reconstituted in consolidometer ring. For each material a few samples were tested. Each sample was prepared to different initial void ratio. Prior to actual loading, the material was saturated with back pressure to ensure full saturation. The samples were loaded in steps up to 1750kPa. The data were elaborated in the form of consolidation and compressibility curves. In order to present change in compressibility of material, the results were presented in in the form of compression indices against fines content. Further analysis of the obtained results allowed to identify threshold fines content which differentiate sand like and clay like materials with respect to compressibility.



TWO SMALL STRAIN SOIL CONSTITUTIVE MODELS CALIBRATION AND VERIFICATION

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ABSTRACT

The paper presents two reasonably advanced constitutive laws for soil. First one is a hybrid of the Modified Cam Clay and a new RU development, and it is author's conception. The second one is a HS-small model by Benz [2]. In the RU+MCC model, normal consolidation behavior is described by the Modified Cam Clay model, which is an isotropic hardening elasto - plastic model originated by Burland in 1967 [1] within the critical state soil mechanics. This model describes realistically mechanical soil behaviour in normal consolidation states. The RU part is designed to ensure more adequate soil responses to reloading paths, particularly in the range of small strains. The HS-small model is an improvement of HS model originated from Schanz and Vermeer. This concept is based on cap yield surface with incorporation of two hardening mechanisms, stiffness variation at small strains, densification mechanism, Rowe's dilatancy and some others. The RU+MCC model has been implemented by the author in the FEM computer code Z_SOIL.pc. The HS-small model has been implemented into the same software by Truty [4]. To test the influence of the small strain nonlinearity on soil - structure interaction as well as to exhibit the ability of the proposed model to simulate realistically this effect, a comparative study based on the FEM solution has been carried out. As a benchmark a trial loading test of strip footing was used. The calibration process has been based on advanced laboratory and field soil tests like resonant columns, triaxial test, dilatometer test and many others.



DESIGN AND DEVELOPMENT OF ELECTROMECHANICAL DYNAMIC ACTUATOR MODULE FOR STATIC TRIAXIAL TEST DEVICES

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ABSTRACT

Although dynamic triaxial test results have been used effectively to calculate the soil response to stresses caused by cyclic loads, dynamic triaxial test apparatus is too expensive and limited number of laboratories can have this device. In this study, a low-cost electromechanical actuator module has been developed, to integrate to the static triaxial test apparatus which is generally available at laboratories. Using electromechanical actuators, cyclic loading at desired size and desired frequency, can be performed in a more precise way than the other actuators (hydraulic and pneumatic). Load control in the developed dynamic loading module is provided with load cell and feedback software. Cyclic loading is applied in the form of a sine wave and the frequency of loading is 0.1 to 1.0 Hz. Automatic control is provided with 16-bit resolution 8-channel data acquisition unit, motion control card and electromechanical motor drive for adjusting the load and number of cycles. Developed software includes sine curve motion algorithm, PID control algorithm and for the transmission of values measured with data acquisition unit to a computer. Two displacement sensors were used for deformation measurement, such that small deformations are measured with a free core, high resolution and short-range sensor while at high deformation levels, a LVDT with increased range but reduced resolution is used. The standard triaxial cell has been modified by adding a ball bushing to the loading shaft. Cost is quite reduced in the developed device using local manufacturing facilities. Even though precise electronic components and sensors were used in the developed device, it has been manufactured to about 1/4 the price of equivalents.



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DESIGNING COMMUNICATION EMBANKMENTS WITH COHESIVE SOILS

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ABSTRACT

Beavers belong to protected species should therefore be properly protected levees, do not damage beavers and protect embankments from destruction caused by these animals. This protection requires the use of bentonite mats as shaft seals, and wire mesh. Such new security structures began to be used successfully in the recent period



DESIGNING COMMUNICATION EMBANKMENTS ON PEAT LAND

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ABSTRACT

In view of impossibility of the peat soil exchange carrier designed embankments suitable structures that make up the entire width of the mattress body. Edges embankments follow the gabions. The embankment is reinforced geogrid or geotextile.



**FRACTAL DESCRIPTION OF THE WEATHERING DEGREES OF BUILDING STONE IN MICRO-SCALE
(OLBA, TURKEY)**

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ABSTRACT

Studying mechanical and geological properties of the natural stones in historical places under conservation is very difficult. Due to sampling prohibition, alternative methods should be applied in ancient cities. In order to overcome this difficulty, some non-destructive methods have been applied to determine the weathering degrees of the building stones and their minerals. For this purpose, development of a simple visual based classification on building stones in terms of macro scale have been carried out. This classification includes three groups: slightly weathered (SW), moderately weathered (MW) and weathered (W). Additionally, a total of eight small specimens are taken for Scanning Electron Microscope (SEM) analysis during the field study. It has been noted that the specimens represent each weathering class. In addition to macro scale classification, micro scale definition of weathering state of the minerals considering with SEM analysis were also carried out by fractal analysis. To compute fractal dimension of a mineral, the shape of the mineral is digitized using a computer program and the parameters of the size of grid cells (s), the number of square cells ($N(s)$) and the estimation of perimeter ($S \times N(s)$) are calculated. From the graphs derivations from fractal analysis, the fractal dimensions of each mineral are calculated. Depending on an increase in weathering degree, the average fractal dimensions of both the blocks and the minerals decrease. The study presented herein show that the results of macro and micro scale fractal dimensions are similar to each other because fractal geometry is analyse the scale invariance. When considering advantage of the non-destructive fractal approach, it is possible to apply this methodology to determination of weathering states of building stones especially in the areas under conservation.



SMALL AND LARGE STRAIN DEPENDENCE ON CYCLIC BEHAVIOR OF SILTS AND SILT-CLAY MIXTURES

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ABSTRACT

The 1999 Kocaeli earthquake of Turkey caused great destruction of structures and lifelines in the city of Adapazari. The soil underlying in the Adapazari is dominantly silts, clays and silt-clay mixtures. In Adapazari, many buildings collapsed or were heavily damaged, hundreds of structures tilted and penetrated into the ground due in part to liquefaction and ground softening. Soils may experience a range of shear strains due to cyclic shear stresses induced by earthquakes depending on their physical and index properties. These variations of strains may result in liquefaction, i.e., a critical decrease of effective stress, which can be characterized by a reduction of the contact force between particles, especially of saturated sands and silts due to pore pressure increase induced by rapid loading and slow drainage response. There have been numerous laboratory investigations as well as field observations conducted to increase our understanding of the complex relationship between basic soil properties and shear strength under cyclic loads. The effect of fines content on the liquefaction of sandy soils has been investigated widely. However, currently there are contradicting suggestions and findings based on laboratory measurements and/or field observations. In this study, both cyclic torsional shear and cyclic triaxial shear tests were performed on the specimens of silt and silt-clay mixtures. Tests conducted on the undisturbed sample from the city of Adapazari. The main objective of this study was to investigate the cyclic failure mechanism of these type of soils and to determine the small strain behaviour of soils. In conclusion, the ground failure and liquefaction potential of each of the site categories and failure mechanisms that might have led to the observed building performance were discussed in the study. Results indicate that there was a reduction in the liquefaction resistance as the silt content increased from 0% to 20% followed by an increase of resistance for samples with 80% silt content. Rock crushed materials with their angular particle shapes and comparatively wider range of grain sizes were more resistant to liquefaction than uniform clean fine sands. Anisotropical consolidation and confining pressures also had an impact on the liquefaction behavior.



**BIM METHODOLOGY IMPLEMENTATION FOR INFRASTRUCTURE DESIGN AND MANAGEMENT. SS 372
- TELESINA: SANNITI VIADUCT CASE STUDY**

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ABSTRACT

Nowadays, the implementation of Building Information Modelling (BIM) for the infrastructure field represent a new challenge for the AECO (Architecture, Engineering, Construction, Owner and Operator) world, which will involve the interest of many researchers in the next years. One of the biggest challenge, it is the necessity to find a way to collect the information in a unique interactive database, able to share information among different discipline. A consistent interest is rising among Public Administration, led by an effective regulation provided by European Union and the consequently national adoptions, due to the possibility to improve the efficiency and to enhance a better management of the complexity of infrastructure projects. In this context, the purpose of the research is to propose a methodology for the use of BIM in a tunnel project, analyzing the definition of a correct level of detail (LOD) and the possibility to share information via interoperability for FEM analysis. Research developments was based on the "Paniga tunnel" from Morbegno variant project, which is a case study provided by ANAS, an Italian State-run company, actively interested in BIM implementation. The investigation is about two main topics: 1) definition of a correct LOD for projects with horizontal extension, such as infrastructures, and modelling activity in creating parametric elements and objects specifically for infrastructures projects; 2) numerical analysis of the tunnel, focusing on interoperability tests for finding the best exchange formats, considering that one important benefit from BIM methodology is the possibility to reuse information generated during the modelling process, avoiding data duplication. In conclusion, the research has obtained positive results for the setting up of the BIM methodology and especially for the design phase, taking advantages from information achieved in in the database for specific analysis, such as geotechnical ones. BIM model permits to qualify the process, also in terms of better control of project elements.



INNOVATIVE SOLUTIONS USING OPEN SOURCE DEVELOPMENT BOARDS IN GEOTECHNICAL TESTING

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ABSTRACT

Nowadays electronic hardware materials can be supplied more economically and easily than the past, due to the increase in production in the world. Moreover, open-source development boards have become more prevalent than ever. As technology advances and information begins to flow freely, open-source philosophy is rising with acceleration. Open-source hardware is a hardware whose design is made publicly available so that anyone can make, modify and sell the hardware. Due to the modular structure, cost advantages and ease of reaching example applications, electronic development boards have become alternative to electronic assembly needs. The most successful enabling open-source hardware is the Arduino electronic development board (prototyping platform). Arduino and other development platforms can be practical solution tool for multi-channel measurement of variables such as pressure, load, displacement/deformation, temperature and humidity which are the most commonly used in geotechnical applications, automatic control with additional peripherals and to perform numerical processing with easy software and data logging. The modular structure of the equipment will allow the creation of fast and economical experimental setups for individual research and application projects, without the need for electronic expertise. One another advantage of making laboratory scientific equipment by using open source hardware is that, shared design promotes a better design as the scientific community can contribute to its design. In modern geotechnical laboratories sensor readings are essential for many setups such as consolidation, uniaxial compression, triaxial compression and shear box tests. Moreover, some tests need temperature and humidity conditioning. In this study, usability of open source equipments to meet the needs of geotechnical laboratories at low cost is evaluated.



THE INFLUENCE OF UNUSUAL MATERIALS AS PROSPECTIVE FILLERS IN THE HOT MIX ASPHALT (HMA)

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ABSTRACT

Among the factors that influence directly the durability of the asphaltic layer on pavements, the type and percentage of filler in the hot mix asphalt pavement (HMA) is one of the most active components; the most traditional fillers, the Portland cement and the hydrated lime, are well known for resisting to weather variations and adding extra features to the hot mixtures. This research is focused on proposing potential fillers such as the glass powder, the cladding waste (gotten from clay bricks), the ashes of rice husks and laterite powder as substitutes to the traditional ones. The materials have been sieved and classified by fitting the powder on the filler grain size required by Brazilian norms, eventually they have been tested with asphalt 50/70. The glass powder performed a Thermal Susceptibility Index (IST) of -0.69 for 5% in weight of filler and -0.75 for 10% in weight of filler, proving that this material satisfies the Brazilian specification DNIT-EM 095/2006; on the other hand the laterite powder presented an IST of -0.61 for 5% and 0.32 for 10% and a lower production cost in Roraima, despite not be as eco-friendly as the previous one. After executing the Softening Point, Penetration, Flash Point and Ductility tests, it has been confirmed that the glass and laterite powder are the most recommended materials as potential substitutes to the Portland cement, however the first one performs better under balmy temperatures due to its negative IST; the cladding powder and the rice husks turns the mixtures too rigid and breakable on percentages close to 10%. The cost reduction and the reuse of some materials are important topics on choosing which one is the most appropriate, showing that expensive components may be replaced by cheaper ones that perform similar characteristics on hot mixtures.



**LOADS FROM TERRAIN DEFORMATION CAUSED BY MINING ACTIVITY ILLUSTRATED WITH THE
EXAMPLE OF TWO BUILDINGS IN MYSŁOWICE**

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ABSTRACT

The soil's load on retention walls or underground elements of engineering structures consists of three basic types of pressure: active pressure (p_a), passive pressure (p_b) and at-rest pressure (p_o). In undisturbed areas without any mining, due to lack of activity in the soil, specific forces from the soil are stable and unchanging throughout the structure's life. Mining activity performed at a certain depth activates the soil. Deformations take place in the surface layer of the rock mass, which begins to act on the structure embedded in it, significantly changing the original stress distribution. Deformation of the subgrade, mainly horizontal, becomes a source of significant additional actions in the contact zone between the structure and the soil, constituting an additional load for the structure. In order to monitor the mining influence in the form of compressive load on building walls, an observation line was set up in front of two buildings located in the Wesola quarter in Myslowice, at ul. Harcerzy Śląskich 18 and 20. In 2013, some mining activity took place directly under those buildings, with expected horizontal deformations of $\epsilon = -5.8$ mm/m. The measurement results discussed in this paper showed that, as predicted, the buildings were subjected only to horizontal compressive deformations with the following values: a. parallel to the analysed wall less than -4.0 ‰ for building No 18 and -1.5 ‰ for building No 20, b. perpendicular to the analysed wall less than -6.0 ‰ for building No 18 and -4.0 ‰ for building No 20 (the only exception was the measurement in line 8-13, where $\epsilon_x = -17.04$ ‰ for building No 18 and -4.57 ‰ for building No 20). Both horizontal and vertical displacement indicate that the impact of mining activity was greater on building No 18. This is also confirmed by inspections of the damage.



BEHAVIOUR OF BRIDGES IN MINING AREAS RECORDED WITH THE USE OF VIBRATING WIRE SENSORS

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ABSTRACT

Structure monitoring methods are increasingly widely used to assess the actual condition of structures and to: a. improve the safety of monitored buildings, b. evaluate the innovations used or monitor high risk locations. In addition, monitoring a structure's behaviour becomes required for structures in geotechnical category three, which, due to risks related to complex soil conditions, is often assigned to highway engineering structures, including motorways and express roads, as well as roads in mining areas. In such cases, monitoring consists in regular observations, measurements and documenting all significant data during construction, after its completion and during usage, and in analysing and evaluating the results. The article will present the behaviour of over bridge structures subjected to mining activity, recorded with the use of a monitoring system consisting of vibrating wire sensors. The aim of the article is to show differences in structure behaviour depending on the direction of mining and location of the wall under structures, and to showcase sensitivity of the system to mining actions.



THE SLOPE REINFORCEMENT WITH THE UTILIZATION OF THE COAL WASTE ANTHROPOGENIC MATERIAL

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ABSTRACT

The protection of the environment, including waste management, is one of the pillars of the policy of the Europe. The application which is presented in that paper try to show trans-disciplinary way to design geotechnical constructions – slope stability analysts near road to shopping center. The generally accepted principles the author presents numerical modelling patterns of earth retaining walls as slope stabilization system. The paper constitutes an attempt to summarise and generalise earlier researches which involved FEM numeric procedures and the Z_Soil package. The design of anthropogenic soil used as a material for reinforced earth retaining walls, are not only of commercial but of environmental importance as well and consistent with the concept of sustainable development and the need to redevelop brownfield. This paper tries to show conceptual and empirical modelling approaches to slope stability system used anthropogenic soil from heaps of mining a special focus to urban areas of South of Poland and perspectives of anthropogenic materials application in geotechnical engineering are discussed. This is one of the possibilities of using soil as waste product from coal mine to the modernisation of the areas where you plan to upgrades roads and expansion of buildings and structures. Characteristics of soils and principles for the construction of earth embankments on reinforced subsoil. Description of calculation methodology for settlements and consolidation of soils and reinforced with waste product from coal mine together with practical examples and discussion of the results obtained was analyzed.



THE EFFECT OF HEAVE SOURCED FROM THE SWELLING CLAYS ON THE WATER CANALS

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ABSTRACT

In this study, determination of the swelling characteristics of the clays and probable heave problems on the water transport canal is aimed. In order to achieve above mentioned objectives undisturbed samples were taken from the canal route, swelling percent and pressures of the clays were determined by laboratory experiments. Then the swelling pressure distribution map was drawn by use of the swelling pressures obtained, and canal surcharge pressures were compared with the swell pressures. The clays on the canal route have medium to high swelling potential, their swelling pressures are higher than surcharge pressure of empty/fill canal in many locations. In addition, surface heavy values show the differences in each location. These differential movements will cause to the deformation on the canal.



EVALUATION OF ROCK JOINT COEFFICIENTS

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ABSTRACT

A computer method for evaluation of rock joint coefficients is described and several applications are presented. The method is based on two absolute numerical indicators that are formed by means of the Fourier replicas of rock joint profiles. The first indicator quantifies the vertical depth of profiles and the second indicator classifies wavy character of profiles. The absolute indicators have replaced the formerly used relative indicators that showed some artificial behavior in some cases. This contribution is focused on practical computations testing the functionality of the newly introduced indicators.



**ESTABLISHING RELATIONSHIPS BETWEEN PARAMETERS OF THE CONTROLLED COMPACTION SOIL
BY USING VARIOUS IN-SITU TESTS**

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ABSTRACT

In both of site engineering practice and design practice, correlations between geotechnical parameters are very important to describe proper view of technical circumstances. It is observed in engineering state of affairs for example that lack of correlations between soil parameters constraints the foundation design. Either contractors in geotechnics are often forced to obligatory present chosen soil parameters compared with others. It is common practice in investment jobs in Poland. But earthworks belongs to engineering works undergoing to covering and sometimes is not possible to directly estimate expected parameters after finishing ground preparations for the construction setting. With no doubt appropriate correlations between parameters can be useful to receive an acceptance of executed earthworks, or to certify quality of the work done, or to avoid spreading out filled layers of soil. The correlations are obtained from the field testing made during a real building investment. The earthwork description demanded the large artificial bank of soil on 150 meters long and 100 meters wide site. The embankment consisted of layered soil to its final height of 1,8 meters. Every layer was gradually compacted and simultaneous field investigations were carried on. For every step of compaction, series of tests in the field were conducted: the dynamic probing (DPL test), the dynamic plate test (LFWD test), the static plate test (VSS test), the soil bearing test (CBR test). Based on this investigation results, relationships between dynamic modulus, static moduli, density index, relative bearing ratio were established for medium/fine grained soil like sand with coars silt. The aim of research was evaluating reliable correlations between chosen soil parameters describing state of surface layers of soil. Disposal of such engineering data is very supportive if during conducted earthworks quick evaluation of the soil state is needed and quality of earthworks must be confirmed. Results can be used to convertible evaluation of soil parameters in the case of possibility managing only one type of the soil test mentioned above.



STEEL SHEET PILES – APPLICATIONS AND ELEMENTARY DESIGN ISSUES

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ABSTRACT

High-intensity housing having been carried out in centres of towns causes that many complex issues related to earthworks and foundations must be resolved. Project owners are required to ensure respective number of parking bays, which in turn demands 2-3 storeys of underground car parks. It is especially difficult to fulfil in dense buildings of old town areas where apart from engineering problems, very stringent requirements of heritage conservator supervision are also raised. The problems with ensuring stability of excavation sidewalls need to be, at the same time, dealt with analysis of foundations of neighbouring structures, and possible strengthening them at the stages of installing the excavation protection walls, progressing the excavations and constructing basement storeys. A separate problem refers to necessity of constructing underground storeys below the level of local groundwater. This requires long-term lowering of water table inside excavation while at possibly limited intervention in hydrological regime beyond the project in progress. In river valleys such "hoarding off" the excavation and cutting off groundwater leads to temporary or permanent disturbances of groundwater run-off and local swellings. Traditional way to protect vertical fault and simultaneously to cut-off groundwater inflow consists in application of steel sheet pilings. They enable to construct monolithic reinforced concrete structures of underground storeys thus ensuring both their tightness and high rigidity of foundation. Depending on situation, steel sheet pilings can be in retrieving or staying-in-place versions. This study deals with some selected aspects of engineering design and fabrication of sheet piling for deep excavations and underground parts of buildings.



THE ROLE TO BE PLAYED BY INDEPENDENT GEOTECHNICAL SUPERVISION IN THE FOUNDATION FOR BRIDGE CONSTRUCTION

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ABSTRACT

Some remarks concerning the necessity of employing an independent and over all ethical geotechnical survey were presented in the paper. Starting from the design phase, through the whole construction process, the importance of geotechnical engineer is stated in legal acts. Numerous testing technologies serve for the calibration of geotechnical technologies and allow for confirming the quality and capacity of piles. Special emphasis was paid to the involvement of scientific and research institutions which can not only serve services but also can postprocess and methodize collected data. Such databases enable for new codes, methods and recommendations. Selection of deep foundations for bridge-type structures is most often dependent on complex geotechnical conditions, concentrated loads and constraints for pier displacements. Besides the last ones, prior to more common introduction of the design-construct system, could be a convenient justification for design engineer, who imposed deep foundation because he didn't want or was not able to estimate the effect of pier settlement on civil engineering structure. The paper provides some notes about the need to engage a geotechnical supervising service of high competency and ethical quality during engineering and construction stages of foundations for bridge-type structures where legal requirements are of special consideration. Successive stages of projects are reviewed and research methods used for current calibration of geotechnical technologies and verification of geotechnical work quality are analysed. Special attention is given to potential involvement of independent R&D institutions which, apart from rendering specific services, also collect and systemize the research results thus enabling, in the long term, to revise engineering standards, instructions and guidelines.



INTERESTING DEVELOPMENTS IN TESTING METHODS APPLIED TO FOUNDATION PILES

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ABSTRACT

Both piling technologies and pile testing methods are a subject of current development. New technologies, providing larger diameters or using in-situ materials, are very demanding in terms of providing proper quality of execution of works. That concerns the material quality and continuity which define the integral strength of pile. On the other side we have the capacity of the ground around the pile and its ability to carry the loads transferred by shaft and pile base. Inhomogenous nature of soils and a relatively small amount of tested piles imposes very good understanding of small amount of results. In some special cases the capacity test itself form an important cost in the piling contract. This work presents a brief description of selected testing methods and authors remarks based on cooperation with Univerities constantly developing new ideas. The paper is divided in two parts: the first presents some experience based remarks on integrity testing by means od low energy impact (low strain). The second part presents selected (Polish) developments in the field of closed–end pipe piles testing based od bi-directional loading, similar to Osterberg idea, but without sacrificial hydraulic jack. Such test is suitable epecially when steel piles are used for temporary support in the rivers, where constructing of conventional testing appliance with anchor piles or kentledge meets technical problems. According to the authors expeience, such tests were not yet used on the building site but they bring a real potential epecially, when the displacement control can be provided from the river bank using surveying techniques.



World Multidisciplinary

12-16 June, 2017 - Prague (Czech Republic)

Civil Engineering-Architecture-Urban Planning Symposium - **WMCAUS**



Session Title:

Hydromechanics



DESIGNING THE ALLUVIAL RIVERBEDS IN CURVED TRACKS

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ABSTRACT

There are many reasons for the continuing attention is given to curved tracks of the rivers in the fields of geology, geomorphology, hydrology, and recently with the emphasis on river ecology. Watercourses in good environmental conditions present the dominant features in the landscape and urban environment. In most cases, regulated channels only provide flood protection. The flat and wide riverbed does not create favourable conditions for the instream biota. In the period of minimum flows, the low water level is overheated and looks unaesthetic; therefore it is necessary to restore the regulated streams. River restoration uses a variety of technical resources, including the creation of asymmetric channel in the curved track. This solution of the whole range of restoration tools provides the biggest accumulation space suitable for the instream biota and can be therefore considered to be an important restoration element. The paper presents the method of determining the shape of the riverbed in curved track of the watercourse, which is based on the method of S. Ikeda (1975) developed for a slightly curved track in sandy riverbed. Regulated rivers have essentially slightly and smoothly curved tracks; therefore this methodology provides the appropriate basis for river restoration. S. Ikeda verified the method on rivers with sandy riverbed. Very good agreement was found between the actual and theoretical shape of the cross section in the area of maximum erosion. The spherical particle shape is considered in the sandy material, but the shape of the particles of alluvial sand-gravel riverbeds is substantially different from a spherical shape. It is therefore necessary to consider the real shape and orientation of the particles. Based on the research in the experimental reach of the Holeška Brook and several alluvial mountain streams the methodology was adjusted. The method also takes into account other important characteristics of bottom material - the shape and orientation of the particles, settling velocity and drag coefficients. Thus, the method is mainly meant for the natural sand-gravel material, which is heterogeneous and the particle shape of the bottom material is very different from spherical. The calculation of the river channel in the curved track provides the basis for the design of optimal habitat, but also for the design of foundations of armouring of the bankside of the channel. The input data is adapted to the conditions of design practice.



INTEGRATED HYDROGRAPHICAL BASIN MANAGEMENT. STUDY CASE - CRASNA RIVER BASIN

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ABSTRACT

Hydrographical basins are important from hydrological, economic and ecological points of view. They receive and channel the runoff from rainfall and snowmelt which, when adequately managed, can provide fresh water necessary for water supply, irrigation, food industry, animal husbandry, hydrotechnical arrangements and recreation. Hydrographical basin planning and management follows the efficient use of available water resources in order to satisfy environmental, economic and social necessities and constraints. This can be facilitated by a decision support system that links hydrological, meteorological, engineering, water quality, agriculture, environmental, and other information in an integrated framework. In the last few decades, different modelling tools for resolving problems regarding water quantity and quality, respectively water resources management. Watershed models have been developed to the understanding of water cycle and pollution dynamics, and used to evaluate the impacts of hydrotechnical arrangements and land use management options on water quantity, quality, mitigation measures and possible global changes. Models have been used for planning monitoring network and to develop plans for intervention in case of hydrological disasters: floods, flash floods, drought and pollution. MIKE HYDRO Basin is a multi-purpose, map-centric decision support tool for integrated hydrographical basin analysis, planning and management. MIKE HYDRO Basin is designed for analyzing water sharing issues at international, national and local hydrographical basin level. MIKE HYDRO Basin uses a simplified mathematical representation of the hydrographical basin including the configuration of river and reservoir systems, catchment hydrology and existing and potential water user schemes with their various demands including a rigorous irrigation scheme module. This paper analyzes the importance and principles of integrated hydrographical basin management and realizes a case study for Crasna river basin, with use of MIKE HYDRO Basin advanced hydroinformatic tool for integrated hydrographical basin analysis, planning and management.



**MODELING OF SEDIMENT TRANSPORT IN THE MEHADICA RIVER, CARAS SEVERIN COUNTY,
ROMANIA**

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ABSTRACT

Study case is situated in Caras Severin County. Every sediment transport model application is different both in terms of time and space scale, study objectives, required accuracy, allocated resources, background of the study team etc. For sediment transport modelling, it is necessary to know the characteristics of the sediment in the river bed. Therefore it is recommended to collect a number of bed sediment grab samples. These samples should be analyzed in terms of grain size distribution. To solve theoretical problems of movement of water in the river Mehadica, it requires modeling of water flow in this case. Numerical modeling was performed using the program MIKE11. MIKE 11 is a user-friendly, fully dynamic, one-dimensional modelling tool for the detailed analysis, design, management and operation of both simple and complex river and channel systems. With its exceptional flexibility, speed and user friendly environment, MIKE 11 provides a complete and effective design environment for engineering, water resources, water quality management and planning applications. The Hydrodynamic (HD) module is the nucleus of the MIKE 11 modelling system and forms the basis for most modules including Flood Forecasting, Advection-Dispersion, Water Quality and Non-cohesive sediment transport modules. The MIKE 11 HD module solves the vertically integrated equations for the conservation of mass and momentum, i.e. the Saint-Venant equations. The input data are: area plan with location of cross sections; cross sections topographical data and roughness of river bed; flood discharge hydrograph. Advanced computational modules are included for description of flow over hydraulic structures, including possibilities to describe structure operation.



OPTIMIZING USE OF WATER MANAGEMENT SYSTEMS DURING CHANGES OF HYDROLOGICAL CONDITIONS

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ABSTRACT

When designing the water management systems and their components, there is a need of more detail research on hydrological conditions of the river basin, runoff of which creates the main source of water in the reservoir. Over the lifetime of the water management systems the hydrological time series are never repeated in the same form which served as the input for the design of the system components. The design assumes the observed time series to be representative at the time of the system use. However, it is rather unrealistic assumption, because the hydrological past will not be exactly repeated over the design lifetime. When designing the water management systems, the specialists may occasionally face the insufficient or oversized capacity design, possibly wrong specification of the management rules which may lead to their non-optimal use. It is therefore necessary to establish a comprehensive approach to simulate the fluctuations in the interannual runoff (taking into account the current dry and wet periods) in the form of stochastic modelling techniques in water management practice. The paper deals with the methodological procedure of modelling the mean monthly flows using the stochastic Thomas-Fiering model, while modification of this model by Wilson-Hilferty transformation of independent random number has been applied. This transformation usually applies in the event of significant asymmetry in the observed time series. The methodological procedure was applied on the data acquired at the gauging station of Horná Oreňany in the Parná Stream. Observed mean monthly flows for the period of 1.11.1980 - 31.10.2012 served as the model input information. After extrapolation the model parameters and Wilson-Hilferty transformation parameters the synthetic time series of mean monthly flows were simulated. Those have been compared with the observed hydrological time series using basic statistical characteristics (e. g. mean, standard deviation and skewness) for testing the quality of the model simulation. The synthetic hydrological series of monthly flows were created having the same statistical properties as the time series observed in the past. The compiled model was able to take into account the diversity of extreme hydrological situations in a form of synthetic series of mean monthly flows, while the occurrence of a set of flows was confirmed, which could and may occur in the future. The results of stochastic modelling in the form of synthetic time series of mean monthly flows, which takes into account the seasonal fluctuations of runoff within the year, could be applicable in engineering hydrology (e. g. for optimum use of the existing water management system that is related to reassessment of economic risks of the system).



LABORATORY APPROACH FOR UNDERSTANDING TRANSPORT OF CONTAMINANTS IN SOIL

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ABSTRACT

The soil is a medium that is composed of three phases: liquid, solid and gaseous. To understand the principles governing the movement of fluids and the related variables to model it is a very complex process for the students, and so on, to the professor. Therefore, in a graduated course of transport of compounds in the soil were designed experiments were that help both, professors and students, the appropriation of knowledge. The experiments were regarding with explanation about the porosity vs size grain distribution, determination of intrinsic permeability and hydraulic conductivity, and study of transport of contaminant in a two-dimensional set up. In the first one, was used a beaker, water and beads; in the second one, an one-dimensional column was used and the test considered hot and cold water movement. In the last one, it was used a 2-D setup that simulate aquifer conditions. The total practices were conducted in a specific day as a supplement of the lecture. According with the results in the course, these activities enhanced student learning experience.



ROCK U-WEIR – EVALUATING EFFECT OF STRUCTURE ON LOCAL HYDRAULICS

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ABSTRACT

The paper investigates the flow over a rock u-weir structure inserted in a rectangular channel with uniform width in the flow direction. This type of weir represents a special type of broad crested structure that induces a spatial diversification of free-surface flow over the weir width. It has potential to improve ecological conditions in the stream's channel by enabling a continuous two-way fish migration, increasing the physical habitat diversity by creating channel bedforms similar to those found along natural rivers, raises water surface elevations to provide water to diversions and channel alcoves, stabilizes stream gradient and provides energy dissipation. The rock u-weirs also limit bank erosion, prevent changes in channel gradient. Though experimental studies confirmed its advantages, properties of this complex structure is still not well known. A laboratory experiments have been carried out to analyze the hydraulic characteristics of steady non-uniform rapidly varied flow over the weir and assess the positive aspects of the weir in comparison of "classical" broad crested weir. The flow conditions were represented by different discharges up to value of bankfull discharge calculated on base of empirical relations for given bed slope and width/depth ratio. We have analyzed flow conditions according to specific discharge, velocity, water level and streamlines along the weir. The comparison between experimental data and numerical results shows that the approach by using the one-dimensional model may provide reliable depth averaged characteristics of weir flows in stream's channel. The two dimensional models provide more complex information for designers and facilitates additional design guidance for river rock weirs.



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NUMERICAL MODEL OF TRANSITARY FLOOD FLOW IN 2005 ON RIVER TIMI?

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ABSTRACT

The paper presents numerical modeling of fluid flow transiting on the Timis River, downstream Lugoj section - N.H. COSTEIU, the occurrence of accidental flood wave 4 April to 11 April 2005. Numerical simulation aims to estimate water levels on the route pattern on some areas and areas associated respectively floodplain adjacent construction site on the right bank of Timis river, on existing conditions in 2005.



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Session Title:

Structural Engineering



DETERMINATION OF STABILITY OF HA LONG BAY ISLETS

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ABSTRACT

The Limestone Islets on Ha Long Bay are the symbol of world natural heritage recognized by UNESCO. Due to the effect of endogenous, exogenous factors, the islets are facing about its existence over time. The dissolution rate at sea level is relatively high creating beautiful and unique attractions curious tourist however less stable of the islet. In terms of execution are difficult, sensitive and less stable to access. The Islets modelled in 2D, analysis the geometric information, bedded, joint set, and shear zone by photo then qualifying, added detail information in the field. The kinematic analysis was applied to calculate the factor of safety for each block. Geometric analysis results match the geological evidence indicates that the impact of physical and chemicals by wave and sea water increased dissolution rate of limestone 1,161mm/year, which is more than 20 times compare with dissolution rate of limestone on land. The viability of these landscapes is matched with the factor of safe of the islet base on kinematic analysis. The results describe and evaluate the details for the 3 islets in the world natural heritage Halong Bay and the question of whether to apply the solution in the eroded part in order to maintain the islets in the discussed at the end of the article.



NUMERICAL ANALYSIS ON THE HIGH-STRENGTH CONCRETE BEAMS ULTIMATE BEHAVIOUR

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ABSTRACT

High-strength concrete can be designed to have a higher workability, and a higher mechanical properties compared to the traditional concrete. The use of high-strength concrete in the building industry will continue to grow. Thus, the development of technologies of high-strength concrete beams production, with the aim of creating a secure and durable material, is closely linked with the numerical models of real objects. The high-strength concrete structures required not only experimental testing, but also finite element modelling of their behaviour to failure. Few researchers studied the finite element modelling of reinforced concrete beams. However, the available publications on the finite element investigation of reinforced high-strength concrete beams are still limited. The three-dimensional nonlinear finite element models of reinforced high-strength concrete beams with a complex geometry has been developed in this study. The numerical analysis are performed using the ANSYS finite element package. The arc-length parameters and the adaptive descent parameters are used with Newton-Raphson method to trace the complete load-deflection curves. Experimental and finite element modeling results are compared graphically and numerically. Comparison of these results indicates the correctness of failure criteria assumed for the high-strength concrete and the steel reinforcement. The results of numerical simulation are sensitive to the modulus of elasticity and the shear transfer coefficient for an open crack assigned to high-strength concrete. The full nonlinear load-deflection curves at mid-span of the beams, the development of strain in compressive concrete and the development of strain in tensile bar are in good agreement with the experimental results. Numerical results for smeared crack patterns are qualitatively agreeable as to the location, direction, and distribution with the test data. The model was capable of predicting the introduction and propagation of flexural and diagonal cracks. It was concluded that the finite element model captured successfully the inelastic flexural behavior of the beams to failure.



CRACKING OF BEAMS STRENGTHENED WITH EXTERNALLY BONDED SRP TAPES

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ABSTRACT

Paper discusses strengthening efficiency of relatively new kind of SRP composite based on high strength steel wires. They are made of ultra-high strength steel primarily used in cords of car tires. Through advanced treatment, the mechanical properties of SRP steel are similar to other high carbon cold drawn steels used in construction industry. Strength significantly exceed 2000 MPa, there is no perfect plasticity at yield stress level. Almost linear stress-strain relationship makes SRP steel mechanical properties similar to carbon fibres. Also flexibility and weight ratio of the composite overlay is slightly worse than CFRP strip. Despite these advantages SRP is not as popular as other composites reinforced with fibres of high strength. This is due to the small number of studies of SRP behaviour and applicability. Paper shows selected results of the laboratory test of beams strengthened with use of SRP and CFRP externally bonded overlays. Attention has been focused primarily on the phenomenon of cracking. Comparison include the cracking moment, crack width and spacing, coverage of crack zone. Despite the somewhat lower rigidity of SRP tapes, they have a much better adhesion to concrete, so that the crack width is comparable in almost the whole load range. The paper also includes an assessment of the common methods of checking the condition of cracking in relation to the tested SRP strengthening. The paper presents several proposals to modify calculation procedures, inter alia on how to determine the reinforcement ratio, the stresses in the reinforcement, crack spacing. The proposed formulas are verified with results of laboratory tests.



CONVERSION OF A TEMPORARY TENT WITH STEEL FRAME INTO A PERMANENT WAREHOUSE

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ABSTRACT

The paper is dealing with the problem of a functional conversion (involving both architectural and structural issues) applied to the case of an industrial building. As well known, temporary tents, designed according to the European Code EN13782, represent a remarkable stake on the building market and a fast and practical solution for some situations. It is exactly the case approached by the paper, where the investor has initially decided to erect on his platform a provisional shelter for agricultural machines and subsequent staff, built of a light steel structure covered by PVC roofing and cladding. This temporary tent has been acquired from a specialized supplier in form of a series product. After using the tent for a number of years, the investor has decided to convert the existing structure from architectural and structural point of view by switching to a permanent structure designed accordingly. Important changes were thus imposed both to the architectural part (technological flows, openings, facades) and especially to the structural part where this switch imposed a re-design to the codes of permanent structures (especially as far as climatic loadings are concerned). The required architectural change implied the building of a 70 cm high concrete plinth and replacing the PVC membrane temporary roofing and cladding by permanent 60 mm thick PUR sandwich panels. Together with a new system of openings this has led to renewed facades of the buildings. As for the structural change, the required conversion has imposed a thorough checking of the existing steel structure (very slender and typical to a tent) in view of transforming it into a permanent structure. The consolidation measures of the existing galvanized steel structure are described, together with the measures applied at infrastructure level in order to implement the required conversion.



CONCRETE COVER INFLUENCE ON INELASTIC BUCKLING OF LONGITUDINAL REINFORCING BARS

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ABSTRACT

Seismic and accidental loads or construction overload, acting on structures, can result in the appearance in each structure's parts postcritical states. In case of analysis of reinforced elements in postcritical state of deformation, when in the same time strain limits of concrete cover are exceeded and reinforcing strain are large, account should be taken fact that it can lead to inelastic buckling of pressured main bars. Buckling of bars usually occurs between two stirrups and inelastic buckling of reinforcement bars in pressured beams and columns area comes after cover detachment. Known models of pressured bars, takes account the possibility of inelastic buckling, have been developed based on the research free stand rods in laboratory conditions. These research show that the impact on inelastic buckling bars have geometric features described by rods slender, as well as the yield strength and steel mechanical properties after reaching yield limits, which is described by length of plastic plateau, the strengthening ratio and shape of hardening curve. However, the concrete cover and adhesive forces between bar and concrete help to delay buckling of main bars. The paper presents the results of numerical analyses of postcritical behaviour of compressed rods, taking into account the impact of concrete cover on static equilibrium path. Concrete cover was modelled as a transverse ties with characteristics like tensioned concrete. The calculations were performed for various parameters of concrete cover and bar's slenderness, used commercial system Abaqus/CAE. The results showed rightness of earlier thesis. Concrete cover has a significant impact on inelastic buckling of reinforcing bars.



A METHOD SUITABLE FOR UPDATING THE BOUNDARY CONDITION OF CONTINUOUS BEAM BRIDGES

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ABSTRACT

The boundary support conditions of continuous beam bridges play the great influence on the results of the structural analysis, but it is difficult to accurately model the boundaries owing to the complexity structure of constraint conditions. To address this issue, a parameterized method is proposed to update the boundary support conditions in this study. First, the connection stiffness at boundary is considered as the optimization variable, and then the optimization problem of updating the boundary conditions are described in detail based on the theory of finite element model updating. Second, for verifying the proposed method, a loading test was conducted on an actual three-span continuous beam bridge. With the proposed method, the discrepancy between the measured modal parameters and the analytical results are greatly reduced; therefore, it is shown that the proposed method is effective for updating the boundary support conditions of actual continuous beam bridges.



KINEMATICALLY ADMISSIBLE FAILURE MECHANISMS FOR 2D AND 3D TRUSSES

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ABSTRACT

The reliability models of statically determinate and indeterminate steel trusses are constructed in this paper. This theme is very important because probability of a failure depends on a reliability model of structures. The flat and 3D trusses are considered. For analysed trusses one of three types of reliability model: series structure, parallel structure and serial-parallel structure is determined. A system that is functioning if and only if all of its components are functioning is called a series structure. For such structures the higher the number of members, the lower load bearing capacity and reliability. A system that is functioning if at least one of its components is functioning is called a parallel structure. In the case of complex structures, there is usually a need to identify mixed systems, which are a combination of serial and parallel systems. Identification of reliability system is based on studies on the transformation the safe structural system in the mechanism. These researches intended to determine the kinematically admissible failure mechanisms (KAFM) which contain minimal critical sets of elements (MCSE). MCSE is a collection in which the at least one causative element is operational, the entire system is operational – the structures is able to move acting loads. Exhaustion of the load of all the elements included in the causative MKZE makes the structure is converted into the geometrically variable system. To identify mechanism of truss the spectral analysis of the stiffness matrix is used. The eigenvalues of stiffness matrix describe the energy states of the module, while the eigenvectors describe the form of deformation. In the case when all the eigenvalues are greater than zero there are no movements. Zero eigenvalues are related to the finite or infinitesimal mechanisms, but in general the information from the null-space analysis alone does not suffice to establish the difference. The mechanism can be considered as an eigenvector related to zero eigenvalue. To establish if the mechanism is infinitesimal it is necessary to apply the nonlinear analysis with the use of geometric stiffness matrix. For these analysis the computational program based on the finite element analysis was written within the Mathematica environment. This stage of the study, in combination with the static load design, allow to determine the minimum critical set of bars corresponding to the most probable scenario of structural damage during a fire.



THE DYNAMIC CHARACTERISTICS OF BUILDINGS FROM SIGNAL PROCESSING OF AMBIENT VIBRATION

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ABSTRACT

The experimental technique used to determine the dynamic characteristics of buildings is based on records of low intensity oscillations of the building produced by various natural factors, such as permanent agitation type microseismic motions, city traffic, wind etc. The possibility of measuring/recording these oscillations is provided by the latest seismic stations (Geosig and Kinometrics digital accelerographs). The permanent microseismic agitation of the soil is a complex form of stationary random oscillations. The building filters the soil excitation, selects and increases the components of disruptive vibrations corresponding to its natural vibration periods. Results. For some selected buildings, with different instrumentation schemes for the location of sensors (in free-field, at basement, ground floor, roof level), a correlation between the dynamic characteristics resulted from signal processing of ambient vibration and from a theoretical analysis will be presented. Conclusions. The interpretation of recording results could highlight the behaviour of the whole structure. On the other hand, these results are compared with those from strong motions, or obtained from a complex dynamic analysis, and they are quite different, but they are explicable.



THE IMPACT OF INTENSITY OF THE SEISMIC AREA ON EVALUATION OF DYNAMIC RESISTANCE OF BRIDGES

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ABSTRACT

The paper presents the results of evaluation the dynamic resistance of existing bridges located in areas of varying seismic intensity. The subject of the analysis was an exemplary reinforced concrete slab road viaduct. For such assumed the object were carried out FEM calculations. Dynamic analysis was performed using the response spectrum method with use an acceleration standard response spectra according to Eurocode 8 and standard acceleration response spectra for the GZW (Upper Silesian Coal Basin) and LGOM (Legnica-Głogów Copper District) areas. For each individual case, the obtained response for seismic impact was compared with the effects of load combinations adopted at the design stage, setting the limits of design ground accelerations in the horizontal (a_g, H_{max}) and vertical (a_g, V_{max}) plane. Based on a comparison of the obtained results, shown differences in the resistance of the bridge structure, which are depend on respective standard response spectra adopted for dynamic calculations. This made it possible to assess the influence of impact of seismic intensity of the respective area on dynamic resistance of analysed bridge. In addition, evaluated limits the peak values of acceleration (PGA_{Vmax} and PGA_{Hmax}) which object can take without a safety hazard. Additionally, interpretation and scope of applicability of the obtained results in the context of the response spectrum method were described.



PROPOSAL EVALUATION OF DYNAMIC RESISTANCE OF THE EXISTING INDUSTRIAL PORTAL FRAME BUILDINGS TO THE IMPACT OF MINING TREMORS

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ABSTRACT

The article presents method for assessing dynamic resistance of existing industrial portal frame buildings subjected to mining tremors. The subject of the study were two industrial halls of reinforced concrete and steel structure. In order to determine the dynamic resistances of these objects was carried out static and dynamic numerical analysis in FEM environment. The range of numerical calculations has been adapted to the guidelines contained in the former and current standards for the design. This allowed to formulate the criteria on the basis of which was obtained maximum permissible value of the horizontal ground acceleration constituting resistance analysed objects. The permissible range of structural behaviour was set by comparing the effects of load combinations adopted at the design stage with a seismic combination recognized in Eurocode 8. In the field of dynamic analysis was used response spectrum method, taking into account the guidelines contained in Eurocode 8 and the guidelines of National. Finally, in accordance with the established procedure was carried out calculations and presents the results for two exemplary industrial halls of reinforced concrete and steel structure. The results allowed the comparison of dynamic resistance for two different types of material and design and a sensitivity analysis with respect to their constituent bearing elements. The conclusions of these analyzes helped to shape the thesis for the next stage of the research, in which is expected to analyse a greater number of objects using a parametric approach in relation to the geometry and material properties.



REINFORCED CONCRETE DEEP BEAMS, BEHAVIOUR UNDER LOAD AND CRITICAL REVIEW OF THE MAJOR DESIGN APPROACHES

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ABSTRACT

Deep beams have depths greater than normal by comparison to their spans. As a consequence, the Bernoulli hypothesis stipulating that a plane section before bending remains plane after bending is no more valid and there may be more than one neutral axis. This invalidates the ordinary beam theory for flexure, with vertical stresses having values that can no more be neglected. As a result of their particular internal stress distribution, the design of these structural members is not correctly covered by the major design codes and manuals in application over the world. The present work gives an appraisal of the behaviour of these structural members under load, presents a critical review of the few existing deep beam design approaches adopted in the literature and stresses on their respective drawbacks and differences. This helps design engineers unfamiliar with these structural members to have an understanding on their loading behaviour and incite for their uses in the construction industry, particularly in tall buildings made of cross wall construction where the first floor cross-walls are supported on columns to leave the ground floor open. They can also be used as transfer girders to provide column offsets for large unobstructed spaces. Indeed, using deep beams as structures in buildings is always a practical solution for spanning over large spaces. The research work is supported by an extensive experimental work on reinforced concrete deep beams, simply supported and continuous, carried out in the past by the author and an on-going research studies on the topic. This research reveals that the deep beam problem is as yet not clearly apprehended, since while for some design approaches shear and diagonal cracking are the main concern, for others, flexure or bearing dictates the ultimate capacity of these structural members. Moreover, with the advances in the material's technology, and hence with the increase in the concrete strength, more slender sections of deep beams can be built, giving rise to the possibility of premature buckling failure which could occur in slender concrete deep beams; this is not considered as a possible design criterion in most of the existing design methods. It is to be noted however, that most design engineers do not understand clearly the behaviour of concrete deep beams under load and continue to treat them with the ordinary beam design formulas.



THE COMPARISON OF THE RELIABILITY METHODS FOR STEEL TRUSSES SUBJECTED TO FIRE

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ABSTRACT

The proposed paper concerns different methods of the reliability analysis of steel structures exposed to fire. Two types of trusses (statically determinate and statically indeterminate) were considered. The fire analysis was carried out in MES3D program, it was assumed that structures were insulated with the spray-applied fibre and were exposed to the fire described by the standard time-temperature curve. The calculation were made according to Eurocode rules. The reliability analysis for both types of structures was carried out with methods of second and third level. To assess the reliability according to second level methods the approximation (FORM, SORM) and simulation (Monte Carlo, Importance Sampling) methods implemented in NumPress Explore program was used. In this way the Hasofer-Lind reliability index was calculated. As the third level method system reliability analysis was carried out. Appropriate reliability systems were defined for each structure. For the statically determinate structure it was series system. For statically indeterminate truss it was need to build mixed (parallel - series) system. There were few model of structural failure (failure modes), so appropriate kinematically admissible failure mechanisms (KAFMs) had to be defined. According to comparison of results from system analysis and calculations made in NumpressExplore there were observed significant differences in the value of reliability index. In the case of the statically determinate truss higher reliability index was gotten as the results of calculation made by second level method. The effect of statistical weakness of structure was observed. For statically indeterminate structure opposite result- the effect of statistical reinforcement was noticed - the reliability index was much higher according to system analysis. It means that using methods of second level, that seems to be easier, is safety for statically indeterminate structures. In the case of statically determinate structure it is recommended to support analysis with second level method by system analysis, what is not difficult task.



**ASSESSMENT OF MASONRY BUILDINGS SUBJECTED TO LANDSLIDE-INDUCED SETTLEMENTS:
FROM LOAD PATH METHOD TO EVOLUTIONARY OPTIMIZATION METHOD**

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ABSTRACT

When dealing with landslide structural damage assessment, considering that the scale of the analysis is regional, it is both technically impossible and economically inconvenient to perform generalized and, at the same time, detailed investigations. In these cases, it is therefore necessary to implement various levels of detail, depending on the size of the analysis, the objectives, the available time and the economic constraints. This multilevel approach usually seems to be the most effective and useful because it allows to calibrate the available resources. The first level of the analysis, necessarily quick, should be extended to all the buildings of the territory under study. The objective is to identify those buildings that require a deeper investigation. In this scenario, models based on classical structural mechanics seem to be difficult to apply for a rapid crack pattern diagnosis. This is why, a new approach, based on a simple model (i.e. the Load Path Method, LPM), has been proposed by Palmisano and Elia (2013). However, according to Palmisano and Elia (2013) the LPM is very useful for rapidly searching the 'most plausible solution' instead of the exact solution. To find the solution, optimization algorithms are necessary. In this scenario, this article aims to show how the Bi-directional Evolutionary Structural Optimization can be very useful to optimize the strut-and-tie models obtained by using the Load Path Method.



GEOMETRICAL AND COMPUTATIONAL MODELS FOR TRANSFORMED FOLDED STEEL SHEETS

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ABSTRACT

The paper concerns features of flat steel sheets folded in one direction and subject to effective shape transformations performed in order to achieve their shell shapes. Such transformed sheets connected to each other along their longitudinal edges into a folded sheeting can create a corrugated shell roof. The sheeting can form diversified and really innovative warped free forms depending on the type and degree the shape transformations of each sheet and even individual fold in the sheeting. Due to the effectiveness of the shape transformations, the initial strength and geometrical imperfections of the shell sheets are possible small and worsen the work and stability of their folds as small as possible. Such initial analyses have been carried out by Adam Reichhart and Zbigniew Kielbasa in Rzeszow University of Technology Hall but they are not too accurate. Therefore, further analyses are advisable in relation to geometrical, mechanical and computational models of the folds. The effective shape transformations result from relevant technique of supporting each fold in the skew shell roof directrices. An influence of the essential and natural boundary conditions as well as mutual position and shapes of directrices supporting shell sheets on their geometrical and mechanical properties ought to be strictly examined to describe their work under static and dynamic loads. Big displacements and small strains of the plane flanges and webs of all folds cause nonlinear interdependences between the supporting conditions and properties of the transformed shell folds as well as their loading. In addition, initial geometrical imperfections caused by the shape transformations should be examined and taken into account. A way of loading and adopting boundary conditions for the consecutive folds of a shell sheet are analysed. As a result of the above analyses, geometrical and computational models are created to present specific geometrical and mechanical properties of such transformed sheets. The models are employed by an innovative method created by the author of the present paper for shaping diversified free form shell roofs.



TRANSVERSE RESONANT VIBRATION OF NON-BEARING STRUCTURES CAUSED BY WIND

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ABSTRACT

Nowadays, there are increasing usage of very thin, subtle and light structures in the field of building constructions. We can find such a structures as part of roofs or facades. By using these lamella like, non-bearing structures as a part of architectural design of buildings, it is necessary to consider wind effects on these structures. Subtle structures of this type are prone to vibration in the transverse direction of the wind flow. The fact that the vibration occurs depends on wind parameters (wind velocity, direction of an air flow) and it also depends on the properties of lamella (shape, length, mass, natural frequency, support type). The principal idea of this article is to show susceptibility of lamellae like structures to transverse resonance vibration caused by the phenomenon called Von Karman effect. Comparison of susceptibility to transverse resonance vibration was analyzed on the different shapes of lamellas with usage of different wind parameters. Analysis was based on usage of empirically derived equations. Von Karman effect arise from wind flow past an object. Turbulence in the form of vortices are formed at the object and shed into the flowing stream intermittently. The potential problem is that this turbulence can induce vibrations into the lamella itself. In terms of this vibration problem, two frequencies are interesting. Von Karman shedding frequency is the frequency at which the vortices are formed and shed at the object. The vortex-shedding frequency increases with the velocity of the wind flow and decreases with the size of the object. Natural frequency of the object depends on the construction of the lamella itself. Parameters of lamella as a shape, mass, length, elasticity modulus of material and support type are directly involved in the calculation of own frequency. Worst case scenario in the term of transverse vibration occurs when the natural frequency of lamella is equal to the vortex-shedding frequency. In this case vibration rising and structure can be snapped or deformed permanently. In the long term vibration, fatigue stress can be significant. At the conclusion hazardous wind speed and recommendations for different shapes and parameters of lamellas are shown.



INFLUENCE OF THE WEIGHTING FUNCTIONS SELECTION ON VDV ANALYSIS

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ABSTRACT

Transport vibrations are the subject of many research, mostly their influence on structural elements of the building is investigated. However, nowadays, especially in the centers of large cities where apartments, residential buildings are closer to the transport vibration sources, an increasing attention is given to providing vibrational comfort to humans in buildings. Currently in most countries two main methods of evaluation are used: root mean squared method (RMS) and vibration dose value (VDV). In this article VDV method is presented and the analysis of the weighting functions selection on value of VDV is made. Measurements required for the analysis were made in Krakow, on masonry, residential, two storey building located in the city center. The building is subjected into two transport vibration sources: tram passages and vehicle passages on very close located road. Measurement points were located on the basement wall at ground level to control the excitation and in the middle of the floor on the highest storey (in the place where humans percept vibration). The room chosen for measurements is located closest to the transport excitation sources. During measurements 25 vibration events were recorded and analysed. VDV values were calculated for three different weighting functions according to standard: ISO 2631-1, ISO 2631-2 and BS-6841. Differences in VDV values are shown, but also influence of the weighting function selection on result of evaluation is also presented. VDV analysis was performed not only for the individual vibration event but also all day and night vibration exposure were calculated using formulas contained in the annex to the standard BS-6841. It is demonstrated that, although there are differences in the values of VDV, an influence on all day and night exposure is no longer so significant.



CONVERSION OF FRACTAL FIELDS INTO HETEROGENEITIES INSIDE SPH SIMULATIONS

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ABSTRACT

The inclusion of material heterogeneities in numerical simulations enables us to come close to the almost perfect description of the behaviour of structures. There are various ways and methods of introducing heterogeneity into a computational model. One of the methods is the creation of areas in which material properties differ. The shape of such areas is most frequently based on simple mathematical functions - trigonometric functions, for example. However, this destroys the ability of the model to represent reality, as the structure of a real material is not based on any mathematical function. The contribution therefore deals with the process of the creation of spatial fractal fields within which material properties would oscillate based on images of the real structure of materials. The previously mentioned areas of heterogeneities, where material quality can differ significantly, would be created in this way. If the Smoothed Particle Hydrodynamics (SPH) method is used, the quality of the process can be amplified via the suitable adaptation of weight coefficients. This can result in highly complex numerical models describing, for example, the behaviour of concrete, wood and other materials. Fractals do not have to be based just on one simple mathematical function. On the contrary, they can be based on more complex inputs, such as real images of materials. In the case of images of concrete, fields can be generated which correspond to the presence of an aggregate, a cement binder or an air void. Complex numerical simulations can be achieved simply by discretizing areas and using various material models. However, the level of complexity can be raised still further. The oscillation of material parameters can be included in the interface between two layers. The oscillation itself can fulfil the condition of any distribution function of random distribution. A consequence of the described process is thus a certain uncertainty in the behaviour of numerical models, e.g. concrete structures subjected to impact load. The contribution describes fundamental steps in the creation of fractals, or the creation of fields based on real images of a material. The conditions necessary for successful simulations if the SPH method is used are described. The contribution also deals with the creation of material parameter oscillations and their subsequent inclusion in the numerical code of the SPH method. The whole process is clearly demonstrated using a pressure test conducted on a cylindrical concrete specimens. The presented results show the consequences of the inclusion of material heterogeneity in numerical simulations. These include randomness in the failure type or differences in the stress-strain diagrams of the monitored specimens. The functionality of the proposed process is supported by the results.



STEEL FIBER REINFORCED CONCRETE SIMULATION WITH THE SPH METHOD

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ABSTRACT

Steel fiber reinforced concrete (SFRC) is very popular in many branches of civil engineering. Thanks to its increased ductility, it is able to resist various types of loading. There are many SFRC variants which differ in the shape of their fibers, their orientation in space or the load bearing capacity of the concrete itself. When designing a structure, the mechanical behaviour of SFRC can be described by currently available material models and therefore no problems arise with numerical simulations. The load bearing capacity of the fibers can be added, for example, to the load bearing capacity of the concrete in such a way that an equivalent material is created. This results in significant simplification, though at the cost of distorting reality. As a result, simplification in this way is not recommended in many cases. High speed loading can be taken as an example. At increased loading speeds, concrete has different properties than when under static loading. Steel fibers also behave in a different manner under the influence of high loading speed. Unfortunately, an equivalent material cannot be obtained by simply adding the resultant load-bearing capacities of the individual materials together. When concrete is combined with steel fibers, interaction occurs between them. This is a case in which it would be a mistake to create an equivalent material. Physical modelling of the concrete fibers used in concrete is usually problematic, though. It is necessary to consider the fact that mesh-based methods are very unsuitable for high-speed simulations with regard to the issues that occur due to the effect of excessive mesh deformation. So-called meshfree methods are much more suitable for this purpose. The Smoothed Particle Hydrodynamics (SPH) method is currently the best choice, thanks to its advantages. However, a numerical defect known as tensile instability may appear when the SPH method is used. It causes the development of numerical (false) cracks, making simulations of ductile types of failure significantly more difficult to perform. The contribution therefore deals with the description of a procedure for avoiding this defect and successfully simulating the behaviour of SFRC. The essence of the problem lies in the choice of coordinates and the description of the integration domain derived from them. Formulation of the task in spatial coordinates (Eulerian kernel) causes tensile instabilities. On the other hand, formulation of the task in the material coordinates (Lagrangian kernel) does not cause numerical cracks. The contribution describes the behaviour of both formulations. Conclusions are drawn from the fundamental tasks, and the contribution additionally demonstrates the functionality of SFRC simulations while complying with certain limitations. The random generation of steel fibers and their inclusion in simulations are also discussed. The functionality of the method is supported by the results of pressure test simulations which compare various levels of fiber reinforcement of SFRC specimens.



A TRADITIONAL EXPERIMENTAL STUDY ON HEADED STUDS IN STEEL PLATE-CONCRETE COMPOSITE STRUCTURES SUPPORTED BY DIGITAL IMAGE CORRELATION METHOD

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ABSTRACT

Steel plate-concrete composite structures are new innovative design concept in which a thin steel plate is attached to the reinforced concrete beam by means of welded headed studs. The comparison between experimental studies and theoretical analysis of this type of the structures had shown that their behaviour is dependent on the load-slip relationship of the shear connectors used to ensure connection between concrete and steel part of the structure. The aim of this paper is to describe an experimental study on headed studs used in steel plate-concrete composite structures. Push-out tests were carried out to investigate the behaviour of the shear connectors. Test specimens were prepared according to standard push-out tests, however, instead of I-beam, steel plate with a thickness of 16 mm was used to better reflect the conditions in a real structure. Test specimens were produced in two batches using concrete with significantly different compressive strength. The experimental study were carried out on 14 specimens. Besides the traditional measurements based on LVDT sensors, optical measurements based on the digital image correlation method (DIC) and pattern tracking methods were carried out. DIC is a full-field contactless optical method for measuring displacements in experimental testing, based on the correlation of the digital images taken during test execution. With respect to conventional methods, optical measurements offer wider scope of results and can give more information about material or construction behaviour during the test. The ultimate load capacity and load-slip curves obtained from the experiments were compared to values calculated based on Eurocodes, American and Chinese design specification. It was observed that the use of the relationships developed for the traditional steel-concrete composite structures were too conservative in terms of the ultimate load capacity.



TIME-DEPENDENT TOPOLOGY OF RAILWAY PRESTRESSED CONCRETE SLEEPERS

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ABSTRACT

Railway prestressed concrete sleepers (or railroad ties) must successfully perform two critical duties: first, to carry wheel loads from the rails to the ground; and second, to secure rail gauge for dynamic safe movements of trains. The second duty is often fouled by inappropriate design of the time-dependent behaviors due to their creep, shrinkage and elastic shortening responses of the materials. In addition, the concrete sleepers are often modified on construction sites to fit in other systems such as cables, signaling gears, drainage pipes, etc. This paper will highlight constitutive models of concrete materials within the railway sleepers under different environmental conditions over time. It will present a comparative investigation using a variety of methods to evaluate shortening effects in railway prestressed concrete sleepers. The outcome of this study will improve material design, which is very critical to the durability of railway track components.



IMPACT CAPACITY REDUCTION IN RAILWAY PRESTRESSED CONCRETE SLEEPERS WITH SURFACE ABRASIONS

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ABSTRACT

Railway sleepers (also called “railroad tie” in North America) embedded in ballasted railway tracks are a main part of railway track structures. Its important role is to transfer the loads evenly from the rails to a wider area of ballast bed and to secure rail gauge and enable safe passages of rolling stocks. By nature, railway infrastructure is nonlinear, evidenced by its behaviors, geometry and alignment, wheel-rail contact and operational parameters such as tractive efforts. Based on our critical review, the dynamic behavior of railway sleepers has not been fully investigated, especially when the sleepers are deteriorated by excessive wears. In fact, the ballast angularity causes differential abrasions on the soffit or bottom surface of sleepers (especially at railseat zone). Furthermore, in sharp curves and rapid gradient change, longitudinal and lateral dynamics of rails increase the likelihood of railseat abrasions in concrete sleepers due to the unbalanced loading conditions. This paper presents a structural capacity of concrete sleepers under dynamic transient loading. The modified compression field theory for ultimate strength design of concrete sleepers under impact loading will be highlighted in this study. The influences of surface abrasions, including surface abrasion and soffit abrasion, on the dynamic behaviors of prestressed concrete sleepers, are firstly highlighted. The outcome of this study will improve the rail maintenance and inspection criteria in order to establish appropriate and sensible remote track condition monitoring network in practice. Moreover, this study will also improve the understanding of the fundamental dynamic behavior of prestressed concrete sleepers with surface abrasions. The insight into these behaviors will not only improve safety and reliability of railway infrastructure but will enhance the structural safety of other concrete structures.



VIBRATION OF RAILWAY OHLE STRUCTURE IN 3D SPACE

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ABSTRACT

Nowadays, the electric train becomes one of the efficient railway systems that are lighter, cleaner, quieter, cheaper and faster than a conventional train. Overhead line equipment (OHLE), which supplies electric power to the trains, is designed on the principle of overhead wires placed over the railway track. The OHLE is supported by mast structure which located at the lineside along the track. Normally, mast structure is a steel column or truss structure which supports the overhead wire carrying the power. Due to the running train and severe periodic force, such as an earthquake, in surrounding area may cause damage to the OHLE structure especially mast structure which leads to the failure of the electrical system. The mast structure needs to be discussed in order to resist the random forces. Due to the vibration effect, the natural frequencies of the structure are necessary. This is because when the external applied force occurs within a range of frequency of the structure, resonance effect can be expected which lead to the large oscillations and deflections. The natural frequency of a system is dependent only on the stiffness of the structure and the mass which participates with the structure, including self-weight. The modal analysis is used in order to calculate the mode shapes and natural frequencies of the mast structure during free vibration. A mast structure with varying rotational soil stiffness is used to observe the influence of soil-structure action. It is common to use finite element analysis to perform a modal analysis. This paper presents the fundamental mode shapes, natural frequencies and crossing phenomena of three-dimensional mast structure considering soil-structure interaction. The sensitivity of mode shapes to the variation of soil-structure interaction is discussed. The outcome of this study will improve the understanding of the fundamental dynamic behavior of the mast structure which supports the OHLE. Moreover, this study will be a recommendation for the structural engineer to associate with the behavior of mast structure during vibration.



ROBUSTNESS ASSESSMENT TO PROGRESSIVE COLLAPSE OF RC FRAMED STRUCTURES

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ABSTRACT

The structural behaviour of buildings under overloading or extraordinary events like impacts, explosions or human errors is extensively admitted to be an influential feature of structural design. Structural robustness is a requirement provided by many current design codes. However, the problem is often recognized in a qualitative manner without referring to a specific process for the evaluation or the achievement of the robustness of constructions. In this paper, a novel procedure derived from dynamic and non-linear static analyses is provided for evaluating and comparing the relative robustness of RC frame buildings against progressive collapse. The developed methodology offers a formal way to compute “robustness curves” following the sudden loss of one or more vertical load carrying member/s. This method suggests a strategy for the definition of the robustness indices, which are applied to two RC frame buildings in an attempt to demonstrate the suitability of this procedure in comparing their structural robustness and resistance to progressive collapse. The first building was designed for gravity load and earthquake resistance in accordance with Eurocode 8 and the second was the same structure, modified according to the tie force (TF) method. The TF method is one of the major design quantitative procedures for enhancing resistance to progressive collapse and it is currently recommended by the codes of practice. In this method, the ties between the structural members must satisfy the strength requirements to ensure structural integrity, ductility and the capacity of load transfer to other parts of a structure. The results of this research may be immediately applied to evaluate the progressive collapse behaviour of RC buildings and provide an adequate tool that can be used for assessment purposes and risk management.



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INFLUENCE OF SURFACE ABRASION ON CREEP AND SHRINKAGE OF RAILWAY PRESTRESSED CONCRETE SLEEPERS

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ABSTRACT

Ballasted railway track is very suitable for heavy-rail networks because of its many superior advantages in design, construction, short- and long-term maintenance, sustainability, and life cycle cost. An important part of the railway track system, which distributes the wheel load to the formation, is the railway sleeper. Improved knowledge has raised concerns about design techniques for prestressed concrete (PC) sleepers. However, the ballast angularity causes differential abrasions on the soffit or bottom surface of sleepers. Furthermore, in sharp curves and rapid gradient change, longitudinal and lateral dynamics of rails increase the likelihood of abrasions in concrete sleepers. This paper presents a comparative investigation using a variety of methods to evaluate creep and shrinkage effects in railway prestressed concrete sleepers. The outcome of this study will improve material design, which is very critical to the durability of railway track components.



INFLUENCE OF LOADS THAT ARE NOT CONTEMPLATED IN THE STRUCTURE CALCULATION PROCESS

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ABSTRACT

. The approach to the calculation of the structure of a building, apart from the geometry and its peculiarities always in the first instance, the first approach is to analyze the state of loads, according to current legislation CTE, to which the building will be subjected and In their respective plants and areas, these loads are defined in any of the regulations in force at the moment in Spain and almost all the professionals of the sector known for their application. In addition to the loads described above, there are others that intervene in the building, although they are evident only during the execution phase of the building, those loads that are forgotten and not taken into account, nor even the existing mandatory regulations CTE, EHE-08, in that first approach of load state for the calculation of the structure of the building, , are there and have their direct consequences on the structure, ultimately on the useful life of the structure and the interaction with The rest of the elements that make up the building can cause instantaneous pathologies, medium and long term in the structures and consequently in the rest of the building with the effects derived from them. 1. Introduction The no observance of loads that you have the concrete structures in the construction process, can generate permanent deformations in the slabs of the structures that can not be corrected later and will have as a consequence the habitability of the stay in it that has been Produced that excessive deformation. The purpose of this investigation has been that the authorities that write the rules have to consider this phenomenon and impose the necessary measures so that it does not happen, the contribution that occurs to the scientific community is clear is the saving of later lawsuits Judicial proceedings with the economic costs entailed by claims to compensate the injured party.. 2. Results and discussions Calculation of the structure with the loads. The calculation of the structure has been carried out by adding the additional loads listed in Table 1, the calculation or checking has been done using the model spreadsheet programmed by the author, and based on the parameters of the current EHE-08 , With three calculation hypotheses ie at 15 days, 21 days and 28 days, after including the value of the additional charges no. represented the permitted legal deformation of 10 mm in continuous line. 3. Conclusions The conclusions reached after analyzing the results can be verified the increase of the active deformation that occurs when going from the status of charges situation 1, to situation 2, the increase that occurs becomes of Up to 16.46% of the initial value between the two situations.



GROUND REACTION FORCES GENERATED DURING RHYTHMICAL SQUATS AS A DYNAMIC LOAD OF STRUCTURES

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ABSTRACT

Dynamic forces generated by moving persons can lead to excessive vibration of the structures such as long span, slender and lightweight floors, stairs and footbridges. These dynamic forces (ground reaction forces) are generated during walking, running, jumping and rhythmical body swaying in vertical or horizontal direction. The mathematical models of the ground reaction forces (GRF) has a great practical importance in dynamic analyses of the structure. In the paper the mathematical model of the GRF generated during squats have been presented. The model was compared to GRF recorded during laboratory tests carried out by author using force platform. Moreover the result of implementations of the GRF model in dynamic analyses of the footbridges with reference to the results of the dynamic field tests of the sample footbridges have been shown. Characterised dynamic action in the form of squats can be classified as a dynamic vandal load of the structure. In dynamic analyses this action may be taken into account as an extreme load cases (exceptional load) to estimate the extreme dynamic response of the structure.



ASSESSMENT OF STEEL BEARING STRUCTURES - ESTIMATION OF THE REMAINING FATIGUE LIFE

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ABSTRACT

In many countries and regions, a significant number of steel bridges exist in operation worldwide. The budget is tight for new infrastructure building and, thus, the importance of inspection, maintenance and assessment of the existing bridges increases. A new fatigue assessment guideline for the estimation of the remaining fatigue life of steel bridges should be developed soon. This paper presents a (i) discussion based on state-of-the-art review and (ii) new possibilities of applications of probabilistic methods for the time dependent reliability assessment of lifetime of steel bridges. The probabilistic fatigue assessment procedure can be applied to existing steel bridges under many times repeated loading in general. The guideline concentrates on the existing traffic infrastructure made from old steel, because of the public importance. The essential general methods for these calculations are provided by structural and fracture mechanics and the reliability theory used in a probabilistic framework.



PREDICTION OF CRACKING INDUCED BY INDIRECT ACTIONS IN REINFORCED CONCRETE STRUCTURES

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ABSTRACT

Cracking of concrete plays a key role in reinforced concrete structures design, especially in serviceability conditions. A variety of reasons contribute to develop cracking and its presence in concrete structures has to be considered as quite unavoidable. Therefore, a good control of the phenomenon in order to provide durability is required. Cracking development is due to tensile stresses that arise in concrete structures as a result of the action of direct external loads or restrained endogenous deformations. This paper focuses on cracking induced by indirect actions. In fact, a low amount of literature regarding this particular phenomenon is present if compared with its high incidence in the constructional practice. As a consequence, the correct prediction of the crack opening, width and position when structures are subjected to imposed deformations, such as massive castings or other highly restrained structures, becomes a compelling task - not so much for the structural capacity, as for their durability. However, this is only partially addressed into commonly used design methods, which are usually intended for direct actions. A set of non-linear analysis on simple tie models is performed using the Finite Element Method in order to study the cracking process under imposed deformations. Different concrete grades have been considered and then analyzed. Finally, the results of this study have been compared with the provisions of the most common codes.



REVIEW OF ROBUSTNESS IN TIMBER BUILDINGS

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ABSTRACT

Timber buildings today aim for taller and larger dimensions to accommodate increased numbers of occupants. In tall buildings, more human lives are at risk if large portions of the structure collapse progressively during catastrophic failure events. To safeguard timber structures from disproportionate collapse due to localised failures, the aspect of robustness in particular needs to be considered. In the literature about building structures the term robustness seems to be contemplated in diverse ways. Several possible approaches to define and analyse this property can be found. However, certain consensus as to what characterises a robust structure seems to exist. A review of the concept of robustness for building structures in general and timber structures in specific is presented in this paper. Certain commonly applied terminology and definitions in the context of robustness are analysed. In the literature, risk-based, reliability-based and performance-based concepts for robustness appear to be established. The first two concepts are briefly summarised. The performance-based concept is treated in greater detail to highlight different procedures of deterministic robustness analyses. Common general characteristics of robust buildings which seem to be agreed upon are summarised. Robustness provisions for timber buildings in specific are described and compared to provisions in other building materials such as steel and concrete. The development of alternate load paths during local failure seems to play an essential role in preventing progressive collapse in buildings. The literature about robustness seems to be comprehensive concerning general considerations and concerning structures built in concrete or steel but appears to be rather limited in regards to timber structures. Evaluations of robustness in timber structures seem to be focused on risk-based and reliability-based concepts in literature.



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EXPERIMENTAL VERIFICATION OF SIMPLE EQUILIBRIUM MODELS OF MASONRY SHEAR WALLS

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ABSTRACT

This paper contains theoretical fundamentals of strut and tie models, used in unreinforced horizontal shear walls. Depending on support conditions and wall loading, we can distinguish models with discrete bars when point load is applied to the wall (type I model) or with continuous bars (type II model) when load is uniformly distributed at the wall boundary. The main part of this paper compares calculated results with the own tests on horizontal shear walls made of solid brick, silicate elements and autoclaved aerated concrete. The tests were performed in Poland. The model required some modifications due to specific load and static diagram.



IDENTIFICATION OF THE PARAMETERS OF MENETREY-WILLAM FAILURE SURFACE OF CALCIUM SILICATE UNITS

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ABSTRACT

The identification of parameters of Menetrey-Willamsurface made of concrete, masonry or autoclaved aerated concrete is not complicated. It is much more difficult to identify failure parameters of masonry units with cavities. This paper describes the concept of identifying the parameters of Menetrey-Willam failure surface (M-W-3) with reference to masonry units with vertical cavities. The M-W-3 surface is defined by uniaxial compressive strength f_c , uniaxial tensile strength f_t and eccentricity of elliptical function e . A test stand was built to identify surface parameters. It was used to test behaviour of masonry units under triaxial stress and conduct tests on whole masonry units in the uniaxial state. Results from tests on tens of silicate masonry units are presented in the Haigh-Westergaard (H-W) space. Statistical analyses were used to identify the shape of surface meridian, and then to determine eccentricity of the elliptical function.



INTEGRATION OF COMPOSITE STRUCTURES IN MODERN DAY ARCHITECTURE: CASE STUDY – CITY BUSINESS CENTRE, TIMIȘOARA, ROMANIA

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ABSTRACT

In current day structural design the use of composite steel-concrete structures has become the norm, because of the advantages that each of these materials has to offer. Composite structures also have the benefit of a faster execution at a lower cost, compared to traditional structures. While the arguments in favor of designing composite structures are well-known and appreciated by civil engineers, there remains a question of integrating these structures in modern-day urban landscapes. Eastern European countries are welcoming a blossoming of culture, arts, economy and industry, which unavoidably and necessarily will lead to a change in urban landscapes. With an increasing amount of foreign companies opening offices in these areas, the need for modern office solutions has arisen. The current paper presents a case study of an office building complex situated in the western part of Romania, in the city of Timisoara. The complex consists of 5 office buildings, all designed in composite steel-concrete structure, an underground parking lot, multiple terraces and adjacent promenade areas. Within the context of rapid growth and development of the city, the City Business Centre has offered high quality office spaces in the heart of the city, while considering the needs of the community. A very important aspect in the successful completion of the project was the efficient and professional collaboration between the separate project teams, between the owner, represented by the project management team, the architect, the structural designer and the building company, which will also be presented in the current paper. The successful joining of seismic structural solutions with modern architectural aesthetics has led to a dynamic, vibrant environment, making the City Business Centre the core of the region's business life, at the same time redefining Timisoara's architectural landscape. A testimony to the success of the project was the Civil Engineering Structural Designers Associations' (AICPS) 3rd Prize awarded for great performance and quality in structural design. The project was also awarded "Green Building of the Year" award by the Romanian Green Building Council and also the Office Development of the Year" in South-Eastern Europe awarded at the Real Estate Awards by an international jury of renowned real estate developers, consulting firms and investment banks. The project was also selected by the European Architects' Council to represent Romania in a Sustainable Architecture Exhibition at the European Parliament in Brussels.



EFFECT OF PARTIAL SHEAR INTERACTION IN STEEL CONCRETE COMPOSITE GIRDERS

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ABSTRACT

Steel concrete composite (SCC) structural system has been commonly used both in the buildings and in the bridges because of the advantages it associates when compared to its counterparts such as RC and steel structures. A typical SCC girder consists of a concrete element placed over a steel element. The effectiveness of this composite system is characterized by the type of connection that exists between the two connecting elements. More commonly shear stud connectors are used to connect the two elements. If the shear studs are infinitely rigid, then it brings about full composite action, on the contrary there is no composite action if the studs are not used, between the two connecting elements. It has been observed that generally the composite action exists somewhere between the full composite action and the no composite action, and is called the partial composite action or the partial interaction. More often the partial composite action is overlooked during the design of SCC girders, and the girder is designed assuming that there exists full composite action, because of the complexities in the analysis incorporating the partial composite action. This might lead to the serviceability issues in the SCC girders. Keeping this in mind the present work has been carried out to understand the significance of the partial interaction in SCC girders. In the present work, a comparative study has been made between the available analytical model and the numerical model. Numerical modeling is performed by using commercially available tool such as SAP2000. The main objective of this work is to bring out the relative significance of the partial interaction with respect to the full composite action, with the help of parametric study. Here, the parametric study has been carried by considering various design parameters, such as, span length, degree of shear connection, cross section geometry of steel girder and concrete slab. It is observed that there is significant increase in deformations of the SCC girder, on account of the partial interaction. It is also observed that there is an increase in internal moment and increase in stresses due to the slip. The results of the numerical model and the analytical model are in good agreement.



OPTIMIZATION-BASED INVERSE IDENTIFICATION OF THE PARAMETERS OF A CONCRETE CAP MATERIAL MODEL

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ABSTRACT

Issues concerning the advanced numerical analysis of concrete building structures in sophisticated computing systems currently require the involvement of nonlinear mechanics tools. The efforts to design safer, more durable and mainly more economically efficient concrete structures are supported via the use of advanced nonlinear concrete material models and the geometrically nonlinear approach. The application of nonlinear mechanics tools undoubtedly presents another step towards the approximation of the real behavior of concrete building structures within the framework of computer numerical simulations. However, the success rate of this application depends on having a perfect understanding of the behavior of the concrete material models used and having a perfect understanding of the used material model parameters meaning. The effective application of nonlinear concrete material models within computer simulations often becomes very problematic because these material models very often contain parameters (material constants) whose values are difficult to obtain. However, getting of the correct values of material parameters is very important to ensure proper function of a concrete material model used. Today, one possibility, which permits successful solution of the mentioned problem, is the use of optimization algorithms for the purpose of the optimization-based inverse material parameter identification. Parameter identification goes hand in hand with experimental investigation while it trying to find parameter values of the used material model so that the resulting data obtained from the computer simulation will best approximate the experimental data. This paper is focused on the optimization-based inverse identification of the parameters of a concrete cap material model which is known under the name the Continuous Surface Cap Model. Within this paper, material parameters of the model are identified on the basis of interaction between nonlinear computer simulations, gradient based and nature inspired optimization algorithms and experimental data, the latter of which take the form of a load-extension curve obtained from the evaluation of uniaxial tensile test results. The aim of this research was to obtain material model parameters corresponding to the quasi-static tensile loading which may be further used for the research involving dynamic and high-speed tensile loading. Based on the obtained results it can be concluded that the set goal has been reached.



STUDY ON IDENTIFICATION OF MATERIAL MODEL PARAMETERS FROM COMPACT TENSION TEST ON CONCRETE SPECIMENS

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ABSTRACT

Identification of a concrete material model parameters using optimization is based on a calculation of a difference between experimentally measured and numerically obtained data. Measure of the difference can be formulated via root mean squared error that is often used for determination of accuracy of a mathematical models in the field of meteorology or demography. The quality of the identified parameters is, however, determined not only by right choice of an objective function but also by the source experimental data. One of the possible way is to use load-displacement curves from three-point bending tests that were performed on concrete specimens. This option shows the significance of modulus of elasticity, tensile strength and specific fracture energy. Another possible option is to use experimental data from compact tension test. It is clear that the response in the second type of test is also dependent on the above mentioned material parameters. The question is whether the parameters identified within three-point bending test and within compact tension test will reach the same values. The presented article brings the numerical study of inverse identification of material model parameters from experimental data measured during compact tension tests. The article also presents utilization of the modified sensitivity analysis that calculates the sensitivity of the material model parameters for different parts of loading curve. The main goal of the article is to describe the process of inverse identification of parameters for plasticity-based material model of concrete and prepare data for future comparison with identified values of the material model parameters from different type of fracture tests.



STATIC AND DYNAMIC ANALYSIS IN DESIGN OF EXOSKELETON STRUCTURE

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ABSTRACT

An article presents static and dynamic analysis of a tall multipurpose building. The static analysis is focused on the analysis of the structure due to horizontal forces from the effect of wind and vertical forces of its own structural weight. The wind analysis is made due to all sides of the tall buildings, rotating the way of flowing by 90 degrees. As results, we get the maximal horizontal displacements of each model. When designing the high-rise building, it is always an important task to find the right proportion between the height of the building and its perceptive width from the various angles of street view. The perceptual width is dependent on the shape of floor plan and the whole shaping of the building's mass along its height. The article deals with static analysis of very slim high-rise building with effective arrangement of vertical communications and technological facilities and usable areas for functional use at the typical floor. The structure of the investigated building is composed of the reinforced core and the steel tube exoskeleton. The static analysis is focused on effects of lateral wind loads on the structural system. The result of the analysis is the displacement of the top slab of the building. Final displacements have to comply with the Limit Serviceability State. From the results it is possible to define, which model of designed tube exoskeleton is the most ideal from the viewpoint of resistance to all vertical and lateral loads. Particular models of the high-rise building were created by using spatial variant of FEM in program Scia Engineer. Eight models were created, which were different in exoskeleton design. The wind load was computed by wind 3D generator, a part of Scia Engineer program. The model structure has to be covered by surfaces that have been loaded by wind. Modelling variants of exoskeleton were differentiated by number of diagrid tubes and their dimensions. The results of wind static analysis are maximal horizontal displacements of buildings. Results are documented in tables and graphs according to the wind direction and particular displacements and rotations by X, Y and Z axis. Limit value of deformations must not exceed value $1/2000$ of building's height. The building was analyzed to Ultimate Limit State and Limit Serviceability State. The first and the last model are rated due to seismic load. We obtained the proper design of building by gradual sequential modeling. This design is proper from the viewpoint of maximal deformations.



IMPACT OF HIGH TEMPERATURE CREEP ON THE BUCKLING OF AXIALLY COMPRESSED STEEL MEMBERS

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ABSTRACT

The paper presents results of the laboratory tests of the impact of creep on the buckling of axially compressed steel members at elevated temperatures. Tests were conducted on samples prepared of normal steel strength (S235JR) and high steel strength (S355J2). Samples were made in the form of a prismatic bar of a rectangular cross section 12 x 30 mm and a length of 500 mm. Support type of the specimens during tests was hinged on both ends. The tests were done at 600, 700 and 800°C. Experiments were carried out at static loads corresponding to values $0,8N_{cr,T}$, $0,9N_{cr,T}$, $1,0N_{gr,T}$, where $N_{cr,T}$ was theoretical value of Euler's critical load at given temperature. Short-term creep analyses were performed in the universal testing machine Instron/Satec KN 600 equipped with a furnace for high-temperature testing type SF-16 2230 that enables testing at temperatures up to 1200 oC. Temperature of the sample placed inside the furnace was verified and recorded with use of the compactRIO cRIO-9076 controller, equipped with a module for the connection of NI 9211 and K-type thermocouples. The system for the measurement and recording of the temperature of the analysed samples operated in the LabVIEW software environment. To measure lateral and longitudinal displacements LVTD Solatron ACR 100 displacement transducer was used. During the tests, the samples were heated to the given temperature (600, 700 or 800°C) and then subjected to a constant compressive load. During each test, for each sample following data was registered: the temperature on the surface of samples, longitudinal and lateral displacements in the middle of the sample. Basing on the conducted tests it was noted, for both analysed steel types, at the temperature of 800°C, growth of lateral displacements due to creep was very rapid, and tested elements lose bearing capacity over the period of tens to hundreds of seconds, depending on strain level and the grade of the steel. At a temperature of 700°C growth of lateral displacements was much slower and the total loss of the bearing capacity of tested samples has occurred after 2 to 5 hours. At the temperature of 600°C samples did not show significant increments of lateral displacements at the test duration more than 6 hours, while maintaining throughout the test rectilinear form.



NONLINEAR THERMO-MECHANICAL ANALYSIS OF STEEL-CONCRETE COMPOSITE STRUCTURES

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ABSTRACT

Performance-based fire safety design of composite structures hinges on availability of fast and accurate, in-office numerical tools for assessing nonlinear response of structures. Composite elements represent a versatile solution in modern design solutions, although structural integrity may be severely affected by fire actions. Recent advances were made towards performance based fire resistance design but the complexity of the phenomenon and the huge demand of computing power make this methods hard to be used in current practice and forcing engineers to resort on the use of simplified methods and prescriptions. This paper presents a simple but not simplistic, fast and accurate method that provides access to sectional moment-curvature interaction diagrams in different fire scenarios. A finite element computer program guides the assessment of sectional response for steel concrete composite elements in respect with thermal and mechanical loading. Physical and mechanical properties of both steel and concrete are severely affected by rising temperatures, therefore the first step in the conducted analysis is accurately evaluating the temperature field in the section. A nonlinear transient thermal analysis is carried out using changes to the physical properties of materials as suggested in European design standards and some trending current scientific papers. Correlating thermal fields with adjusted material properties, the interaction diagrams and moment capacity contours are obtained using an incremental-iterative procedure based on the arc-length constraint equation. A high rate of convergence is ensured, for any loading case, even if it is pure compression or tension, by adopting a tangent stiffness strategy in solving the nonlinear equilibrium equation systems. Total strain distribution is governed by 2 distinct elements - mechanical induced strains and thermal induced strains, for both steel and concrete. Material stress-strain constitutive laws at ambient temperature will be modified according to each heating phase in connection to design codes prescriptions. The authors will provide a comparison of this prescriptions and some relevant material models provided in literature. In order to prove the program's accuracy and efficiency its results were permanently compared to several representative examples of experimental and numerically tested elements subjected to mechanical and thermal loading. Further work is expected on assessing element and structure response of steel concrete composite buildings subjected to thermal and mechanical loading.



NUMERICAL MODELING OF CONNECTIONS BETWEEN STONES IN HISTORICAL BUILDING FOUNDATIONS

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ABSTRACT

Proper assessment of the behavior of the historical building foundations is extremely complicated or even impossible. This is due to the lack of adequate design documentation, absence of information about loads and other phenomena occurring over the years, as well as degradation of the materials (wood, mortar). Progress in the field of materials caused replacement of weak mortars by materials of significantly improved properties. However, nowadays many historical objects are supported by foundations made in times when mechanical properties were much worse than the materials currently known. This problem is difficult due to the fact, that objects representing cultural heritage are protected against external interference and strengthening works on such foundations are limited. The aim of this paper is to analyze the behavior of old building foundations composed of stones (the main load-bearing elements) and mortar based on numerical analysis. Some basic aspects of historical foundation are briefly discussed, with an emphasis on its development, techniques, and material. The behavior of the foundation subjected to the loads transmitted from the upper parts of the object is described using finite element method (FEM). Main problems of analysis of the foundations of historical buildings are determinations of characteristics of the materials and the degree of degradation of mortar, which is the weakest part of the foundation. Mortar was described by the damaged-plastic model. In this model exceeding the bearing capacity occurs due to the degradation of materials. The damaged-plastic model is the most accurate model describing the work and properties of mortar because it shows exactly what happens with material throughout its completely load history. For a uniformly loaded fragment of the foundation, both stresses and strains were analyzed. The results of the analysis presented in this paper give a contribution to the further research in field of understanding a behavior and modeling historical building foundations.



EXPERIMENTAL VERIFICATION OF THE STRUCTURAL GLASS BEAM-COLUMNS STRENGTH

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ABSTRACT

This paper deals with experimental research of axially and laterally loaded members made of structural (laminated) glass. The purpose of the research is the evaluation of buckling strength and actual behaviour of the beam-columns due to absence of standards for design of glass load-bearing structures. The experimental research follows the previous one focusing on measuring of initial geometrical imperfections of glass members, testing of glass beams and columns. Within the frame of the research 9 specimens were tested. All of them were of the same geometry (length 2000 mm, width 200 mm and thickness 16 mm) but different composition - laminated double glass made of annealed glass or fully tempered glass panes bonded together by PVB or EVASAFE foil. Specimens were at first loaded by axial force and then by constantly increasing bending moment up to failure. During testing lateral deflections, vertical deflection and normal stresses at midspan were measured. A maximum load achieved during testing has been adopted as flexural-lateral-torsional buckling strength. The results of experiments were statistically evaluated according to the European standard for design of structures EN 1990, appendix D. There are significant differences between specimens made of annealed glass or fully tempered glass. Differences between specimens loaded by axial forces 1 kN and 2 kN are negligible. The next step was to determine the design strength by calculation procedure based on buckling curves approach intended for design of steel columns and develop interaction criterion for glass beams-columns



ON THE PROBLEM OF TORSIONAL RESTRAINT OF STEEL COLD-FORMED BEAMS PROVIDED BY PLANAR MEMBERS

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ABSTRACT

The effect of continuous or discrete lateral and torsional restraints of metal thin-walled members along their spans can positively influence their buckling resistance and thus contribute to more economical structural design. The prevention of displacement and rotation of the cross-section results in stabilization of the member. The restraints can practically be provided e.g. by planar members of cladding supported by metal members (purlins, girts). The rate of stabilization of a member can be quantified using values of shear and rotational stiffness provided by the adjacent planar members. While the lateral restraint effected by certain shear stiffness can be often considered as sufficient, the complete torsional restraint can be safely considered in some practical cases only. Otherwise the values of the appropriate rotational stiffness provided by adjacent planar members may not be satisfactory to ensure full torsional restraint and only incomplete restraint is available. Its verification should be performed using theoretical and experimental analyses. The paper focuses on problem of steel thin-walled cold-formed beams stabilized by planar members and investigates the effect of the magnitude of the rotational stiffness provided by the planar members on the resistance of the steel members. Cold-formed steel beams supporting planar members of cladding are considered. Full lateral restraint and incomplete torsional restraint are assumed. Numerical analyses performed using a finite element method software indicate considerable influence of the torsional restraint on the buckling resistance of a steel thin-walled member. Utilization of the torsional restraint in the frame of sizing of a stabilized beam can result in more efficient structural design. The paper quantifies this effect for some selected cases and summarizes substantial results of numerical analysis.



ROBUSTNESS OF STEEL STRUCTURES CONSIDERING DYNAMIC EFFECTS - PART 1: BACKGROUND AND DESIGN PRINCIPLES

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ABSTRACT

Structural design was in older times, to a large extent, based upon empiricism. Not infrequently the experimental evidence was gained from building failures. The use of new methods of construction, new types of structural elements and new building materials will always increase the risk of unforeseen weaknesses in a construction. The collapse at Ronan Point, London, in 1968, was such a building failure from which the susceptibility of certain constructions to progressive collapse following local damage was better understood. The realization of and measures against such “chain failures” are important to consider, to ensure robustness of the structure. It is now a commonly accepted philosophy to prevent a region of local damage from spreading thereby causing a large-scale collapse of the structure. Most research work is related to large concrete panel structures, but several building failures have been reported where the structural systems were made up of steel, timber or masonry. It is commonly agreed on that the problem of progressive collapse is of a general nature and should be taken into account in all types of buildings regardless of material, type of structure, and construction used. Principles for design in order to preclude progressive collapse have consequently been proposed in most countries. These design rules are often based upon static considerations. However, local damage often arises during a very short period of time, which causes dynamic effects in the structure. Thus, it is of basic interest to evaluate the influence of dynamic conditions on the capability of a structure to withstand a progressive collapse. The susceptibility of steel structures to progressive failure has nowadays been studied to some extent, but when the author started his first studies on robustness of steel structures many years ago, he was one of the first, especially to include dynamic effects. In the main research program, the fundamental behaviour and the capacity of steel structures subjected to loss of interior load-bearing elements are studied. The ultimate load-bearing and deformation capacity of certain beam-to-column connections and the dynamic fail-safe behaviour of corresponding frame steel structures are investigated in detail. In this paper, a number of different geometrical models of steel structures in the area of primary damage are analysed. Both bending and catenary action of the models are treated and the strength properties of both members and connections are considered. Two types of connections are investigated, viz. the “bolted heel connection” and the bolted end-plate connection. A rigid-body method of analysis is used to analyse the dynamic response of these structural system models. An introduction of the research work conducted on robustness of steel structures considering dynamic effects is given including a background and the design principles for the prevention of progressive collapse or ensuring robustness of the structure. The applicability and accuracy of the rigid-body method are evaluated in the companion papers 2a and 2b. This part 1 comprises discussion on approaches in the analysis of fail-safe behaviour, concepts and design principles, basic dynamic effects, analysis models and evaluation of the static capacities for the simple analysis models as reference cases.



**ROBUSTNESS OF STEEL STRUCTURES CONSIDERING DYNAMIC EFFECTS - PART 2A:
COMPARISONS OF DYNAMIC ANALYSIS MODELS USING A RIGOROUS METHOD AS REFERENCE**

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ABSTRACT

The main research program is focused on the fundamental behaviour and the capacity of steel structures subjected to loss of interior load-bearing elements are studied. Primarily framed steel structures with different beam-to-column connections are studied. The ultimate load-bearing and deformation capacity of those beam-to-column connections and the dynamic response of models of those frame steel structures subjected sudden loss of interior support are investigated in detail. To analyse the dynamic response, a rigid-body method of analysis will be applied. Since bending and catenary action of the models will be treated and the strength properties of both members and connections including plastic and strain-hardening effects will be considered, there is a need of a simple analysis method as a rigid-body model if practical hand calculations are desirable.

The applicability and accuracy of the dynamic rigid-body method then need to be evaluated. In this paper 2a and the companion paper 2b, the accuracy of the rigid-body method is determined by comparison with a rigorous elastoplastic vibration theory and an equivalent mass-spring method. The rigorous method refers to application of the Euler-Bernoulli theory of elastic beam vibrations extended to elastoplastic conditions. The equivalent method implies a transformation of the real system to an equivalent one-degree of freedom system under consideration of certain physical conditions. The rigid-body method implies an approximation of the actual flexural beam to rigid segments connected by rotational springs - all the strain in the beam being concentrated to these springs. An elastoplastic theory for dynamic loading using modal technique has been proposed by Bleich & Salvadori (1955). The basic ideas are that the beam behaves elastically until the first plastic hinge is formed (the elastic phase) and after that the beam still behaves elastically except for the plastic hinge where constant plastic moment prevails (the plastic phase). This theory is used here, but is formed more strictly and definite. Especially, the proper treatment of the matching conditions at the hinges is described and a method of obtaining the moment and shear force distributions at and near the hinges is indicated. Only the simply supported beam under plastic bending and after a momentary loss of an intermediate support, will be analysed representing one of the structural models discussed in part 1. This case represents an extreme case as far as the applicability of the rigid-body model is concerned. The other cases discussed in part 1, which include catenary action and/or framed structural systems having "inherent hinges", i.e. some kind of beam-to-column connections, will give more accurate results than what is obtained in parts 2a and 2b. The deflection obtained by the three methods will be compared and hence the accuracy of the rigid-body method can be evaluated. This part 2a comprises analysis of a simply supported two-span beam due to sudden support loss by using a rigorous continuous medium method, which is capable of analysing elastoplastic vibrations in the ultimate or rather the fail-safe limit state. This rigorous method is used as a reference for comparison reasons when evaluating the accuracy of the simplified methods discussed in part 2b.



**ROBUSTNESS OF STEEL STRUCTURES CONSIDERING DYNAMIC EFFECTS - PART 2B:
COMPARISONS OF DYNAMIC ANALYSIS MODELS USING SIMPLIFIED METHODS**

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ABSTRACT

This paper part 2b, dealing with the applicability and accuracy of the simple hand calculation method, the rigid-body model, is a companion to and a continuation of paper 2a, dealing with a reference method, the rigorous elastoplastic vibration theory. A simply supported beam under plastic bending after a sudden support loss is considered. Two simplified models are discussed, the equivalent model and the rigid-body model. The equivalent model of analysis is based on the principles of the one-degree of freedom method, but somewhat modified in the present analysis in order to have a straight-forward analogy with the rigid-body model. The beam is divided into two rigid beam segments of equal length, but transformation factors for the elastic curve are used. All the strain energy in the beam is stored in the rotational spring with the spring constant, which connects the rigid beam halves. The spring constant is determined for the statically equivalent system and then transformed (together with certain other quantities) into the dynamically equivalent system. The systems are statically equivalent if the static deformation of the equivalent model is equal to the deformation of a significant point in the real beam, here the mid-section is used. The rigid-body model of analysis is conform to the statically equivalent model. Thus, the spring constant is the same as for the equivalent system in the elastic phase, and in the plastic phase the moment at the mid-section is equal to the plastic capacity. In the rigid-body model the deformation mode in the elastic phase is approximated by two straight lines as in the plastic phase. If comparison is made with the equivalent model, this means that the transformation factors are equal to unity also in the elastic phase. The maximum deflections according to the rigorous, equivalent and rigid-body methods are compared. The percentage of errors in the maximum deflection for the equivalent analyses and the rigid-body analysis compared to the rigorous analysis, taking the initial deflection configuration into account. It is found that a refined version of the equivalent analysis is more accurate than the rigid-body analysis. However, it is also found that the rigid-body analysis is more accurate than the conventional equivalent analysis. The conventional equivalent analysis is regarded as sufficiently accurate for practical design purposes according to Norris et al (1959) and Biggs (1964). The refined equivalent analysis has the advantage of overestimating the maximum deflection while the rigid-body analysis has the disadvantage of underestimating it. This part 2b comprises of the analysis of a simply supported two-span beam concerning its response when there is a loss of a support by using the equivalent and the rigid-body models and where the results are compared to the results of the rigorous method, used as a reference, as discussed in part 2a.



POST-TENSIONED CONCRETE LONG-SPAN SLABS IN PROJECTS OF MODERN BUILDINGS CONSTRUCTION

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ABSTRACT

Nowadays, design of modern architectural building structures requires the use of slender and free from numerous supports slabs. The most suitable solution for above requirements are the post-tensioned slabs with unbonded tendons. Slabs prestressed by unbonded tendons are successfully used worldwide for several decades. During that time many recommendations dealing with the forming of geometry, selection of prestressing, dimensioning and erection technology were issued. Recommendations dealing with slab thickness and geometry were prepared based on numerical simulations performed. However, these recommendations are limited to slab spans within the range of 13-14 m. Thus, the longest recommended prestressed slab spans are limited to 14 m. Due to that, one will hardly find in the technical literature reports of erection or research analyses for longer span slabs. During the recent years prestressed slabs characterized by span and slenderness substantially exceeding these limitations were designed and erected in Poland. Generally, the highest span to depth ratios do not exceed the value of 45. The allowed recommended span lengths for continuous slabs are equal to 13.6 m for bidirectional slabs and to 12.5 m for unidirectional slabs, while the authors designed and were erected the slabs with the thickness equal to 35 cm and the span equal to 17,6m . In Poland were erected another slabs with lower span but highly exceeding recommended span to depth ratios. The authors managed to obtain the maximum span to depth ratios equal to 55,5. The obtained value was received for one-way and single-span slab. Moreover, in Poland was designed the slab with span exceeding 21 m and actually this project is waiting for realization. Due to the prototypical character of the structural solutions applied, permanent structural monitoring is applied during the erection and in use. The strains in concrete, slab deflections and forces in tendons are measured and recorded. In this paper, the examples of oversized slabs will be presented together with the obtained results of deflection, measured during the first two years of their usage and another projects prepared based on achieved results from successful realizations.



ELASTIC LATERAL TORSIONAL BUCKLING BEHAVIOUR OF SIMPLY SUPPORTED BEAM UNDER LINEAR MOMENT GRADIENT

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ABSTRACT

In the design of structural steel members under flexure, local buckling potential and the post buckling resistance of the cross-section elements, the yield and/or rupture strength of cross-section elements are substantial factors for the design engineer. Lateral torsional buckling effect is encountered as one of the most significant structural stability problems especially for I-shaped steel members. When these steel members are subjected to flexure about their strong axis and they are not accurately braced so as to prevent lateral deformations and torsion, it may be under risk of failure because of the lateral torsional buckling prior to reach its ultimate load carrying capacity. Even though lateral torsional buckling is a key issue in structural steel design, the analytical studies for determining lateral torsional buckling strength are complex and closed form solutions exist only for the simplest cases. Therefore, several design standards and codes offer methodologies in order to calculate lateral torsional buckling behaviour of the steel members. In this study, elastic lateral torsional buckling behaviors of I-shaped simply supported steel beams with linear moment gradient and under vertical loading are investigated. For achieving a comprehensive study, different unbraced length conditions are also taken into account in the analysis. Lateral torsional buckling analyses are performed with using several design standards and codes, approaches from the literature and finite element analysis. Results of the analysis are evaluated using moment ratios of beam members and their critical elastic moment capacities. Analysis results show that lateral torsional buckling is a crucial stability problem for I-shaped simply supported steel members and it directly affects ultimate load carrying capacity. Besides, lateral torsional buckling is reflected reasonably well in all standards and design codes that are considered in the present study regarding the finite element analysis results. Moreover, in order to improve the accuracy of determining the elastic critical moment capacity, moment gradient factors are investigated and outcomes are compared with finite element solutions. Consequently, analysis results of the study revealed that unbraced member length is a major factor for determining critical elastic moment capacity of the beam member.



PREFABRICATED RM FAÇADE PANELS - THE SEARCH FOR SAFE SOLUTION

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ABSTRACT

Nowadays it is popular and common to make the external layer of a triple-layer enclosure masonry wall using clinker bricks. Clinker layer, except for its aesthetic value, in case of using solid or vertically perforated bricks is characterized by high durability and resistance against any environmental impacts. This type of elements is used in a new way with an openwork pattern that creates dappled light inside; at night, when the lights are on inside, the building seen from the street looks like a glowing lattice lantern. The present article described the problem and its solution, which appeared during the design works on the untypical masonry openwork of the front elevation of the academic building in Poland. The original solution of masonry external façade was too risky and practically impossible for realization from the workmanship point of view. For this reason authors were proposed to make this elevation wall as prefabricated construction consisted of medium scale prefabricated elevation panels made of openwork clinker units and masonry joints with reinforcement. Two solutions of prefabricated panels were elaborated: first, proposed by the design office and second one, significantly modified, proposed by the authors. The performed experimental research included two series of prefabricated elements: two panels according to the first solution (proposed by the design office) and three panels of the authors' modified concept. Special test stand was designed and constructed to reflect the real location of the panels on the elevation of the building. The specimens were subjected to out-of-plane bending, realised in static and cyclic way (depending on the testing series). During the tests applied force and displacement perpendicular to the specimen surface (using LVDT ganges) were recorded. The analysis of panels' behaviour included: cracking state (cracking bending moment, deflection at cracking), failure of tested panels and load-deflection relationship. Modern masonry buildings, in relation to the material and structural as well as architectonical solutions sometimes require an individual and unconventional approach, often exceeding the typical standards' cases. Such an approach to the problem was taken to analyse the safety of the new and untypical front elevation. Original research program, included two types of prefabricated panels, was conducted and elaborated. The results have shown the lack of safety, manifested by uncontrolled disintegration of the panels from the first test series, included the elements proposed by the design office. The second type of tested elements – modified by author concept panels, forming a steel spatial structure – turned out to be extremely safe (even in case of cyclic loading) and was characterized by high durability and easy montage.



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THE TYPE OF MATERIAL IN THE PIPES OVERHEAD POWER LINES IMPACT ON THE DISTRIBUTION OF INTERNAL FORCES IN THE SUPPORTED STRUCTURES

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ABSTRACT

The article presents the type of material from which conductors of overhead power lines are produced impact on the distribution of internal forces in the supporting structures. The aim of the calculations was to present the benefits in terms of pipe's mechanic and his column supporting, arising from the cable's type. The analysis was performed for two types of cables: aluminum with steel core and aluminum with composite core, twice span power line section, focusing on the strong central pillar. The force rods in the truss structure by a static analysis theory by one row was obtained using the linear-elastic material model. The loads were collected in accordance with applicable Eurocode.



THE RELIABILITY ASSESSMENT OF STEEL LATTICE TOWER

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ABSTRACT

In the subject of the present study a probabilistic approach to the problems of dynamic analysis of steel lattice tower was used. Structural design parameters are defined as the deterministic values and random variables. Random variables are not correlated. The dynamic analysis of the structure involves taking account the load of wind gusts as extortion harmonic force. The criterion for structural failure is expressed the limits of functions referring to the serviceability limit state. The description of the limit state of structure implicit forms of the random variables function was used. The study presents a combination of the reliability analysis program with the MES3D external FEM program. The NUMPRESS software [<http://numpress.ippt.gov.pl>], created at the IPPT PAN, was used in the reliability analysis. The Hasofer-Lind reliability index, determined using an iterative procedure of Rackwitz-Fiessler [Nowak and Collins, 2000], was used as a reliability measure. The values of reliability index for different cases of the vector of random variables, that is, different descriptions of mathematical model of the structure, were determined. The effect of assumed probability distribution of individual random variables on the value of the reliability index was determined. In the description of random variables the different types of probability distribution were used and the values of the reliability index for the normal distribution and the distribution chosen according to the kind of a variable were compared. The primary re-search method is the FORM method. In order to verify the correctness of the calculation Monte Carlo and Importance Sampling methods are used. The relative error of the reliability index was calculated taking the simulation Monte Carlo method as a reference. The effectiveness of the primary research method was performed by comparing the number of calls of the limit state, which is connected with the calculation time. The sensitivity of reliability index to the random variables was defined.



TECHNICAL – ECONOMIC RESEARCH FOR PASSIVE BUILDINGS

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ABSTRACT

A newly constructed passive house must save 80 % of heat resources; otherwise it is not a passive house. The heating energy demand of a passive building is less than 15 kWh/m² per year. However, a passive house is something more than just an energy-saving house. This concept involves sustainable, high-quality, valuable, healthy and durable construction. Features of a passive house: high insulation of envelope components, high-quality windows, good tightness of the building, regenerative ventilation system and elimination of thermal bridges. The Energy Performance of Buildings Directive (EPBD) 61 requires all new public buildings to become near-zero energy buildings by 2019 and will be extended to all new buildings by 2021. This concept involves sustainable, high-quality, valuable, healthy and durable construction. Foundation, walls and roofs are the most essential elements of a house. The type of foundation for a private house is selected considering many factors. The article examines technological and structural solutions for passive buildings foundation, walls and roofs. The technical-economic comparison of the main structures of a passive house revealed that it is cheaper to install an adequately designed concrete slab foundation than to build strip or pile foundation and the floor separately. Timber stud walls are the cheapest wall option for a passive house and 45-51% cheaper compared to other options. The comparison of roofs and ceilings showed that insulation of the ceiling is 25% more efficient than insulation of the roof. The comparison of the main envelope elements efficiency by multiple-criteria evaluation methods showed that it is economically feasible to install concrete slab on ground foundation, stud walls with sheet cladding and a pitched roof with insulated ceiling.



REPAIR AND PROTECTION OF SMALL RAILWAY VIADUCT WITH JAMMED SPAN AT THE MINING INFLUENCE

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ABSTRACT

This paper is about the maintenance of bridge objects on mining areas. Based on several years' of observation is shown as functional parameters and a technical condition was deteriorated. As a result of the mining area deformation appeared among others following damages: block of bearings, jam of span, cracks on the bridgehead. The article describes series of clever ad hoc measures (such as the restoration of freedom of displacements on non-standard tangent bearings) which enabled the exploitation of the viaduct without interruptions of railway communication. The region of the bridge is planned to further mining activities, which prejudged, that a repair of the viaduct is necessary to realization. The article discusses the forecasted mining area deformation and analyzes their influence on the bridge structure. The mining map and the example of determination of kinematic freedom bearings find in the full text of the article. Repair of the viaduct is a comprehensive example of the mining facility protection with the restoration of the expansion joint, bearing replacement, widening benches under bearings, stitching cracks and strengthening bridgeheads, recreating the isolation and the drainage system damaged by mining influences, performances strut in the foundation level. An important element in determining the durability of repair is the selection of appropriate materials and repair technology, which is analyzed in the full text article. For example, cracks in order to eliminate the leaks have been completed elastic gelling (expansive) mass and not bonded with epoxy resin as the load carrying capacity of concrete was poor (concrete class C12 / 15) and it was not possible to obtain durability of the "glued" connections. Shell made of steel net and concrete overhead performed under pressure strengthen bridgeheads and fulfil slight scratches. All of these tasks completed in less than four months. Article illustrates the photo documentation made before and after repairs and technical drawings that show the range of the repairs.



CONTROL METHOD STRETCHES SUSPENSIONS BY MEASURING THE SAG OF STRANDS IN CABLE-STAYED BRIDGES

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ABSTRACT

The method that allows on evaluation and validation of measurement correctness of dynamometers (strain gauges, tension meters) used in systems of suspensions is described in the article. Control of monitoring devices such as dynamometers is recommended in inspections of suspension bridges. Control device (dynamometer) works with an anchor, and the degree of this cooperation could have a decisive impact on the correctness of the results. Method, which determines the stress in the strand (cable), depending on the sag of stayed cable, is described. This method can be used to control the accuracy of measuring devices directly on the bridge. By measuring the strand sag it is possible to obtain information about the strength (force) which occurred in the suspension cable. Digital camera is used for the measurement of cable sag. Displacements of other structural elements do not affect the results, therefore, are not recorded. It is convenient to measure the sag at a fixed point marked on the strand by marker. It is necessary to measure the distance of the marker from the cable anchorage. Changes of marker position we can measure using a digital camera locates in one point outside of the object (to eliminate vibration of bridge). Vibration strands can be filtered out. Tilts of the vibrating strands are symmetrical. Location chord of strand is not the same in space and time as a result of deflection of the pylon and the bridge span, changing the positions of the attachment points of cables. The reference point can be virtual chord applies during computer processing on the image captured on camera. A control measurement should be made independently from the controlled parameter but should verify this parameter directly (it is the best situation). In many cases in practice the parameter is not designation by direct measurement, but the calculations, i.e. relation measured others parameters, as in the method described in the article. In such cases occurred the problem of overlapping error of measurement of intermediate parameters (data) and the evaluation of the reliability of the results. Function of the control calculations made in relation to installed in the bridge measuring devices is doubtful without procedure of estimation uncertainty. Such an assessment of the accuracy can be performed using the interval numbers. With the interval numbers are possible the analysis of parametric relationship accuracy of the designation of the individual parameters and uncertainty of results. Method of measurements, relations and analytical formulas, and numerical example can be found in the full text of the article.



IMPROVING THERMAL INSULATION PROPERTIES FOR PREFABRICATED WALL COMPONENTS MADE OF LIGHTWEIGHT AGGREGATE CONCRETE WITH OPEN STRUCTURE

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ABSTRACT

Porous concrete is commonly used in civil engineering due to its good thermal insulation properties in comparison to normal concrete and high compression strength in comparison with other building materials. Reducing of the concrete density can be obviously obtained by using light aggregate (e.g. pumice). The concrete weight can be further minimized by using specially graded coarse aggregate, cement, water and little-to-no fine aggregates. In this way a large number of air voids arise. The aggregate particles are coated by a cement paste and bonded together with it just in contact points. Such an extremely porous concrete is used in a German plant "Thermodur" in the city of Neuwied to produce prefabricated wall elements used mainly for hall buildings, e.g. supermarkets. The need of improving thermal insulation properties was an inspiration for the "Thermodur" managers, engineers and a scientific staff of the Technical University of Kaiserslautern / Germany to realise an interesting project. Its aim was to reduce the heat transfer coefficient for the wall elements. Three different wall structure types were designed and compared in full-scale laboratory tests with originally produced wall elements in terms of load-carrying capacity and stiffness. The load was applied perpendicularly to the wall plane. As the elements are originally not load-bearing and are used for curtain walls only, the wind load is the main load for them. The wall elements were tested in horizontal position and the load was applied vertically. Totally twelve wall elements 8.00 x 2.00 x 0.25m (three for every series) were produced in the "Thermodur" plant and tested in the University of Kaiserslautern laboratory. The designed and tested elements differed from each other in amount of expanded polystyrene (EPS), which was placed in the plant inside the wall structure. The minimal amount of it was designed in original wall element. Besides, two improved types of prefabricated wall had built-in steel trusses. The failure mode was the same for all the tested elements. Diagonal cracks occurred on the sides of each element due to their insufficient shear-force-capacity. The span deflection was measured during all the tests by means of LVDTs. Strains in reinforcement were measured by means of strain gauges preinstalled on the bars and on the steel trusses. Load-carrying capacities obtained in the tests were for all wall structure types similar and much higher (many times) than internal forces (i.e. bending moments and shear forces) calculated for a wind load assumed according to the German codes. An increased amount of EPS (up to 30 per cent in volume) did not influence significantly the wall structural strength. Use of the steel trusses integrated with the wall structure caused a visible increase of wall stiffness. The midspan deflections measured at the same load level were reduced by 13 per cent. However, the use of the steel trusses caused some technological problems and led to a quality loss of the produced elements. The future use of the trusses would require a change in the production process. It would have to be longer.



INFLUENCE OF DIFFERENT STRUCTURAL SOLUTIONS FOR DYNAMIC RESPONSE OF THE MODERNIZED BUILDING

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ABSTRACT

During modernization of the building where comfort threshold of people staying inside is exceeded we should solve the problem comprehensively. Implemented solution which fulfilled expectations of the designer is not always correct in the other (apparently similar) conditions. This paper describes an attempt to interference with the stiffness of the floors of a residential building in order to achieve comfort of people staying inside. It is disturbed by car passing the way located 20 meters from building. Investigated object is an two-storey apartment building with basement, typical for the '70s. It is characterized by compact design (block in the form of a cuboid) and low vertical stiffness of floors, where horizontal partitions (walls) are supported by identical system of walls. In the study it is discussed the desirability of interference with the construction of the building and 5 variants of floor structure were carried out. Those variants constituted reinforced concrete slabs with thicknesses of 10, 12, 14 and 16 cm as well as existing reinforced concrete slab supported by steel beams made of IPE 180 spaced every 2 m. This procedure was applied on every residential storey. Criterion to rank applied solution was comfort of the people staying inside the building according standard PN88 / B-02171 - Evaluation of vibrations influence on people in buildings. As follows from the analysis interference in floors stiffness in the present case does not bring the required results. The reason for this is that an essential component of the vibration of the building is its movement as a solid. Change in time of the configuration of internal components constitutes little impact on the comfort of the people staying inside. In addition, based on analysis of the responses floors of the building on two floors, it is concluded that even in the same building in the application of the solution (which in terms of static should be torsamym) construction does not always result in similar effects. The reason of different floor responses at different levels is that they are separated by elastic damped medium, which change boundary conditions seemingly similar structural components. An additional aspect is the path length of wave propagation affecting the amplitude-frequency characteristics of extortion of selected floor slabs. Therefore, repeating selected structure solution should only occur after completing the calculation.



IMPACT OF RAILWAY ROLLING STOCK ON BUILDINGS BEING DESIGNED

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ABSTRACT

Need for residential and office spaces - especially in cities - induces to use areas, which so far have not been very attractive because of the inconvenience, which they are subject to. These includes among other areas located in the influence zone of railway. Newly-constructed buildings should be resistant to the previously mentioned impacts and comfort of people placed inside should not differ from the standards set out in the guidelines corresponding to the region (in particular ISO 2631, Pr PN / B-02171, Pr PN / B-02170). During designing a new buildings it should be taken into account - apart from standard loads - dynamic actions caused by passing trains. This paper describes how to design a reinforced concrete building, distant from the railway line of 22,80m, whereas the rail head is 5,29m below the zero level of the building. In order to determine kinematic loadings, measurements of ground vibrations caused by passing in the vicinity rolling stock were made. Using transition function between the ground and building (prepared for similar objects) movement of the applied FEM model of the analyzed object was determined. Results of numerical integrations were substantial for obtaining information about its configuration change in the time which allowed to: a. determine internal forces (expressed as extreme amplitudes) in each bearing member, which added to forces obtained from static analysis served to choose dimensions of cross-sections and the number of reinforcing inserts, b. estimate impact of vibrations on people staying in the facility through terce analysis of accelerations in 1/3 octave bands. Because behavior of the building depends on the size of applied loads, according to Pr PN / B-02171 calculations were performed with the participation of different service loads - 60% (for residential buildings). Obtained values are summarized in the form of the envelope of extreme values. Detailed analysis of the obtained results showed, that adopted due to static-strength calculations cross-sections of the bearing members do not meet the conditions of perceiving vibrations by man. It resulted in changes in the thickness of slabs and increase the reinforcement ratio. Analyzing response of the structure due to dynamic action also showed, that the main factor influencing the change of dimensions of the concrete bearing elements is a condition related to the comfort of people staying inside. Increasing the amount of reinforcement bars in concrete elements often turns out to be less effective than increasing cross-sections. Quite often, due to architectural reasons both procedures should be applied.



USING CONTAINER STRUCTURES IN ARCHITECTURE AND URBAN DESIGN

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ABSTRACT

The paper presents using modules structure in architecture and urban design. Houses and apartments are still too expensive. Since 1923 architects tried to improve life conditions of citizens by building very simple, repeatable forms. With prefabrication technology it was possible to build quicker and because of that prices went down. Apartments in block of flats were affordable by more and more people. Modernism had great impact on quality of living spaces, although large panel technology destroyed social life, it gave people their own bathrooms, and gifted them with simple solutions we now cannot live without. The ambition to build something cheap but effective is still here. The future of housing is prefabricated apartment modules. Well optimized process of creating architecture is the key, but taking into consideration mistakes made by past generations should be second most important factor. Studies show that large panel buildings were definitely too monumental and solid for a housing structure, and offered no public spaces between them. Lack of urban design transformed great idea into blocks that are considered to be ugly and unfriendly. Diversity is something that large panel structures were missing. While most block of flats were made of the same module (Model 770) it was hard to achieve differentiated architecture. Nowadays, more and more shipping containers are being used for housing purpose. Those constructions show that it is possible to create astonishing housing with modules. Shipping containers were not meant to be a building material, but in contrast to large panel modules, there are possibilities of their transformation. In this paper authors go toward setting rules that if followed, result in cheaper apartments, surrounded with both tremendous architecture, and friendly urban design. What is more, proposed solution is thought through to adapt to personalized requirements. In the paper authors include information's about design guidelines for structures made of containers.



ASSESSMENT OF NOISE EFFECT ON DISPLACEMENTS ESTIMATED FROM CONTAMINATED ACCELERATION RECORDS FOR ELASTIC AND INELASTIC OSCILATORS

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ABSTRACT

The purpose of this study is to show the effect of the noise contained in acceleration records, on the accuracy of displacement estimations obtained at civil-engineering structures. Using analytical simulations, the responses of oscillators, representative of elastic and inelastic structures, are studied. Several levels of signal contamination, with signal/noise ratios that range from 1/10,000 to 1/1, are considered. The methodology is based on step-by-step dynamic analyses of several oscillators, with natural vibration periods that varied between 0.2 and 2.0 s, subjected to the El Centro earthquake record of 1940. They provide the exact records of accelerations and displacements. Two types of noise contamination of acceleration records are evaluated separately: 1) noise in the input (excitation) and 2) noise in the output (response). Displacements are estimated from acceleration records by using several well-known algorithms specifically developed for such purpose (Chiu, Trifunac and Lee, Converse and Brady, Park, and Boore). The signal contamination effect is assessed by comparing the assumed exact displacements obtained from the dynamic analyses against the displacements obtained with these algorithms applied to the contaminated acceleration records. The comparison is carried out in terms of two parameters: 1) the error in the estimation of peak displacements, and 2) the value of the cross-correlation coefficient for both displacement records. Conclusions are obtained in relation with the threshold values of signal/noise ratios that lead to acceptable displacement estimations, for each algorithm.



NUMERICAL STUDY ON DEFLECTION BEHAVIOUR OF GFRP REINFORCED CONCRETE BEAM

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ABSTRACT

Fiber Reinforced Polymer (FRP) reinforcing bars are gaining popularity as potential sustainable replacement for conventional reinforcing steel bars. The environmental cost of producing conventional reinforcing steel is much higher than Glass Fiber Reinforced Polymer (GFRP) reinforcing bars. Flexural behaviour of concrete reinforced with GFRP bars is already incorporated in many specialized building codes and design standards, such as ACI440.1R published by the American Concrete Institute (ACI) and CAN/CSA S806-12 published by the Canadian Standards Association. This paper conducts a literature review of the force-deformation relationships for normal weight concrete beams reinforced with GFRP bars. The paper also evaluates ACI440.1R and CAN/CSA S806-12 in terms of the capacity to estimate the deflection of beams reinforced with GFRP bars. Numerical models of concrete beams reinforced with various percentages of GFRP bars were created and the mid-span deflection was determined and compared to estimates provided in ACI440.1R and CAN/CSA S806-12. The initiation of cracking and progression of deflection are sensitive to the modulus of rupture, which has approximately the same value in both codes. Both codes provided good estimate of mid-span deflection for all reinforcement ratios with CAN/CSA S806-12 being more conservative than the current version of ACI ACI440.1R. Both codes as well as the finite element model predict significant decrease in maximum mid-span deflection of the concrete beam with increase in GFRP reinforcement ratio.



ON THE PUNCHING SHEAR BEHAVIOUR OF FRP REINFORCED CONCRETE FLAT SLABS

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ABSTRACT

The mechanism of shear failure in reinforced concrete slabs is a complex and remain an area of research, especially when reinforcement is not conventional steel. Interest is growing in using fiber reinforced polymer (FRP) bars to reinforce concrete slabs. Favourable properties of FRP bars, such as corrosion resistance, may extend service life and reduce maintenance cost of reinforced concrete buildings. This study examines the design formula for determination of concrete punching shear capacity of FRP reinforced flat slabs in two building codes: The American ACI440.1R-15 and the Canadian CAN/CSA S806-12. Punching shear expressions for flat slabs reinforced with FRP bars typically take into account the effects of the axial stiffness of main reinforcement, the ratio of the perimeter of slab critical section to slab effective depth, and slab size. In this study, the punching shear capacity of FRP reinforced flat slabs currently in ACI 440.1R-15 and CSA S806-12 are compared with experimental data in the literature. Experimental data covered in this study include concrete slab reinforced with GFRP, BFRP, and CFRP bars. It shown in this paper that both ACI 440.1R-15 and CSA S806-12 estimates of punching shear capacity are in agreement with test results and represent reliable predictions of the punching shear capacity.



ANALYSIS OF AIR FLOW AROUND THE BRIDGE CABLE

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ABSTRACT

The impact of wind on construction structures is the essential issue in design and operation process. In particular, the wind can cause the dangerous vibrations of slender structures with low rigidity, eg. vibrations of cables of suspension and cable-stayed bridges or high voltage transmission lines, thus understanding of wind flow around such constructions is significant. In civil engineering structures located under the action of the wind, the system response can be divided into the following parts: static and dynamic responses, where the static is independent of time and dynamic response - fluctuating part is associated with the turbulent nature of wind, which one can write as follows: $f=f_1+f_2$ (1) In the paper the issues of dynamic wind action are the subject of discussion. The static part (f_1) is proportional to the mean velocity value, in the dynamic part (f_2) one can notice: vortex shedding, buffeting and motion-induced behaviour, which is very important from the point of view of the impact on bridge structures and components of bridges including cables suspending bridges' decks. Paper concerns the flow around the bridge cable. The purpose of the paper is to describe force coefficients such as drag and lift, distribution of velocity and pressure as well as the turbulence nearby the two-dimensional cylinder model of the bridge cable. In the analysed case, the RNG k- ϵ method is used. This method belongs to the Reynolds-Averaged Navier-Stokes models. The numerical simulations are performed for different aspect ratio, as the shape of surface of bridges' cable is significant. The ellipse section, analysed in the paper, models the shape with possible ice on the cable. Especially ice and water drops on cables make the unstable of response that cause the fatigue stresses and faster failure of the cable.



A DELAYED COLLAPSE OF WOODEN FOLDING STAIRS

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ABSTRACT

During the operation of folding stairs, the fastener joining the steel ladder hanger with the frame made of wood was torn off. A person using the stairs sustained serious injury. In several dozen other locations similar accidents resulting in different consequences for users were observed. As a result of visual inspections, joining screws were identified. The threaded parts of the screws were found in the gaps between the wooden elements of the folding stairs. The folding stairs consisted of a three-segment ladder folded alternatively. The bottom ladder segment resting on the floor was supported by the floor, while the top segment was fixed at six points to the flap. The flap made of a wooden frame covered by an HDF board was attached to an external wooden frame by means of metal hangers. The hangers had a hinged foldable structure owing to the folding mechanism of the stairs. The hangers were mounted to the flap frame with four screws in each of the four elements made of steel angle bars. Laboratory strength tests were conducted on several wooden samples. Some of the samples were made in a correct way, some with a 4 mm gap (as in the damaged stairs) between the joined strips and the remaining samples with an 8 mm gap. The results corresponded to the characteristic values of the forces calculated on the basis of the EC5 guidelines. The destruction of the connection of the stair plate with the steel hanger was initiated by the damage of the pressure zone connector located in the gap (force T_y , screw #1), which resulted in its disruption by force N_x . The absence of the connector caused a disruption of the adjacent connector, which in turn resulted in a domino effect leading to the destruction of the whole structure by breaking out all the other connectors. Due to complex load distribution mechanism acting on the base of the structure, whose outer frame was fixed in the ceiling level, a three-dimensional FEM model was created. It was as close as possible to the real structure. Five computational model variants were considered. They differed in the place of load and support conditions of the bottom part of the ladder. The highest step of the stairs was loaded with a force of 1500N. The weakest link in the load transmission chain were found to have been the screws connecting the flap board with the metal hangers. According to the criteria set out in the EC standard, the load bearing capacity of the screws placed in the slots must be assumed to equal to zero. However, under extreme conditions, which is the phase of structure destruction, each individual factor has its share, and, as a result, the load bearing capacity of the screw placed in the gap must be taken into account.



DEGRADATION AND REINFORCEMENT OF INDUSTRIAL GAS TANK SUPPORT STRUCTURES: THIRTY-YEAR LONG MONITORING

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ABSTRACT

The paper presents an analysis of reinforced concrete supporting structures of more than a dozen liquid gas tanks of a capacity of 195 m³ and 600 m³ mounted on tower support structures located at different sites on Poland's territory. Stability testing of the degraded structures was carried out on a regular basis over a period of 30 years and pointed out significant defects that prevented safe operation of the tanks containing hazardous medium. Analyzing complex stress states, as well as displacements of shell structure components, the author developed a concept of strengthening the structures. Initial repair works, which had been carried out without proper supervision, failed to meet the mandatory requirements and were not compatible with the original design solutions. After several years of operation of the reinforced structures, their degradation states were assessed again, followed by resultant recommendations. The most damaged structures were temporarily excluded from the operation. The next stage of repair works was carried out under the supervision of the author together with the authorized representatives of the investors. After completion of the repair work, the structures were allowed for temporary operation and subject to regular assessment of their technical condition. As a result of the examinations of more than a dozen degraded concrete support structures of spherical industrial gases tanks, it was possible to develop the following guidelines concerning their supervision with due regard to the provisions of the construction law: a. in view of the repeatability of constructional solutions concerning support structures of gas tanks produced in Poland, it is possible to state that repair solutions using shotcrete should be taken into account by designers and users of this type of construction, as proven in terms of durability over a 10-year period of use; b. special attention should be paid to contact zones and connections of reinforcement elements with materials of reduced strength parameters; c. in the course of repair works, modern technologies using carbon fiber and polymers can be applied. However, due attention should be paid to life expectancy of the reinforced surfaces; d. an important issue, subject to verification, must be the qualifications of the repair works team. All work should be carried out under the supervision of the authors of the reinforcement work documentation and the representative of the investor. In the presented cases, proper risk assessment and efficiently conducted reconstruction activities made it possible to eliminate danger and ensure the launching of the technological process as soon as possible, all in compliance with the conditions of safety for workers and the environment.



ASSESSMENT PROCESSES TO INCREASE THE BURDEN OF EXISTING BUILDINGS USING BIM

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ABSTRACT

The process of implementation of the reconstruction of buildings is often associated with the need to adapt them to increased loads. In the restricted access to the archive project documentation it is necessary to use technical solutions to obtain a fairly short period of time necessary to implement the technical parameters of such processes. Dissemination of BIM in the design process can also be used effectively in the processes of identification of existing facilities for the implementation of the work of strengthening or adapting objects to the increased load requirements. Obtained in the process of research and macroscopic data is then used in the processes of numerical processing aimed at developing a numerical model reflects the actual parameters of the structure of the existing structure and, therefore, allows a better look at the object and the execution of the process to strengthen future. This article will identify possibilities for the use of BIM in processes of identification technology buildings and structures and indicated the necessary data to be obtained during the preliminary work. Introduced in model solutions enable the use of multi-criteria analysis of the choice of the most optimal solutions in terms of costs or expenditures of time during the process of construction. Taking the above work by building a numerical model of the object allows every step of verification by authorized persons inventoried solutions and enables tracking and changes in the situation of those found derogations in relation to the parameters established at the primary stage. In the event of significant deviations, there is the possibility of rapid changes to the completed process of calculation and presentation of alternative solutions. Availability software using BIM technology is increasingly common here knowledge of the implementation of such solutions will become in a short time, the standard for most objects or engineering structures. The use of modern solutions using the described processes will be discussed on the example of an industrial facility where there was a need for installation of new equipment and adapt it to the technical parameters.



THERMAL ANALYSIS OF RC RESERVOIR FOR THE WOOD CONDITIONING

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ABSTRACT

The article introduces the analysis of RC reservoir for the wood conditioning made by MES method procedure. A temperature gradient distribution up rise as result of the influence of hot liquid fulfilling the reservoir was defined. Values of gradients high sections of walls and bottom floor of the reservoir was defined on the basis of isotherm method. Received results were compared with empirical formulas from the literature. Strength analyses were also carried out. Additionally was introduced the problematic aspects of the longitudinal monolithic reservoirs for liquids especially in case of large temperature gradients and the ways of necessary technical solutions. The use of MES method for designing of engineer's objects is nowadays irreplaceable solution. In case of the discussed reservoir, for correct estimate of necessary dimensions of walls and bottoms sections and for the reinforcement the spatial model of the construction mapping real its performance was performed.



STEEL FIBERS REINFORCED CONCRETE PIPES: EXPERIMENTAL TESTS AND NUMERICAL SIMULATION

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ABSTRACT

The paper presents in the first part a state of the art review of reinforced concrete pipes used in microtunnelling realised through pipes jacking method and design methods for steel fibres reinforced concrete. In part two experimental tests are presented on inner pipes with diameters of 1410mm and 2200mm, and specimens (100x100x500mm) of reinforced concrete with metal fibres (35 kg / m³). In part two experimental tests are presented on pipes with inner diameters of 1410mm and 2200mm, and specimens (100x100x500mm) of reinforced concrete with steel fibres (35 kg / m³). The results obtained are analyzed and are calculated residual flexural tensile strengths which characterise the post-cracking behaviour of steel fibres reinforced concrete. In the third part are presented numerical simulations of the tests of pipes and specimens. The model adopted for the pipes test was a three-dimensional model and loads considered were those obtained in experimental tests at reaching breaking forces. Tensile stresses determined were compared with mean flexural tensile strength. To validate tensile parameters of steel fibres reinforced concrete, experimental tests of the specimens were modelled with MIDAS program to reproduce the flexural breaking behaviour. To simulate post - cracking behaviour was used the method sigma-epsilon based on the relationship stress - strain, according to RILEM TC 162-TDF. For the specimens tested were plotted force-displacement diagrams, which have been superimposed for comparison with the similar diagrams of experimental tests. The comparison of experimental results with those obtained from numerical simulation leads to the following conclusions: - the maximum forces obtained by numerical calculation have higher values than the experimental values for the same tensile stresses; - forces corresponding of residual strengths have very similar values between the experimental and numerical calculations; - generally the numerical model estimates a breaking force greater than that obtained in the experimental tests. Experimental and numerical studies are used to establish the residual characteristic flexural tensile strength minimum guaranteed and limits of applicability of concrete pipes reinforced with steel fibres used in various field and loading situations



THE METHODS FOR REMOVING BUILDINGS DEFLECTION USED IN POLAND

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ABSTRACT

The deflection of the building in relation to the vertical is caused by its uneven lowering. The deflection hinders the use of the building and causes occurrence of the additional inner forces which the construction of the building is not designed to take. Therefore the deflections of the buildings should be removed. Nowadays in Poland there are three methods to remove the deflection. The first method is removing the soil from under the part of the building which is positioned too high. The second method is elevating parts of the building that are too low. The third method is simultaneous removing the soil and elevating the building. In this work all three methods are presented and analysed showing their advantages and disadvantages. Removing the soil from under the part of the building which is positioned too high can be achieved by drilling holes under the building or cutting parts of the soil under the building. After removing the soil the building returns to the vertical. The advantage of this method is no interference in the construction of the building. The disadvantages are the lack of precise control over the building and the necessity of occupancy for the construction site the considerable area around the building. The second method to remove the deflection of building is elevating using the hydraulic jacks. These jacks are usually built-up in the openings made in the walls of the lowest level. Removing deflection through elevating is performed through inflicting shifting to the jacks. It consists of three phases: tearing the building, steady elevating and not steady elevating. In practice two types of jacks are used: hydraulic piston jacks and hydraulic diaphragm jacks. These jacks can be manually or computer controlled. The advantage of this method is full control of the levelling process. The disadvantage is the interference in the construction of the building (tearing the building). The last method is simultaneous elevating parts of the building located too low and lowering parts of the building positioned too high. The most frequently used method, because of the lack of damages during the implementation, is levelling through elevating with the use of computer controlled piston jacks.



SUBCRITICAL FLOW REGIME OF TANDEM INTERFERING CYLINDERS

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ABSTRACT

The subcritical flow regime for Reynolds number $Re = 1.0 \times 10^4$ is the subject of the paper in the context of aerodynamic interference of tandem circle cylinders. The two cylinders are in distances of $L/D=1.0$. The purpose of the paper is to determine drag and lift coefficients, the frequency of drag and lift for upstream and downstream cylinders and also the distribution of the velocity around the cylinders and in the wake. The assumption that air is incompressible is made. Upstream cylinder is located in the distance from the flow inlet of $19D$ and $21D$ from the outlet, downstream cylinder is located $21D$ from the inlet and $19D$ from the outlet. The boundary conditions are: uniform flow inlet with velocities $u_x = U_{\infty}$, $u_y=0$. No slip condition is applied on the cylinder surface and $u_y=0$. For improving accuracy of results, 27820 elements were applied. In the analysis the grid was required to be fine to capture the flow distribution near the cylinders and in the wakes. In numerical analysis the RNG k- ϵ method was used. Navier Stokes equations were solved numerically with use of Semi Implicit Method for Pressure Linked Equations (SIMPLE) with sequenced calculations of velocity and pressure's components. The coefficients of sub relaxations were additionally used for stabilizing the calculations process. Additionally, second order upwind method for momentum equations was adopted. Paper concerns case that are often meet in the suspended cable and cable-stayed bridges. Flow around civil structures and their parts as cables are the subject of detailed investigations due to practical applications in design and operations of constructions. Wind load action on bridge cables cause their vibrations. In addition, behind the cables the vortex street appears which may play significant role in the interaction of elements. Both cables of the suspended and stayed bridges and overhead transmission lines are often in the system of several elements so they may interact. Due to the flow around the elements, the pressure differences appear. Followed by separation, the boundary layer are located in the upstream and downstream cylinder. The boundary layer as a disturbance, has the different level depending on inertia, viscosity of the media, surface roughness and distance between the interfering bodies.



MASONRY VAULTS SUBJECTED TO HORIZONTAL LOADS: EXPERIMENTAL AND NUMERICAL INVESTIGATIONS TO EVALUATE THE EFFECTIVENESS OF A FRM REINFORCEMENT

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ABSTRACT

In ancient masonry buildings of European cities, the presence of vaults supporting only their own weight (shelters) is quite common. Such a structural elements commonly present good strength reserves against vertical loads but a very low resistance when subjected to horizontal actions and require, thus, specific interventions of structural enhancement so to prevent possible brittle failures during earthquakes. Modern reinforcement solutions, based on composites materials, were introduced in the last two decades, with the aim to comply both effectiveness and compatibility needs. In particular, the application of fiber-reinforced polymers (FRP), made up of synthetic or natural fibers (carbon, glass, aramid, basalt€) embedded in an inorganic matrix (fiber-reinforced cementitious matrix - FRCM and fiber-reinforced mortars - FRM), applied to the vaults intrados or extrados, were investigated. The paper focuses on a compatible FRM strengthening technique consisting in the application of a reinforcement made of glass fiber reinforced polymer (GFRP) meshes embedded in a thin mortar coating (about 30 mm) anchored to the masonry vault by means of GFRP connectors. The authors already presented a finite element numerical model for a preliminary study on the effectiveness of the extrados reinforcement intervention in terms of strength and ductility of masonry vaults (Gattesco and Boem, 2016). It emerged that the typical simplified loading patterns used in the literature for the experimental tests, based on concentrated vertical loads, are not able to reproduce the actual behavior and the effectiveness of the reinforced elements. Thus, the authors recently performed experimental tests on full-scale solid brick masonry barrel vaults (thickness 120 mm, arch span 4000 mm, arch rise/radius = 0.75) so to validate the numerical findings and evaluate the actual effectiveness of the technique. The tests were properly designed so to reproduce the pattern of transversal horizontal load proportional to the vault self-weight. Three quasi-static cyclic tests were performed: unreinforced vault, vault reinforced at extrados and vault reinforced at intrados. The results showed that the reinforcement increased the resistance of the vault: the ultimate load of reinforced samples increases by 3.7 times and 2.5 times, respectively for the extrados and intrados reinforced vault. Also very large capacities to displace emerged (about 100 times greater in respect to that of unreinforced vault), due to the presence of the GFRP mesh, which permitted the development of numerous cracks in the reinforced coating before failing in tension, and to the concentrated rotation at the hinges, that form at the unreinforced side of the vault. The developed numerical model, based on smear-crack, was adopted for the simulation of the behavior of these three tested samples. The assumed materials characteristics were assessed experimentally. The experimental and numerical results were compared in terms of capacity curves expressing the global horizontal load against the horizontal displacement at the crown section. Though the analysis were based on a monotonic loading, a very good accordance between experimental and numerical findings emerged. Gattesco N., Boem I. (2016). Strengthening of masonry vaults through a thin extradosal layer of fiber reinforced lime mortar. In: Proceedings of the 10th International Conference on Structural Analysis of Historical Constructions - SAHC, 13-15 September, Leuven (BE).



TOPOLOGY OPTIMIZATION - ENGINEERING CONTRIBUTION TO ARCHITECTURAL DESIGN

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ABSTRACT

The idea of the topology optimization is to find within a considered design domain the distribution of material that is optimal in some sense. Material, during optimization process, is redistributed and parts that are not necessary from objective point of view are removed. The result is a solid/void structure, for which an objective function is minimized. This paper presents an application of topology optimization to multi-material structures. The design domain defined by shape of a structure is divided into sub-regions, for which different materials are assigned. During design process material is relocated, but only within selected region. The proposed idea has been inspired by architectural designs like multi-material facades of buildings. The effectiveness of topology optimization is determined by proper choice of numerical optimization algorithm. This paper utilises very efficient heuristic method called Cellular Automata. Cellular Automata are mathematical, discrete idealization of a physical systems. Engineering implementation of Cellular Automata requires decomposition of the design domain into a uniform lattice of cells. It is assumed, that the interaction between cells takes place only within the neighboring cells. The interaction is governed by simple, local update rules, which are based on heuristics or physical laws. The numerical studies shows, that this method can be attractive alternative to traditional gradient-based algorithms. The proposed approach is evaluated by selected numerical examples of multi-material bridge structures, for which various material configurations are examined. The numerical studies demonstrated an significant influence the material sub-regions location on the final topologies. The influence of assumed volume fraction on final topologies for multi-material structures is also observed and discussed. The results of numerical calculations show, that this approach produces different results as compared with classical one-material problems.



INFILL WALLS CONTRIBUTION ON THE PROGRESSIVE COLLAPSE RESISTANCE OF A TYPICAL MID-RISE RC FRAMED BUILDING

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ABSTRACT

GSA (2003) Guidelines defines the progressive collapse as “a situation where a local failure of a primary structural component leads to the collapse of adjoining members which, in turn, leads to additional collapse. Hence, the total damage is disproportionate to the original cause. After the catastrophic collapse, such as those of the Ronan Point apartment building (London, 1968), the Alfred P. Murrah Federal Building (Oklahoma, 1995) and the World Trade Center (New York, 2001), U.S. General Services Administration and Department of Defense published two guidelines: GSA (2003) and DoD (2005) for progressive collapse assessment of new and existing buildings. There are many experimental and numerical studies regarding the progressive collapse risk assessment of RC framed structures, but very few of them have considered the interaction between the frame elements and the infill walls. A complete analysis should include the effect/contribution of the secondary elements, such as infill walls, in the evaluation of the structural response. Thus, the main objective of this study is to assess the influence of the existing autoclaved aerated concrete (AAC) infill walls on the progressive collapse behavior of a 13-story RC framed building subjected to the sudden removal of a first-story corner column. The 13-story existing building located in Braila (a zone with high seismic risk from Romania), was designed in 1972 according to the former Romanian seismic code P13-70 (1970). None of the previous investigations focuses on the effect of the AAC infill walls on the progressive collapse resistance of an old RC framed building, designed 45 years ago. Two three-dimensional models of the RC framed building are generated in the Extreme Loading for Structures (ELS) computer software: a model without infill walls (frame structure) and a model with infill walls. In the first model, the infill walls are considered only as dead loads uniform distributed on the exterior beams. For the model with infill walls, in the ELS computer software is used the macro-simulation, in which the wall is represented with relatively larger elements composed by bricks and mortar. The progressive collapse risk of 13-story building is assessed following the GSA (2003) Guidelines for the damage case when a first-story corner column is suddenly removed. Alternate Path Method is recommended, which requires that the structure should be capable to bridge over the missing structural element. As nonlinear dynamic analysis gives more accurate results, in this study only this procedure is used. It was found that, the 13-story RC framed building is not expected to fail under the standard GSA loading (DL+0.25LL). Moreover, if the infill walls are introduced in the model, the maximum vertical displacement of the node above the removed column is reduced by about 48%. Therefore, for more accurate results in progressive collapse analyses and especially in the assessment of robustness index of the structure, it is recommended to introduce in the numerical model not only beams, columns and slabs, but also the existing infill walls.



PRESTRESSED RING BEAM IN CHURCH OF ST. PETER'S AND PAUL'S IN BODZANOW DESIGN AND REALIZATION

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ABSTRACT

Prestressed concrete was used to raise commercial buildings in Poland at the beginning of 1950s. Firstly, long span post-tensioned roof girders were made in industry halls, warehouses, airport hang-ars, etc. Moreover, they were used to construct large capacity liquid tanks and bridges. The new form of post-tensioning, which means unbonded tendons, was used in buildings after year 2000. Lately in Poland occurred a trend of implementation of prestressed concrete technology for construction of church buildings. In the world, pre-tensioned precast concrete elements were used to construct churches. Sometimes, external prestressing with FRP material was used to strengthen existing facilities. Usage of post-tensioning with internal, unbonded tendons in the construction of churches is unknown to the authors. Lately, the first time in Poland, prestressing has been used in project of the two church buildings. As a result of using the unbonded tendons two attractive forms were received. A prestressed concrete circumferential ring allows to create a delicate structure of timber girders in the second church. In this paper, these solutions will be presented in detail together with the obtained benefits and proper calculation results. In addition, during the prestressing process the authors of the following project and paper were conducting the measurements of radial dis-placements and the displacements of ring beam in number of crucial sections. The detailed plan of ring beam deformation after prestressing was made. The accuracy of the adopted assumptions was determined on the basis of achieved results. The products of the research will allow for future verifi-cation of adopted calculation models and more courageous design approach. The trend of con-struction of lightweight, small and delicate shapes introduced recently in Poland, will require usage of light and durable constructions. Prestressed concrete and its relatively new form, based on utiliza-tion of unbounded tendons, will certainly contribute to their development and popularization. Achieved and presented results will surely confirm the validity of proposed structural and architec-tural forms, and may be a good reason for development of more advance design.



IMPACT OF THE DEGREE OF CONCRETE CRACKING ON THE PULLOUT RESISTANCE OF STEEL AND PLASTIC/METAL SLEEVE ANCHORS

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ABSTRACT

Areas affected by seismic and mining disturbances are tied to a risk of damage to engineering structures. The problem may result in damaging fasteners installed in buildings. Such damage may affect the strength of different types of construction fasteners and connectors. The technical condition of fastening elements should be assessed, and conclusions formed regarding the causes of damage and ways to secure those elements. In order to determine the pull-out resistance of fasteners set in a concrete base, the effects of disturbances were simulated as cracks in the concrete. Additionally, the influence of tolerances for openings made using drills with diameters d_{min} , d_{nom} and d_{max} presented in the study was also determined. Introduction of the variables described may influence the pull-out resistance of the steel and plastic/metal anchors. The article presents the results of tests for specific pull-out resistances of steel and plastic/metal sleeve anchors installed in a concrete base in normal-weight non-cracked concrete and normal-weight cracked concrete where crack initiation was at 0.20 mm and 0.35 mm. All tests were carried out for the purposes of this paper at normal temperature and with C20/25 concrete, without factoring in influence of concrete or air moisture content.



THE FAILURE ANALYSIS IN DESIGN OF THE HOUSING PROJECT IN ISTANBUL ACCORDING TO THE OWNERS' REQUEST AND TURKISH CODES

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ABSTRACT

The failure analysis has an important role during the design process. Since the failures should be determined during the design, the failures which occur during the construction may be obstructed or decreased. Especially, in worldwide the design process should be related to the codes and regulations of any country. These codes and regulations help to determine the failures and supply the suitability of the design to the codes and regulations. Besides, the owners' requests are also taken into account during the design process. Sometimes, the owner's requests are different and not suitable to the codes. Therefore, it is important to specify the right alternatives. The failure analysis forms the alternative solutions and makes the architects and engineers decide which solution is best suited for the construction. In this paper, the design process of the housing project in Istanbul is evaluated and analyzed for the failures according to the Turkish codes and regulations, and also the owners' requests. Generally, the structural system and services are analyzed for the failures that occur during the construction. By the help of this analysis, the questions like which structural system should be used in earthquake zone or is it suitable to use different structural systems together or how and where the service systems are settled or constructed are tried to be answered. As a result of this study, the right alternatives which are suitable to the owners' requests and regulations should be determined and also the failures which may occur during the construction are specified. Hence, it is possible to decrease the problems of the construction within the help of the failure analysis in design process. As a result of the analysis, the suitable design should be chosen according to both the owner's requests and regulations.



NUMERICAL EVALUATIONS OF HORIZONTAL DISPLACEMENT CAPACITY OF TIMBER SHEAR WALLS

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ABSTRACT

Timber shear walls are the most important structural components of the light timber framed structures. They are used both as gravitational and lateral resisting system. The key parameter when characterizing the seismic behavior of a structure with respect to satisfying the serviceability and ultimate limit states is the lateral displacement capacity. Due to the fact that the timber shear wall consists of several components, its lateral displacement capacity is a sum of component's displacements: the bending and the shear deflections, the fastener deformation, the anchorage slip, and other contributing sources of displacement. The American International Building Code (IBC), provides an analytical procedure for computing of the horizontal displacement. In Europe, the norm Eurocode 5 does not provide any specifications regarding the computation of the horizontal displacement for the timber shear walls, several computational models being now developed in the frame of some advanced research programs. In this paper, several analytical models for the calculation of the horizontal displacement are presented and analyzed. Also, the analytical results are compared with the ones obtained by the use of the Finite Element Method (FEM) implemented in Abaqus software. The numerical FEM model and its calibration based on experimental data are also presented.



FIRE RESISTANCE OF ECCENTRICALLY BRACED STEEL FRAMES

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ABSTRACT

The Eccentrically Braced Frames represent highly dissipative seismic systems due to the formation of plastic hinges in link elements. In case of an accidental design scenario, a part of the structure may be affected and the tributary load is redistributed to the unaffected elements of the structure. Being designed to resist important horizontal loads, this structural system can be considered to bear the lateral forces developed through the catenary action, in the case of a column loss, caused by an explosion. After such accidental events, fire may arise within the structure and may affect directly the braced frames which represent the ultimate stability support, thus, limiting the collapse of the entire structure. The paper presents the numerical analysis of a steel eccentrically braced frame in fire condition using finite element software Abaqus. The finite element model was calibrated based on a previous experimental test performed under monotonic loading, within the CEMSIG laboratory at the Polytechnic University of Timisoara, at normal temperature conditions. Starting from the already established capacity of eccentrically braced frames, the structure is analyzed for different levels of lateral load and gravitational actions, assessing the fire resistance of the substructure. The effect of the compression forces in the bracings induced by the gravitational load as well as the link response in case of elevated temperature will be highlighted.



DISPLACEMENT PROFILE OF CONCENTRIC BRACED FRAMES FOR DIRECT DISPLACEMENT BASED DESIGN METHOD

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ABSTRACT

The direct displacement based design (DDBD) procedure is well developed and used for designing reinforced concrete and steel moment resisting frame structures, wall structures and bridges. However, limited number of studies is available on designing steel concentric braced frame (CBF) structures using DDBD approach and also those studies used the displacement profile developed for the reinforced concrete moment resisting frame structures by Priestley et al. (2007) as the design displacement profile for CBFs. Therefore, an appropriate design displacement profile for CBFs is required to enhance the seismic design and performance of CBFs. On this regards, an attempt is made to develop a design displacement profile based on the median maximum storey displacements obtained from the nonlinear time history analyses for a set of real ground accelerations. For this purpose, pre-determined four different steel CBF structures with varying brace configuration, and different heights are selected with uniform slenderness over the height. The nonlinear time history analyses are performed for the 3-D nonlinear finite element models of the selected frames using OpenSEES software. The developed models are capable of simulating the out-of-plane buckling and low cyclic fatigue failure of braces. The models are subjected to a set of 30 real ground motion records with varying levels of spectral acceleration at the first modal period of the structures. The maximum storey displacement at each storey levels is recorded for all the ground motion records. On the basis of the observed storey displacement and interstorey drift, the appropriate design displacement profile for CBFs is proposed. The proposed equations in this study show high depiction with observed behavior of the suggested CBFs.



STATE-OF-THE-ART REVIEW ON DIRECT DISPLACEMENT BASED DESIGN

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ABSTRACT

In the last century, the seismic structural behaviour was conferred special attention through research and governmental policies more than other load cases. It was also recognized that the seismic vulnerability is a function of building deformation and not strength that only helps to reduce displacements or strains, and the potential damage of buildings is directly linked to deformation. Recently, research granted more attention to structural performance, which is represented by strain or drift. Hence, wide range of structural types and structural material have been examined to develop a feasible and practical design methodology that would be suitable for the next generation of seismic international codes. In this concern, direct displacement based design method (DDBD) was developed and improved as the first design concept that adopts the structural performance philosophy, defined by strain or drift limits under a specified seismic intensity level. Direct Displacement Based Design method (DDBD) is considered as a viable alternative to the strength-based design or acceleration spectra. The current study reviews studies of direct displacement based design methodology (DDBD) concerning concentric steel braced frames (CBFs). Further, the method's procedure and the considerable improvement of structural response simulation for concentric braced frames (CBFs) are highlighted. In fact, the direct displacement based design (DDBD) procedure is well developed and used for designing reinforced concrete moment resisting frame structures, wall structures and bridges. However, there is limited number of studies available on designing steel concentric braced frame (CBF) structures using direct displacement base design (DDBD) approach.



SEISMIC BEHAVIOUR OF COMPOSITE STEEL FIBER REINFORCED CONCRETE SHEAR WALLS

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ABSTRACT

In this paper is presented an experimental study conducted at the “Politehnica” University of Timisoara, Romania. This study provides results from a comprehensive experimental investigation on the behavior of composite steel fiber reinforced concrete shear walls (CSFRCW) with partially or totally encased profiles. Two experimental composite steel fiber reinforced concrete walls (CSFRCW) were fabricated and tested under constant vertical load and quasi-static reversed cyclic lateral loads, in displacement control. The tests were performed until failure. The tested specimens were designed as 1:3 scale steel-concrete composite elements, representing a three storeys and one bay element from the base of a lateral resisting system made by shear walls. As a reference specimen, a typical reinforced concrete shear wall (RCW), (without structural reinforcement) was used, and configuration/arrangement of steel profiles in cross section were varied within the other specimens. The main objective of this research consisted in identifying innovative solutions for composite steel-concrete shear walls with enhanced performance, as steel fiber reinforced concrete which was used in order to replace traditional reinforced concrete. A first conclusion was that replacing traditional reinforcement with steel fiber changes the failure mode of the elements, as from a flexural mode, in case of element RCW, to a shear failure mode for CSFRCW. The maximum lateral force had almost similar values but test results indicated an improvement in cracking response, and a decrease in ductility. The addition of steel fibres in the concrete mixture can lead to an increase of the initial cracking force, and can change the sudden opening of a crack in a more stable process.



FIRE RESISTANCE OF ECCENTRICALLY BRACED STEEL FRAMES

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ABSTRACT

The Eccentrically Braced Frames represent highly dissipative seismic systems due to the formation of plastic hinges in link elements. In case of an accidental design scenario, a part of the structure may be affected and the tributary load is redistributed to the unaffected elements of the structure. Being designed to resist important horizontal loads, this structural system can be considered to bear the lateral forces developed through the catenary action, in the case of a column loss, caused by an explosion. After such accidental events, fire may arise within the structure and may affect directly the braced frames which represent the ultimate stability support, thus, limiting the collapse of the entire structure. The paper presents the numerical analysis of a steel eccentrically braced frame in fire condition using finite element software Abaqus. The finite element model was calibrated based on a previous experimental test performed under monotonic loading, within the CEMSIG laboratory at the Politehnica University of Timisoara, at normal temperature conditions. Starting from the already established capacity of eccentrically braced frames, the structure is analyzed for different levels of lateral load and gravitational actions, assessing the fire resistance of the substructure. The effect of the compression forces in the bracings induced by the gravitational load as well as the link response in case of elevated temperature will be highlighted.



THE COMPARATIVE ANALYSIS OF THE RELIABILITY OF STEEL STRUCTURE WITH PINNED AND RIGID NODES SUBJECTED TO FIRE

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ABSTRACT

The paper concerns the reliability analysis of steel structures subjected to high temperatures of fire gases. Two types of spatial structures were analysed, namely with pinned (MERO system) and rigid (SDC system) nodes. The fire analysis was carried out according to prescriptions of Eurocodes. The static-strength analysis was conducted using the finite element method (FEM). The MES3D program, developed by Szaniec (Kielce University of Technology, Poland), was used for this purpose. The results received from MES3D made it possible to carry out the reliability analysis using the Numpress Explore program that was developed at the Institute of Fundamental Technological Research of the Polish Academy of Sciences (numpress.ippt.gov.pl). The measurement of reliability of structures is the Hasofer-Lind reliability index (β). The reliability analysis was carried out according to approximation (FORM, SORM) and simulation (Importance Sampling, Monte Carlo) methods. The reliability of steel structure with SDC nodes is lower than that with MERO nodes. In the basic design situation, i.e. when fire duration is $t=0$, computations performed for the spatial frame with rigid nodes (SDC) produce the reliability index that is approx. 5% lower than for the same structure with pinned nodes (MERO). In the first minutes of the fire, when the reliability index starts falling, the differences amount to several percent. The analysis re-vealed a particularly dangerous phenomenon observed in the 55th and 60th minutes of the fire. Then, for the truss structure, the computations produce the reliability index that is higher than the required one. Conversely, when the structure is modelled as a frame, the index is lower than the necessary one. The structure computed as a truss is assigned R60 fire resistance class, whereas the structure computed as a frame is categorised as the one having R45 fire resistance class. It should be noted that the values of the reliability index obtained with the approximation methods (FORM, SORM) are slightly overestimated when compared with the results received using the simulation methods (Monte Carlo, Importance Sampling). However, the advantage offered by approximation methods include their effectiveness and a short time of computations. When simple limit functions were analysed, FORM or SORM method produced the results within 1s or less than that. The application of simulation methods prolongs the time of computations. It takes only slightly longer when the Importance Sampling is used, whereas with the Monte Carlo method, substantial differences can be observed.



DESIGNING OF TIMBER BOLT CONNECTION SUBJECTED TO DOUBLE UNEQUAL SHEARS

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ABSTRACT

The paper deals with load-carrying capacity of bolted connections subjected to unequal double shear with thin plates as outer members and inner timber member. This type of connection is usually widespread and in building support structures made of wood is commonly used. This may occur for example in skeletal structures which contain structural elements based on wood, but also for smaller wooden buildings. Specifically, this type of connection can be found in ceiling structures in the joint joists and beams. If one joist greater margin than the second, bringing the load on the side of the joists of a larger span greater loads than on the side with a smaller span joist. Structure engineer, who is designing such a connection, must use for the design of the connection design procedures and formulas from which he or she calculates the design resistance in order to carry out further assessment of the reliability of the connection in the ultimate limit state. The load-carrying capacity of this connections type can be calculated at present according to Johansen's equations, which are also contained in present European standard for the design timber structures -Eurocode 5. These Johansen's equations assume that the loads which act on the outer plates are equal. For this reason the structure engineer is often forced to use formulas intended for the timber bolt connection subjected to double equal shear and he or she must find ways how to use them although the formulas are not suitable. This paper deals with the case, when the loads acting on the outer plates are unequal.



ULTIMATE LIMIT STATE ASSESSMENT OF TIMBER BOLT CONNECTION SUBJECTED TO DOUBLE UNEQUAL SHEARS

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ABSTRACT

Nowadays the problems occur when a structure engineer need to assess the ultimate limit state of timber bolt connection which is subjected to double unequal shears. This assessment of ultimate limit state shows the reliability of these connections. In assessing the reliability of this connection in ultimate limit state is a problem, because the formulas and equations that are currently available in design standards and available literature, describing only connections loaded symmetrically – this mean that they describes the timber bolt connection subjected to double equal shears. This fact causes problems because structural engineers have no available support, according to which they could assess reliability of the connection in terms of the ultimate limit state. They must therefore often report following an asymmetrically loaded connections carry about using formulas, which are primarily designed for checking connections loaded symmetrically. This leads logically to the fact that it is not respected by the actual behavior of the connection in the ultimate limit state. Formulas derived in this paper provide the possibility to assess the ultimate limit state for such connection. The formulas derived in this article allow to carry out a reliability assessment of the ultimate limit state of timber bolt connection subjected to double shear. The using of the formulas derived in this paper leads to better description of the behavior of this type of connection and also to the more economic design. An example of using these derived formulas is shown. There is shown in this example, how to assess the reliability of timber bolt connection subjected to double unequal shears in terms of ultimate limit states.



**PARTICULATE MATTER MASS CONCENTRATION IN RESIDENTIAL PREFABRICATED BUILDINGS
RELATED TO TEMPERATURE AND MOISTURE**

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ABSTRACT

Building environmental audit and the assessment of indoor air quality (IAQ) in typical residential buildings is necessary process to ensure users' health and well-being. The paper deals with the concentrations on indoor dust particles (PM₁₀) in the context of hygrothermal microclimate in indoor environment. The indoor temperature, relative humidity and air movement are basic significant factors determining the PM₁₀ concentration [mg/m³]. This experimental measurements in this contribution represents the impact of indoor physical parameters on the concentration of particulate matter mass concentration. The occurrence of dust particles is typical for the almost two-thirds of interiors of the buildings. Other parameters indoor environment, such as air change rate, volume of the room, roughness and porosity of the building material surfaces, static electricity, light ions and others, were set constant and they are not taken into account in this study. The mass concentration of PM₁₀ is measured during summer season in apartment of residential prefabricated building. The values of global temperature [°C] and relative humidity of indoor air [%] are also monitored. The quantity of particulate mass matter is determined gravimetrically by weighing according to CSN EN 12 341 (2014). The obtained results show that the temperature difference of the internal environment does not have a significant effect on the concentration PM₁₀. Vice versa, the difference of relative humidity exhibits a difference of the concentration of dust particles. Higher levels of indoor particulates are observed for low values of relative humidity. The decreasing of relative air humidity about 10% caused 10µg/m³ of PM₁₀ concentration increasing. The hygienic limit value of PM₁₀ concentration is not exceeded at any point of experimental measurement.



INDOOR ENVIRONMENT IN RESIDENTIAL PREFABRICATED BUILDINGS

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ABSTRACT

The contribution presents results of the experimental measurement of indoor air quality in residential prefabricated buildings. People spend about 90% of their life in the indoor environment of buildings. Hygrothermal parameters and indoor air quality are the essential component that define the quality of the indoor environment. The results of case study characterize the quality of the indoor environment of the ordinary occupants in housing unit of residential prefabricated building. A current problem of revitalized prefabricated buildings is inadequate air exchange and related thereto to poor indoor air quality. The experimental measurements were carried out just before and at the beginning of the heating season (from 1st October to 30th November 2016). Heating season was launched in the middle of experimental measurement. The wireless indoor sensor Elgato Eve Room was used for measurements. The obtained values of indoor air temperature [°C], relative humidity [%] and indoor air quality [ppm] are describe and analysis in this study. The results of the study indicates that the values of temperature and indoor air quality meet optimal levels during the experiment with nuances. The mean air temperature in the indoor environment is 22.43 °C. The temperature of the indoor environment is held at the optimum level (18-24 °C) for 94.50% time of the experimental measurements. In addition, the indoor air quality in the context of the content of harmful volatile organic compounds (VOCs) has been excellent for almost 91% time of the total experiment. However, the values of relative humidity were less than the optimum value nearly 40% of the total observed time. The mean 10-minutes values of relative humidity during the heating season is about 10% lower than the mean 10-minutes relative humidity before the heating season.



INDOOR NOISE LOADING IN RESIDENTIAL PREFABRICATED BUILDINGS

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ABSTRACT

Quality on indoor environment is among others also defined by an acoustic comfort and noise emissions. The indoor noise loading in the residential prefabricated buildings is specific problem related to structural design of these buildings. Problems with noise level of sanitary systems are mostly associated with hydraulic shock such as water distribution and sewage drainage. Another very common cause of excessive noise is also flushing the toilet or water fall on enamelled steel (bath or shower). This paper aims to analyse the acoustic properties in the residential prefabricated buildings. Sanitary core of the assessed apartment is in original condition without any alterations. The sanitary core is based on a formica (high-pressure laminate). The study discusses the maximum sound levels in the three assessed rooms for the three different noise sources. The values of maximum noise level are measured for the corridor, bedroom and living room. Sources of noise are common activities relating to the operation of sanitary core - the toilet flush in the toilet, falling water from the shower in the bathroom and the water falling on the bottom of the kitchen sink in the kitchen. Other sources of noise are eliminated or minimized during the experiment. The digital sound level meter Testo 815 is used for measurements. The measured values of maximum sound level LA,max [dB] are adjusted by the correction coefficient. The obtained values are compared with the hygienic limits for day and night period. Night hygienic limit (30 dB) is exceeded in all the rooms for all noise sources. This limit is exceeded from 17 to 73%. The values in the bedroom and the living room meet the daily hygienic limit (40 dB). The daily limit is exceeded only in the corridor. The highest values of noise are identified for the toilet flushing.



HYGROTHERMAL ANALYSIS OF INDOOR ENVIRONMENT OF RESIDENTIAL PREFABRICATED BUILDINGS

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ABSTRACT

Recent studies show that the relative humidity and the indoor air temperature constitute an important determinant of the quality of indoor air. Hygrothermal microclimate has a significant impact on occupant's health and their comfort. The study presents the results of experimental measurement of indoor air temperature and relative humidity in selected apartment in prefabricated panel house situated in Ostrava, Czechia. The contribution describes and analysis the relation between indoor air temperature [°C] and relative humidity [%] in this apartment. The experimental object is selected with respect to the housing stock in the Czech Republic. A third of the housing stock in the Czech Republic is composed of prefabricated panel houses. Regeneration and revitalization of these buildings were in the focus of interest during recent years. Building modifications, such as thermal insulation of building envelope or window replacement, lead to a significantly higher level of airtightness of these objects. Humidity and indoor air temperature are measured in 10-minute cycles for two periods. The values of temperature and humidity are measured for the non-heating and the heating season. The length of each experimental period is 30 days. The mean value of indoor air temperature is 22.21 °C and average relative humidity is 45.87% in the non-heating period. The values of 22.62 °C and 35.20% represent average values for the heating period. A slight increase of the average temperature of the indoor environment (+1.85%) is observed. The decrease of the relative humidity is evident at first glance. The relative humidity of the internal environment is approximately 10% lower in the heating period. Long-term decline of relative humidity below 30% brings many problems. It is necessary to take measures to increase of relative humidity in residential prefabricated building. The aquarium appears to be ineffective. The solution may be forced artificial ventilation or humidifiers.



ASSESSMENT OF CARRYING CAPACITY OF TIMBER ELEMENT USING SBRA METHOD

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ABSTRACT

Wood as a building material has a significant perspective in the context of non-renewable energy sources and production of greenhouse gas emissions. The subject of this paper is to verify the carrying capacity of the timber element using the probabilistic method Simulation Based Reliability Assessment (SBRA). The simulation is performed for one million cycles. Key factors decreasing the strength of wooden material at the time include the duration of the loads, and combinations thereof. Inconsiderable factor affecting the strength of wood is also the humidity. Continuous beam with three fields (length 15 m, glued laminated timber, and strength class GL 36 according to the DIN EN 1194) is placed in an environment with a thermal-humidity regime of the 2nd class according to the EC 5. Average life of carrying timber structure is estimated to be 50 years. The simulation results show that there is no risk of failure of wood during the first year. The probability of failure is common in the 10 years of its life. Then, wooden element already meets only a reduced level of reliability.



OCCURRENCE OF INDOOR VOCs IN NURSERY SCHOOL: CASE STUDY

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ABSTRACT

Children's exposure to air pollutants is an important public health challenge. Particular attention should be paid to preschools because younger children are more vulnerable to air pollution than higher grade children and spend more time indoors. The concentrations of volatile organic compounds (VOCs) as well as carbon dioxide (CO₂) concentrations in younger and older children's classrooms during the winter season were studied. An electronic nose based on gas chromatography was used for the analysis of individual VOCs and a photoionization detector with a UV lamp was used for the determination of total volatile organic compounds (TVOC) concentration. Continuous measurements of CO₂ concentrations both inside classrooms and outside each building were performed using automatic portable monitors. Improving ventilation, decreasing the occupancy per room and completing cleaning activities following occupancy periods can contribute to alleviating high CO₂ and VOCs occurrence levels.



THE EXPERIMENTAL INVESTIGATION OF COMPRESSED THIN-WALLED STEEL MEMBERS

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ABSTRACT

The paper presents fundamental information about realized experimental-theoretical research to determinate the load-carrying capacities for thin-walled compressed steel members with quasi-homogenous and hybrid cross-sections. The webs of such members are stressed in the elastic-plastic region. This continuous research joins on previous research of the first author of the paper. The aim of this research is to investigate and analyze the elastic-plastic post-critical behavior of thin web and its interaction with flanges. The experimental program, test members and their geometrical parameters and material properties are evident from Tables 1, 2 and Figures 1 and 2. The test arrangement and failures of the test members are illustrated on Figures 3, 4 and 5. Some partial results are presented in Table 3 of the paper, too.



THE SELECTION OF EXCAVATORS FOR EARTH WORK ON THE BASIS OF THEIR PERFORMANCE

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ABSTRACT

For the specific construction of the reconstruction of the railway section Ostrov nad Oslavou and Žďár nad Sázavou will be done removed the railway superstructure and the partial adjustment of the substructure including drainage. For the earthwork will be used excavators of the company Komatsu, with the possibility of adjustment of parameters of the working tool – the length of the bracket and the volume of the shovel. The determined value will be purely indicative, as it does not affect how the operator of the excavator handles the discharge of cargo means.



**THE ISSUE OF BUILDING INFORMATION MODELING IMPLEMENTATION INTO THE CZECH REPUBLIC'S
LEGISLATION USING THE LEVEL OF DEVELOPMENT**

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ABSTRACT

The object of this paper is the issue of links between the Level of Development of particular project in Building Information Modeling environment and the projects of certain stages of project documentation within the existing Czech Republic's Legislation. This research article uses the experiences from the initiative of active working group „WG#03: BIM & Realization“, which is the part of the Czech BIM Council, especially the document called “Draft of unified data structure for Building Information Modeling in the Czech Republic”. The findings of this paper are in the defining specific Level of Development of relative parameters, mentioned in this document, connected to the specific level of information and details requested by the Czech Republic's Legislation. These findings could be used as an underlay to create document called “Level of Development draft assignment to the individual stages of project documentation in the Czech Republic”. The Level of Development is the most useful way of the information visualization, which leads to the most effortless way of exact stated implementation of Building Information Modeling into the practice of designing structures and buildings in the Czech Republic. The Implementation of using Building Information Modeling technology in designing structures and buildings will lead to the enhanced quality of the project documentation and generally to more effective cost savings during whole life cycle of buildings. Moreover, the all over using of the BIM technology in the Czech Republic will be very useful in the Facility Management area, especially in the facility management and maintenance of state buildings.



ELASTIC-PLASTIC BENDING LOAD-CARRYING CAPACITY OF STEEL MEMBERS

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ABSTRACT

Many members of steel structures are subjected mostly to bending. In these cases can be especially very useful to use by resources also plasticity of structural steels. Therefore, the new international and national standards for the design of steel structures allow the elastic and plastic calculation methods and procedures. The elastic-plastic bending load-carrying capacity of steel members depends in a high degree on local stability of their webs and flanges. From local stability aspects the steel members can have compact or slender cross-sections. The compactness of steel cross-sections is only relative. It depends on the loading level or material utilization, and on the buckling resistance of their webs and flanges in the most loaded cross-sections and areas. The judgment of steel cross-sections compactness in this content is complicated stability problem. The new standards for the design of steel structures contain the specific classification of the cross-sections due to dimensions and slenderness of their compression and bending parts. The paper contains the results of the experimental-theoretical investigation of the elastic-plastic local stability and load-carrying capacity of steel members. The proposed methodology enables the elastic-plastic calculation of the cross-section bending resistance depending from the limit development of plastic strains.



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BUILDING INFORMATION MANAGEMENT AS A TOOL FOR MANAGING KNOWLEDGE THROUGHOUT WHOLE BUILDING LIFE CYCLE

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ABSTRACT

BIM today is much more than drafting in 3D only, and project participants are further challenging, what is the topic of both this paper, and further research. Knowledge of objects, their behavior, and other characteristics has high impact on whole building life cycle. Other structured and unstructured knowledge is rightfully added (e.g. historically based experience, needs and requirements of users, investors, needs for project and objects revisions) Grasping of all attributes into system for collection, managing and time control of knowledge. Further important findings lie in the necessity of understanding how to manage knowledge needs with diverse and variable ways, when BIM maturity levels are advanced, as defined by Bew and Richards (2008). All decisions made would always rely on good, timely, and correct data. Usage of BIM models in terms of Building Information Management can support all decisions through data gathering, sharing, and using across all disciplines and all Life Cycle steps. It particularly significantly improves possibilities and level of life cycle costing. Experience and knowledge stored in data models of BIM, describing user requirements, best practices derived from other projects and/or research outputs will help to understand sustainability in its complexity and wholeness.



THE ISSUE OF CHANGES IN ADHESION OF BITUMEN SHEET TO PRIMARY LAYER OVER THE COURSE OF TIME IN MULTILAYER WATERPROOFING DURING SHEAR TESTING

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ABSTRACT

This paper is based on research dealing with defects that appear on concrete bridge decks with an insulating layer from asphalt strips on the interface between the asphalt strip and its basis. The durability and lifespan of the bearing structure of concrete bridge is determined by insulating layer, that constitutes, together with the primary layer and a protective layer, the insulation system of the concrete bridge deck. Paints based on low viscosity epoxy resins are one of the possibilities of primary layer implementation. These paints may be performed as anchoring-impregnation paints that usually represent single layer paint on the bridge deck surface. Sealing layer is another variant. Sealing layer is a multilayer consisting of anchoring-impregnation paint and sealing paint. The primary layers mainly provide vapour closing of the concrete surface, and partly, through roughening the surface, contribute to adhesion of bitumen (asphalt) insulation (waterproofing) layer. Application of the primary layer has been spreading in the Czech Republic since the 1990s. Now, after approximately 30 years of use defects in these epoxy based sealing layers at the interface between primary layer and waterproofing layer of reinforced bitumen sheets (RBS) are being solved in the Czech Republic. After performance of the first test focusing on breaking-strength, it was found that the strength between the asphalt and the primary belt layer in some types of low-viscosity resin-epoxy decreases and after a certain period of time again increases, depending on the time. Tensile strength test is carried out on a sample of asphalt strip, which is fused onto the substrate with a primer coat. It was therefore proceeded to test the shear adhesion. Testing of the shear adhesion is conducted on the entire concrete deck waterproofing system. It was supposed that the decrease of adhesion at this test become evident in higher extent. Adhesion tests in shear were performed on the primary layer consisting of an anchoring impregnation coating and sealing layer.



TRANSPORT INFRASTRUCTURE IN THE PROCESS OF CATALOGUING BROWNFIELDS

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ABSTRACT

To begin with, the identification and follow-up revitalisation of brownfields raises a burning issue in territorial planning as well as in construction engineering. This phenomenon occurs not only in the Czech Republic and Europe, but also world-wide experts conduct its careful investigation. These issues may be divided into several areas. First, it is identifying and cataloguing single territorial localities; next, it means a complex process of locality revitalisation. As a matter of fact, legislative framework represents a separate area, which is actually highly specific in individual countries in accordance with the existing law, norms and regulations (it concerns mainly territorial planning and territory segmentation into appropriate administrative units). Legislative base of the Czech Republic was analysed in an article at WMCAUS in 2016. The solution of individual identification and following cataloguing of brownfields is worked out by Form of Regional Studies within the Legislation of the Czech Republic. Due to huge the scale of issues to be tackled, their content is only loosely defined in regard to Building Act and its implementing regulations, e.g. examining the layout of future construction in the area, locating architecturally or otherwise interesting objects, transport or technical infrastructure management, tourism, socially excluded localities etc. Legislative base does not exist, there is no common method for identifying and cataloguing brownfields. Therefore, individual catalogue lists are subject to customer's requirements. All the same, the relevant information which the database contains may be always examined. One of them is part about transport infrastructure. The information may be divided into three subareas – information on transport accessibility of the locality, information on the actual infrastructure in the locality and information on the transport accessibility of human resources.



ASSESSING THE STRUCTURAL HEALTH STATUS OF TIMBER WARREN TRUSSES

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ABSTRACT

The Canadian government maintains close to 60 wooden Warren truss buildings that were initially constructed as temporary structures during the Second World War. Within a few months of construction, significant shrinkage and cracking began to take place. Various repairs and inspection methods have been tried over the years but the remaining structures continue to pose structural integrity concerns. Regular inspections are not sustained and recommended repairs are often costly and over conservative. A Structural Health Monitoring (SHM) system is planned to assess the health status of these structures in order to extend their design life and improve their safety. The objective of this study is to find a method of SHM in order to attain an understanding of the long-term performance of the trusses under service load as well as detect and identify the severity of damage. Various types of sensors and methods of data collection were implemented for this task. Electrical strain gauges as well as fiber optic sensors have been used. The current SHM system is fixed on three of the eleven trusses of the hanger under study. This paper presents the results of the preliminary study and its conclusions.



NUMERICAL MODELLING OF FOUNDATION SLABS WITH USE OF SCHUR COMPLEMENT METHOD

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ABSTRACT

The paper discusses numerical modelling of foundation slabs with use of advanced numerical approaches which are suitable for parallel processing. The solution is based on the Finite Element Method with the slab-type elements. The subsoil is modelled with use of Winkler-type contact model (as an alternative a multi-parameter model can be used). The proposed modelling approach uses the Schur Complement method to speed-up the computations of the problem. The method is based on a special division of the analysed model to several sub-structures. It adds some complexity to the numerical procedures, especially when subsoil models are used inside the finite element method solution. In other hand, this method makes possible a fast solution of large models but it introduces further problems to the process. Thus the main aim of this paper is to verify that such method can be successfully used for this type of problem. The most suitable finite elements will be discussed, there will be also discussion related to finite element mesh and limitations of its construction for such problem. The core approaches of the implementation of the Schur Complement Method for this type of the problem will be also discussed. The proposed approach was implemented in the form of a computer program which will be also briefly introduced. There will be also presented results of example computations which prove the speed-up of the solution - there will be shown important speed-up of solution even in the case of on-parallel processing and the ability of bypass size limitations of numerical models with use of the discussed approach.



THE IMPACT OF THE MATHEMATICAL MODEL DESCRIPTION ON THE ASSESSMENT OF THE RELIABILITY OF STRUCTURAL ELEMENTS

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ABSTRACT

The study presents a probabilistic approach to the problems of static analysis of structural elements. A steel and reinforced concrete elements were analyzed. Structural design parameters were defined as deterministic values and random variables. The latter were not correlated. The criterion of structural failure is expressed by limit functions related to the ultimate and serviceability limit state. In the performed analyzes explicit form of the random variables function were used. The Hasofer-Lind index was used as a reliability measure. In the description of random variables were used the different types of probability distribution appropriate to the nature of the variable. Sensitivity of reliability index to the random variables was defined. If the reliability index sensitivity due to the random variable X_i is low when compared with other variables, it can be stated that the impact of this variable on failure probability is small. Therefore, in successive computations it can be treated as a deterministic parameter. Sensitivity analysis leads to simplify the description of the mathematical model, determine the new limit functions and values of the Hasofer-Lind reliability index. Besides the effect of the assumed level of the variation coefficient of selected random variables on value of the reliability index was determined. The primary research method is the FORM method. In order to verify the correctness of the calculation SORM, Monte Carlo and Importance Sampling methods were used. In the examples of reliability analysis the NUMPRESS program was used. In the considered issues, the time was not taken into account explicitly.



COST-BASED DESIGN FRAMEWORK OF RC FRAME STRUCTURES IN SEISMIC AREAS THROUGH A LOSS ESTIMATION APPROACH

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ABSTRACT

In this paper a cost-based framework for seismic design of new buildings is proposed. Involved design parameters are initial construction cost and probable repair cost as consequence of earthquake-induced damage that may occur within the service life of the structure. While the initial cost can be assumed as deterministic value, the latter definitely is aleatory. Therefore the framework is based on a preliminary decision about the accepted probability that a given amount of repair cost is exceeded in a given period of time. The new framework is developed through the implementation of loss estimation analysis, performed in this work according to FEMA P-58 procedure using the so-called Performance Assessment Calculation Tool (PACT). The introduction of a cost-based design framework arises from the necessity of overcoming the limit of performance-based design of predicting damage and consequent economic loss due to earthquakes. The proposed procedure provides a higher consciousness about costs to deal with in case of emergency, both to stakeholders and designers. Two case study structures are analyzed with the aim of illustrating the framework through applicative examples. In particular a reinforced concrete frame building is analyzed, designing it through Displacement Based Design approach once as a moment resisting frame in the respect of capacity design principles, and once introducing a low-damage seismic control system based on re-centering passive rocking. The comparison of the two structural performances in terms of fragility curves and loss estimations highlights the capacity of the low-damage system of significantly reducing damage and repair cost corresponding to a specific probability of exceedance.



THE DYNAMIC EIGENVALUE PROBLEM OF CONCRETE SLAB ROAD SURFACE

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ABSTRACT

The paper presents an analysis of the dynamic eigenvalue problem of concrete slab road surface. A sample concrete slab was modelled using Autodesk Robot Structural Analysis software and calculated with Finite Element Method. The slab was set on a one-parameter elastic subsoil, for which the modulus of elasticity was separately calculated. The eigenfrequencies and eigenvectors (as maximal vertical nodal displacements) were presented. On the basis of the results of calculations, some basic recommendations for designers of concrete road surfaces were offered.



THE USE OF TECHNOLOGY IN THE DIAGNOSIS OF RAO DURABILITY OF CERAMICS MATERIALS

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ABSTRACT

In the literature we can find a numerous of publicatiосn realting to compounds durability of ceramic materials with specific pores properties. The authors of this paper, in an attampt to develop their own posistion in this matter, conducted a number of tests, whose test method RAO is the basic one.



EVALUATION ASPECTS OF BUILDING STRUCTURES RECONSTRUCTED AFTER A FAILURE OR A CATASTROPHE

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ABSTRACT

The article presents the characteristics of several steel structures, among others modernized industrial dye house, school sports hall, truck repair workshop, that have been rebuilt after a disaster or a catastrophe. The structures were analyzed in detail, and the evaluation and reconstruction processes were described. The emergencies that occurred during exploitation of the buildings were the result of multiple mistakes: incorrectly defined intervals between inspections, errors during periodic inspections, incorrect repair work recommendations. The concepts of reinforcement work implemented by the authors, enabling the long-term future failure-free operation of the objects, were presented. Recommendations for monitoring of the facilities, applied after reinforcement or reconstruction, have been formulated. The methodology for the implementation of specialized investigations, such as geodetic, optical, geological, chemical strength tests, both destructive and non-destructive, has been defined. The need to determine the limit values of deformations, deflections, damage or other faults of structural elements and the entire rebuilt facilities, as well as defining conditions for objects' withdrawal from operation in subsequent exceptional situations was indicated. On the basis of the studied cases, it has been shown that the safety of a construction is particularly related to the impeccable design and cautious execution of the steel structural elements, especially connections between them. The need for thorough verification of the accuracy of the static calculations, structural drawings and the building materials used in the consecutive stages of the construction process should also be emphasised. However, building administrators should strictly conform to relevant regulations concerning inspections and the maintenance of buildings. In practice, the elimination of all defects is impossible, but the awareness of the possible causes of hazardous situations allows for the minimisation of damage and, at the same time, ensures the safety of people who use the building.



APPLICATION OF A SEMI-ACTIVE ROCKING SYSTEM TO ENHANCE THE SEISMIC BEHAVIOUR OF PRECAST RC COLUMNS

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ABSTRACT

This work is inspired by the idea of dissipating seismic energy at the base of prefabricated RC columns via semi-active (SA) variable dampers exploiting the base rocking. It was performed a wide numerical campaign to investigate the seismic behavior of a pre-cast RC column with a variable base restraint. The latter is based on the combined use of a hinge, elastic springs, and magnetorheological (MR) dampers remotely controlled according to the instantaneous re-sponse of the structural component. The MR devices are driven by a SA control algorithm purposely written to modulate the dissipative capability so as to reduce base bending moment without causing excessive displacement at the top. The proposed strategy results to be really promising, since the base restraint re-laxation, that favours the base moment demand reduction, is accompanied by an high enhancement of the dissipated energy due to rocking that can be even able to reduce top displacement in respect to the "fixed base rotation" conditions.



HIGH WIND TURBINES UNDER EXTREME WIND LOADS: APPLICATION OF A SEMI-ACTIVE ROCKING SYSTEM

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ABSTRACT

The negative impact of the use of fossil fuels on the environment has led to a boom in the production of wind turbines. The progressively increasing turbines' height, decided to take advantage of the smoother winds at higher altitude, has led to an increased demand to control tower forces. The proposed work is focused on the application of a semi-active (SA) control system to limit bending moment demand at the base of a wind turbine by relaxing the base restraint of the turbine's tower, without increasing the top displacement. The proposed SA control system reproduces a variable restraint at the base that changes in real time its mechanical properties according to the instantaneous response of the turbine's tower. This smart restraint is made of a central smooth hinge, elastic springs and SA magnetorheological dampers driven by a properly designed control algorithm. A commercial 105 m tall wind turbine has been considered as a case study. Several numerical simulations have been performed with reference to two extreme loads, different one each other for intensity, duration, frequency content, so as to understand if a unique optimal configuration of the controller can be defined for both of them. The proposed study is also focused on understanding whether and how to reduce the residual top displacement due to the possible incremental base rotation that may happen during a wind load history, especially when it is long lasting.



MULTIPLE CRITERIA ANALYSIS OF ASSEMBLING BUILDINGS FROM STEEL FRAME STRUCTURES

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ABSTRACT

Steel frame structures are often used in the construction of public and industrial buildings. They are used for: all types of slope roofs; walls of newly-built public and industrial buildings; load bearing structures; roofs of renovated buildings. The process of assembling buildings from steel frame structures should be analyzed as an integrated process influenced by such factors as construction materials and machinery used, the qualification level of construction workers, complexity of work, available finance. It is necessary to find a rational technological design solution for assembling buildings from steel frame structures by conducting a multiple criteria analysis. The analysis provides a possibility to evaluate the engineering considerations and find unequivocal solutions. The rational alternative of a complex process of assembling buildings from steel frame structures was found through multiple criteria analysis and multiple criteria evaluation. In multiple criteria evaluation of technological solutions for assembling buildings from steel frame structures by pairwise comparison method the criteria by significance are distributed as follows: durability is the most important criterion in the evaluation of alternatives; the price (EUR/unit of measurement) of a part of assembly process; construction workers' qualification level (category); mechanization level of a part of assembling process (%), and complexity of assembling work (in points) are less important criteria.



NEW CONCEPT OF PRECAST CONCRETE SLAB ON PRE-TENSIONED BOARDS

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ABSTRACT

Economic growth of Poland throughout the years imposes the increase of building rate and an advancement. A good way to a fast erection of concrete building structures is a building prefabrication. Many prestressed floor systems were widespread in concrete building construction in Poland. These are large-size slabs (as hollow core slabs) as well as the slabs consisted of small-size elements as beam and block floor. Most of the solutions used are foreign patents which were imported and nested in polish building construction. Despite many disadvantages, beam and block floors are very popular. These consist of RC or pre-tensioned concrete beams with no more than 0.6m spacing and filling lightweight aggregate concrete, ceramic or wooden small-size blocks. Although it solution does not tight formwork or heavy fits it is time-consuming in construction and sometimes little economic. This slabs are not stiff and have tendency to transfer of noise. High rate of assembly is providing by the large-size slabs as hollow core slabs. On the other hand, the floor with total deep is transported. It raises the cost of transport significantly. The authors of this paper proposed the new solution of half precast concrete slab. It consists of pre-tensioned concrete boards as formwork and bottom tensioned slab layer. No reinforced concrete topping is casted at the concrete boards. The necessity of connecting reinforcement of both layers (concrete boards and topping) was avoided. It is a great importance for transport economic. The transverse steel inserts to ensure the transverse stiffness are used inside the topping concrete only. Detailed design calculation was carried out for the slab with the span of 8.0m and the total thickness of 250mm. The calculation gave the minimum concrete cover for 60 minutes of fire resistance equal to 25mm. It determinates the minimum thickness of the board of 50mm (for axial prestressing). Base of this, it can be concluded the standard capacity vehicle with the load of 24 tons is able to take 192m² of precast slab. It seem to be very attractive in transport cost. Some of concrete cross-section is completed with wide available in-situ concrete. The presented solution will be scope of tests in Cracow University of Technology. Testing of full-scale elements are planned. The paper will present the main assumptions, some structures details as well as the results of calculation. Encountered problems and concerns will also be drawn.



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APPARATUS PRODUCING AN EVEN DISTRIBUTION OF STRAIN INTO CARRIES

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ABSTRACT

In many high-rise residential buildings or multi-storey warehouses, machinery, so called lifts, is used for the vertical transportation of people or weights between two or more altitudinally distant places. Carriers used for lifts are steel ropes or sprocket chains, on which a cage or a counterbalance is hinged. Apparatus of all carriers, attached to the hinge of the cage or counterbalance, should be even. This can be hundred percently made only by hammer hinge. Fixed or spring hinge cannot be a perfect equalizing apparatus. This article describes an apparatus, which allows an even distribution of the strain into lift carriers, which use spring hinge of carrier ropes.



THE DYNAMIC CHARACTERISTICS OF BUILDINGS FROM SIGNAL PROCESSING OF AMBIENT VIBRATION

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ABSTRACT

The experimental technique used to determine the dynamic characteristics of buildings is based on records of low intensity oscillations of the building produced by various natural factors, such as permanent agitation type microseismic motions, city traffic, wind etc. The possibility of measuring/recording these oscillations is provided by the latest seismic stations (Geosig and Kinometrics digital accelerographs). The permanent microseismic agitation of the soil is a complex form of stationary random oscillations. The building filters the soil excitation, selects and increases the components of disruptive vibrations corresponding to its natural vibration periods. For some selected buildings, with different instrumentation schemes for the location of sensors (in free-field, at basement, ground floor, roof level), a correlation between the dynamic characteristics resulted from signal processing of ambient vibration and from a theoretical analysis will be presented. The interpretation of recording results could highlight the behavior of the whole structure. On the other hand, these results are compared with those from strong motions, or obtained from a complex dynamic analysis, and they are quite different, but they are explicable.



MODELING OF FLOW PAST DAMPER ATTACHED TO THE OVERHEAD TRANSMISSION LINE

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ABSTRACT

The paper presents the model of airflow around the conductor of overhead transmission line with the attached vibration damper of Stockbridge type. The analysis was performed for fixed Reynolds number $Re = 12000$, circular cross-sections of the conductor with the vibration damper. The purpose of the paper is to determine aerodynamic drag and lift coefficients and the frequencies for conductor and damper and also the pressure around them and in their wakes. Based on the analysis, the velocity distribution around the conductor and the damper was found. For analysis the model of RNG $k - \varepsilon$ was used. On the basis of the performed study one can emphasize the need of control of interference of both conductor and attached dampers. Due to the vibrations of conductors of overhead transmission lines, the reduction of their vibrations is essential. For this purpose the mechanical dampers are often used. The wind load depends on the wind velocity, air density, surroundings of the object, rough of the terrain, shape and the proportion of the elements of the structure. From the point of aerodynamics, the bodies are divided on: streamlined - elongated in the direction of the fluid flow such as cross sections used for wings of aircrafts, and bluff bodies. In the case of bluff bodies the separated wakes are formed, which are the source of detaching vortices, causing problems of vibrations of slender structures, e.g. aeolian vibrations of conductors. According to the Reynolds hypothesis, components of velocity and pressure fields can be represented as the sum of the averaged and turbulence components. The wind around the conductor with damper, that are modeled as smooth cylinders, of infinite length of circle section was analysed. Diameter of the circles are $D_1=18\text{mm}$ for the line and $D_2=40\text{mm}$ for the damper. The 'x' direction of the wind is analysed and 'y' component is zero. The unsteady flow for stream simulation around cylinders with fixed Reynolds numbers was used. Navier Stokes equations were solved numerically with use of Semi Implicit Method for Pressure Linked Equations with sequenced calculations of velocity and pressure's components. The coefficients of subrelaxations were additionally used for stabilizing the calculations process. Additionally, second order upwind method for momentum equations was adopted.



THE VISUAL PERCEPTION BY DRIVERS OF THE ADVERTISEMENTS LOCATED AT SELECTED MAJOR ROUTES

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ABSTRACT

This article characterizes the research based on the analysis of the eye fixation points on the advertisements. The research has been realized in real road and traffic conditions. The group of 12 drivers was equipped with the glasses oculometric measurement system mounted on the drivers head. The participants were driving their private cars. The analysis was concentrated on the fixations on the advertisement tables located along the selected national roads in Rzeszów area. For better recognition if the advertisements have distracted the drivers the number of fixations on the advertisements has been compared with the fixations on the road signs. The active drivers have observed many visual attractors like advertisements, road signs and cars being ahead and on another lane. Passive drivers have low number of fixations on road signs and advertisements. Their fixations typically have been localized on survey and they probably used the peripheral vision in order to recognition of road sign shapes. The results show, that: the percentage of fixations on the advertisement and road signs is different for each participants; the highest percentage of fixated advertisements was on the section with small number of advertisements, but in the city area, when a group of advertisements was on the road, the participants selected some of them, yet no participant fixated all advertisements localized in a small distance between them; the single advertisement visible from the long distance strongly attracts the visual perception; the percentage of the fixated advertisements was higher than road signs.



World Multidisciplinary

12-16 June, 2017 - Prague (Czech Republic)

Civil Engineering-Architecture-Urban Planning Symposium - **WMCAUS**



Session Title:

Building Performance and Simulation



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**PREDICTING ENERGY PERFORMANCE RATE OF RESIDENTIAL CONSTRUCTED IN DISTRICT
ANTALYA-KORKUTELI (TURKEY) BY ANFIS**

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ABSTRACT

This study is designed to investigate the energy performance results of buildings in Antalya/Korkuteli (Turkey) district with the adaptive neural fuzzy inference systems (ANFIS) prediction model. To construct this model, the carbon dioxide emissions values of 105 buildings were obtained from the experiments for the training stages of the ANFIS model. This data was on ANFIS model as Heating, cooling, hot water, lighting, 4 input parameters including and carbon dioxide emulsion as output parameter. The ANFIS model presented training performance with 0.02 error. The test results show that ANFIS model is a convenient to use and simple model for estimating of carbon dioxide emulsion.



ASSESSING THERMAL COMFORT DUE TO A VENTILATED DOUBLE WINDOW

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ABSTRACT

Building design and its components are the result of a complex process which should provide pleasant conditions to its inhabitants. Therefore, indoor acceptable comfort is influenced by the architectural design. ISO and ASHRAE standards define thermal comfort as the condition of mind that expresses satisfaction with the thermal environment. The energy demand for heating, beside the building's physical properties, also depend on human behaviour, like opening or closing windows. Generally, windows are the weakest façade element concerning to thermal performance. A lower thermal resistance allows higher thermal conduction through it. When a window is very hot or cold, and the occupant is very close to it, it may result in thermal discomfort. The functionality of a ventilated double window introduces new physical considerations to a traditional window. In consequence, it is necessary to study the local effect on human comfort in function of the boundary conditions. Wind, solar availability, air temperature and therefore heating and indoor air quality conditions will affect the relationship between this passive system and the indoor environment. In the present paper, the influence of thermal performance and ventilation on human comfort resulting from the construction and geometry solutions is shown, helping to choose the best solution. The presented approach shows that in order to save energy it is possible to reduce the air changes of a room to the minimum, without compromising air quality, enhancing simultaneously local thermal performance and comfort. The results of the study on the effect of two parallel windows with a ventilated gap in the same fenestration on comfort conditions for several different room dimensions are also presented. As the room dimensions' rate changes also the window to floor rate changes and so, under the same climatic conditions and same construction solution, different results are obtained.



MODELLING OF EDGE INSULATION DEPENDING ON BOUNDARY CONDITIONS FOR THE GROUND LEVEL

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ABSTRACT

The article presents results of CFD software aided simulations of a thermal bridge, existing at the wall–slab-on-ground connection. Calculations were made for different variants of the edge insulation location. Schemes without any edge insulation, with some vertical insulation, horizontal, diagonal, and diagonal combined with insulation used as formwork under the slab on ground were analysed. Each variant was differentiated with boundary conditions for the ground. Vertical borders of the model in the ground, as well as the lower border were described in the first solution as adiabatic, while in the second case, a variable temperature value, depending on the ground depth, was set. For comparison, additional calculations were conducted for non-stationary conditions, in which the initial temperature of the ground was set to the average annual temperature of air. The calculations were based on the location of Szczecin, for which the outside air temperature was set to $-16.0\text{ }^{\circ}\text{C}$. Results obtained from the simulation were then used to determine the thermal bridge parameters, in particular, thermal coupling coefficient and linear thermal transmittance. The effect of the set of boundary conditions is clearly seen. In general, for all the five variants, lower values of heat fluxes and linear thermal transmittances were obtained, when variable temperature in the ground was assumed. From the point of view of energy balance, it is more favourable to use the values of ψ_g obtained when the ground temperature is taken into account. The data breakdown shows that application of the actual temperature distribution in the ground to a model has a strong effect on distribution of the 0.0°C isotherm. The adiabatic model indicates that the ground under the slab freezes, while the model, which takes into account the temperature of the ground, shows that the ground under the floor has positive temperatures and the 0.0°C isotherm reaches only the edge of the outer wall. Moreover, the effect of the adopted ground temperatures on the hygro-thermal parameters of the cases in question was demonstrated. Again, the models that take into account the temperature of the ground provide more favourable values than those in the adiabatic models. For non-stationary heat flow conditions, the advantages of the diagonal edge isolation, which caused significant offset of the zero isotherm from the foundations, were presented. Variants of horizontal and diagonal edge insulations eliminate the risk of freezing of the foundation and the ground beneath it.



ANALYTICAL TOOLS FOR FUNCTIONAL ASSESSMENT OF ARCHITECTURAL LAYOUTS

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ABSTRACT

Functional layout of the building, understood as a layout or set of the facility rooms (or groups of rooms) with a system of internal communication, creates an environment and a place of mutual relations between the occupants of the object. Achieving optimal (from the occupants' point of view) spatial arrangement is possible through activities that often go beyond the stage of architectural design. Adopted in the architectural design, most often during trial and error process or on the basis of previous experience (evidence-based design), functional layout is subject to continuous evaluation and dynamic changing since the beginning of its use. Such verification of the occupancy phase allows to plan future, possible transformations, as well as to develop model solutions for use in other settings. By linking the design with the construction phase it is possible to build parametric models of functional layouts, especially in the context of sustainable design or lean design in every aspect: ecological (by reducing the property's impact on environment), economic (by optimizing its cost) and social (through the implementation of high-performance work environment). Parameterization of size and functional connections of the facility become part of the analyses, as well as the element of model solutions. The "lean" approach means the process of analysis of the existing scheme and consequently - finding weak points as well as means for eliminating these defects. This approach, supplemented by the method of reverse engineering means that already in the design phase there is essential knowledge about the functioning of the facility. It is far beyond intuitive knowledge, based on the standards and specifications. In the scope of reverse engineering methods the subject of the research is an audit of the product (i.e. architectural design, especially the built spatial layout) in order to determine exactly how it works. Information gained in this way is to help building a system for supporting decisions for preparing design solutions for future investments as well as the functional analysis itself becomes an essential part of the setting up building information process. The results of research are transferred and integrated with BIM system (building information modelling system), and included in the specifications of the IFC (Industry Foundation Classes), especially at the level of information on the relationship between the individual properties associated with elements (in the case of hospitals it may be information about the necessary connections with other rooms, access times from or to specific rooms, rooms utilization conditions, fire safety protection and conditions and many other). At the level of the BIM specification the model data are integrated at the BIM 6D (an extension of the model data with a range of functional analysis) or even BIM 7D (additional integration with systems used at the stage of operation and maintenance of the facility).



**ANALYSIS OF THE CONSTRUCTIVE LEGACY OF MODERN NEIGHBORHOODS IN ANDALUSIA.
CHALLENGES AND OPPORTUNITIES FOR THE ENERGETIC REHABILITATION OF THEIR SKINS:
SIMILARITIES AND DIFFERENCES WITH EUROPEAN MODELS**

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ABSTRACT

This communication aims to analyze the constructive legacy of housing developments that emerge across Europe in response to the urgent quantitative needs of homes existing in Europe at the end of the mid-century wars. In this time frame (third quarter of the twentieth century), several significant references are recognized by experimenting with new building systems thanks to the possibilities that the technique was offering to the architectural discipline. In contrast, that fact was not properly understood in many contexts, and many solutions employed in the construction of social housing were especially conditioned by traditional techniques. This is the case of many neighborhoods built in Andalusia (Spain). Despite sharing many characteristics with their European counterparts, this research has detected that they present a significant difference in the approaching to the relation between structure and enclosure. Besides the lack of coherence with its historical moment or the excessive use of material due to the use of massive solutions, over the years they have triggered a series of important pathologies, which have had important consequences on the housing conditions of these buildings. From these, the communication will focus on highlighting the deficiencies on the thermal envelope that occur in the points of friction between structural elements and the building envelope. In order to do this, a comparative study will be carried out between those solutions that were adopted in Andalusian context, with those that were points of reference in the use of innovative solutions. Definitely, it is intended to show that the technological development achieved in these other contexts was far behind others, despite the possibilities to innovate that were opened by the loss of the supporting function in building enclosures.



**SENSING TECHNOLOGIES FOR THE INNOVATION OF FACILITY MANAGEMENT: A COGNITIVE
FRAMEWORK OF APPLICATION**

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ABSTRACT

The several innovations in the field of Information Management and the wide dissemination of Sensing Technologies are opening up innovative scenarios for Facility Management (FM). The application of Sensing Technologies to the specificity of the FM field may give rise to new opportunities of innovation of traditional practices. Indeed, Sensing Technologies provide pioneering ways to understand, interpret and control the built environment, bringing out innovative forms of data sensing, processing, transfer, and networking. Sensing Technologies allow nowadays to easily and economically monitor in a continuous way various aspects of the built environment. This new availability to real-time data and the possibility of integration with static data (e.g. historical, technical, etc.), opens the door to the development of innovative strategies of services optimization before inconceivable. In parallel, the growth of the FM market witnesses the trend towards new integrated managerial and organizational models, requiring advanced tools of information management able to support decision-making processes both at the operational and strategic level. The stakeholders involved in the management of real estate express a growing demand for proper models of application and implementation of sensing technologies to the building management in order to exploit the opportunity to create value from it. In this light, the paper propose a cognitive framework, based on the elaboration of a "parameters-sensors matrix" able, firstly, to guide the identification of potential areas of improvement or innovation and, secondly, to identify improvement actions for the innovation of FM services and processes. The cognitive framework is based on the presence of (a) a plurality of various sensors, embedded or juxtaposed on building components, (b) a real-time monitoring system, based on a communication network that connects sensors to the data storage and allows the interaction among all the involved sensors, (c) a dynamic database which collect, process and use collected data. In particular, the dynamic database, on the life cycle of the building, is built on unified protocols of collection, processing and communication able to provide data on characteristics, behavior and use of the spatial and technical components. Along with the dynamic database, the real-time monitoring system, that has to be integrated and interoperable, completes the database with all those useful information coming from the building use and management phase. The methodology to built up the cognitive framework will be described in the paper, and it is articulated in the following phases: 1. Identification of the parameters useful for monitoring, controlling and managing the built environment; 2. Categorization and classification of sensors for detecting the identified parameters; 3. Creation of the "parameter-sensor matrix"; 4. Application of the matrix to the design, planning and programming, delivery and feedback phases of FM process; 5. Definition and description of potential improvement actions that can increase the efficiency or innovate the FM process thanks to the implementation of sensing technologies.



ASSESSMENT OF INDOOR CLIMATE MEASUREMENTS AND DERIVATION DATASETS FOR BUILDING SIMULATIONS

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ABSTRACT

The indoor climate is an essential input variable for many building physical simulations and analyses, for example on thermal comfort or energy consumption. Precise knowledge of the indoor climate is necessary to minimize the risk of mould or moisture damage and is required to ensure minimum heat insulation in buildings. Detailed data are especially necessary for the progressive application of transient calculations. The properties of building materials and the (local) outdoor climate are known, but there exists only rudimentary information about dynamic indoor climate. Most existing information in the literature about indoor climate is universal and forgoes a differentiation between climatic region, occupancy profile or utilisation of single rooms. In this paper, we report about indoor climate measurements in naturally ventilated living rooms over a period of one year. The measurement results complement the existing data to provide accurate results for indoor climate data in buildings. The measured values of indoor temperature and relative humidity serve to derive the dew point temperature. Dynamic, time-dependent regression functions are determined for those parameters. Furthermore, the indoor climate's dependency on outdoor temperature is also being analysed and will be described by statistical functions. During the measuring period the living rooms were free of mould and moisture damage and had different occupancies. On the one hand, the measurement results are used to derive an indoor climate model, and on the other hand an examination and evaluation of simulation results regarding the risk of condensation on the inside wall surfaces of naturally ventilated living rooms becomes possible.



SEARCH OBSERVATIONS OUTLIERS IN TIME SERIES USING DIFFERENT CALCULATION METHODS

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ABSTRACT

The analysis of the time series is one of the more significant evaluation methods of large sets of data, collected during a specified interval of time or permanently. This specific technique for analytical calculation may have wide application during construction monitoring in emergency disaster, when sourced are large data sets that require fast parse. In this situation, the importance of having the ability to search for items deviating from expected values during monitoring design. Important here: the speed of data processing and the ability to spot the observations indicate a change of State structures. The paper presents search algorithms for time series data deviating from expected values during monitoring. The main issue is the use of mathematical formulae, sensitive to changes of the measurements results, in such a way, as to get final results with the greatest possible speed and accuracy. For this purpose the constructed algorithms used the methods of moving average, the examination of variations to the Hausdorff distance and Cooke's distance function. The algorithms have been verified by means of simulation and test measurements.



THERMAL SIMULATION OF A ZERO ENERGY GLAZED PAVILION IN SOFIA, BULGARIA. NEW STRATEGIES FOR ENERGY MANAGEMENT BY MEANS OF WATER FLOW GLAZING

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ABSTRACT

The building sector is primarily responsible for a major part of total energy consumption. The European Energy Performance of Buildings Directives (EPBD) emphasized the need to reduce the energy consumption in buildings, and put forward the rationale for developing Near to Zero Energy Buildings (NZEB). Passive and active strategies help architects minimize the use of active HVAC systems, taking advantage of the available natural resources such as solar radiation, thermal variability and daylight. The building envelope plays a decisive role in passive and active design strategies. The ideal transparent facade would be one with optical properties, such as Solar Heat Gain Coefficient (SHGC) and Visible Transmittance (VT), that could readily adapt in response to changing climatic conditions or occupant preferences. The aim of this article consists of describing the system to maintain a small glazed pavilion located in Sofia (Bulgaria) at the desired interior temperature over a whole year. The system comprises i) the use of Water Flow Glazing facades (WFG) and Radiant Interior Walls (RIW), ii) the use of free cooling devices along with traditional heat pump connected to photo-voltaic panels and iii) the use of a new Energy Management System that collects data and acts accordingly by controlling all components. The effect of these strategies and the use of active systems, like Water Flow Glazing, are analyzed by means of simulating the prototype over one year. Summer and Winter energy management strategies are discussed in order to change the SHGC value of the Water Flow Glazing and thus, reduce the required energy to maintain comfort conditions.



HYSTERETIC MODELS CONSIDERING AXIAL-SHEAR-FLEXURAL INTERACTION IN REINFORCED CONCRETE STRUCTURES

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ABSTRACT

Most of the existing numerical models implemented in finite element software, at the current state of the art, are not capable, with enough reliability, to describe the interaction between axial, shear and flexural actions under cyclic loading (i.e. seismic excitation), neglecting crucial effects for predicting the nature of the collapse of reinforced concrete (RC) structural elements. Just a few 3D volume models or fiber beam models can lead to an enough accurate response, but they are still computationally inefficient for typical applications in earthquake engineering and also characterized by complex formulation. Thus, discrete models with lumped plasticity hinges may be the preferred choice for modelling the hysteretic behaviour due to cyclic loading conditions, in particular with reference to its implementation in a commercial software package. These considerations lead to this research work focused on the development of a model for RC beam-column elements able to consider degradation effects and interaction between the actions under cyclic loading conditions. In order to develop a model for a general 3D discrete hinge element able to take into account the axial-shear-flexural interaction, it is necessary to provide an implementation which involves a corrector-predictor iterative scheme. A reliable constitutive model based on damage plasticity theory is formulated and implemented for its numerical validation. Aim of this research work is to provide the formulation of a numerical model, which will allow implementation within a finite element software package for nonlinear cyclic analysis of RC structural members. The implemented model accounts for stiffness degradation effect and stiffness recovery for loading reversal.



**EXPERIMENTAL EVALUATION OF THE ADJUSTMENT FACTOR IN UNCONDITIONED SPACES TO
CALCULATE HEAT LOSSES BY TRANSMISSION**

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ABSTRACT

In this paper an experimental evaluation of the adjustment factor to calculate heat transfer by transmission between the conditioned space and the unconditioned space is presented for two detached houses. Temperature profiles were acquired by using data loggers for temperature placed in conditioned spaces, unconditioned spaces and in exterior of the buildings. The experimental measured value of the adjustment factor for each unconditioned space was compared to that obtained through simplified and detailed methods. The simplified methods include the Portuguese regulations (RCCTE, 2006 and REH, 2013) and BR 443:2006. The detailed method includes the EN ISO 13789:2007. The results allow evaluating how far the simplifications adopted in regulations can affect the calculation of heat losses by transmission from conditioned to unconditioned spaces



**RESEARCH ON CRACK FORMATION IN GYPSUM PARTITIONS WITH DOORWAY BY MEANS OF FEM
AND FRACTURE MECHANICS**

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ABSTRACT

Cracking of partition walls in newly commissioned buildings is a frequent phenomenon, actually “normal”. It is difficult, and probably impossible to eliminate completely because we are not able to anticipate accurately enough the spatial behaviour of building structures. Using overdimensioned sections of structural elements in order to eliminate small cracks would be an action unjustified economically, however, designers should know and apply solutions reducing the probability of cracking of partition walls based on the floor slab. Sometimes one may have an impression that the only criterion they follow is to achieve the safety of the structure at the lowest costs of execution, paying no attention to usability requirements. Damage in partition walls is sometimes so great that they cannot be accepted by their occupiers. This problem was illustrated by the example of damage in a gypsum partition wall with doorway attributed to deflection of the slabs beneath and above it. In searching for the deflection which causes damage in masonry walls, fracture mechanics applied to the Finite Element Method (FEM) have been used. For a description of gypsum behaviour, the smeared cracking material model has been selected, where stresses are transferred across the narrowly opened crack until its width reaches the ultimate value. Cracks in the Finite Element models overlapped the real damage observed in the buildings. In order to avoid cracks under the deflection of large floor slabs, the model of a wall with reinforcement in the doorstep zone and a 40 mm thick elastic junction between the partition and ceiling has been analysed.



**THE ASSESSMENT OF BENEFITS OF PARTIAL THERMAL RETROFIT OF HISTORIC BUILDINGS FROM
PERSPECTIVE OF INDIVIDUAL FLATS**

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ABSTRACT

Most of the European towns contain a lot of historic buildings, which in comparison with new ones are characterized by a deficit of technical and commercial advantages, which significantly reduces their usability. Their occupants are faced with low thermal quality of building envelope, ineffective technical systems and unsatisfying thermal comfort of old structure. The technical condition of historic buildings results in high costs of their maintenance and a significant burden on the environment in terms of energy sources demand and CO₂ emissions to the atmosphere. In order to improve the situation are taken thermal retrofit works, including the envelope of building and its technical systems. However, in the case of buildings that are under the law protection, with the preserved values of cultural and historical works, general retrofit cannot be carried out throughout the building often excluding main facade. There are two types of the benefits for the residents after successful done general thermal retrofit - decreasing energy demands of the building and increasing aesthetic its look. For both of them the residents bear the costs specified in the repairs fund. The repair fee in relation to the benefits associated with a reduction in energy bills is significantly different depending on the location of the units in the building. The aim of the study is to analyze the real economic and energy benefits of thermal retrofit in historical buildings from the perspective of the building as a whole collection of units and the individual units especially those are located in the front of the building. The scope includes a comparison of energy demand index and economic indicators of some selected tenement houses located in Szczecin, Poland. The buildings taken under consideration are varied in shape, size and share of the protected facade to the rest of their envelope. The adopted study method includes the calculation of the buildings energy demands for two states - current and after the thermal retrofit. The results of energy savings and costs of repair fund are compared for the entire building and each separate flat. Generally the results of the study indicate a significant potential of thermal retrofit of historic buildings as a whole. Achievable energy savings for each building varies primarily because of its shape, location in the urban structure, the structure condition and the period in which it was erected. But the main indicator is the possibility of carrying out work on as large area of its envelope as possible. After thermal retrofit with the renovation works of the facade, the energy benefits are significantly different for individual unites - the smallest are in the case of ones with the envelope of the front facade, highest in the case of premises located in the rear of the building and the share of residents in the repair fund, regulated by law, does not reflect the real benefits of the project.



A REVIEW OF METHODS FOR BUILDINGS ENERGY PERFORMANCE MODELLING

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ABSTRACT

Research presented in this paper gives a brief review of methods used for buildings energy performance modelling. This paper gives also a comprehensive review of the advantages and disadvantages of available methods as well as the input parameters used for modelling buildings energy performance. European Directive EPBD obliges the implementation of energy certification procedure which gives an insight on buildings energy performance via existing energy certificate databases. Some of the methods for buildings energy performance modelling mentioned in this paper are developed by employing data sets of buildings which have already undergone an energy certification procedure. Such database is used in this paper where majority of buildings in database have already gone under some form of partial retrofitting - replacement of windows or installation of thermal insulation but still have poor energy performance. The case study presented in this paper utilizes energy certificates database obtained from residential units in Croatia (over 400 buildings) in order to determine the dependence between buildings energy performance and variables from database by using statistical dependencies tests. Building energy performance in database is presented with building energy efficiency rate (from A+ to G) which is based on specific annual energy needs for heating for referential climatic data [kWh/(m²a)]. Independent variables in database are surfaces and volume of the conditioned part of the building, form factor, energy used for heating, CO₂ emission, building age and year of reconstruction. Research results presented in this paper gives an insight in possibilities of methods used for buildings energy performance modelling. Further on it gives an analysis of dependencies between buildings energy performance as a dependent variable and independent variables from database. Presented results could be used for development of new building energy performance predictive model.



COMPARISON OF APPROACHES IN OBTAINING VIEW FACTORS FOR RADIANT HEAT TRANSFER

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ABSTRACT

Measurements of heat transfer in the built environment, whether indoor or outdoor, can be obtained with a set of elaborate sensors. Amongst these measurements, one of the most challenging to accurately obtain is the mean radiant temperature (MRT). State-of-the-art measurement usually takes place in the center of the measured space with globe thermometer or net radiometers (in three dimensions to obtain the spatial integral radiation). Yet the globe thermometer is fixed in space while people move through it, and therefore it is not enough to obtain measurements for one static point. A change of location in space means a different view factor in relation to the surfaces hence a different MRT, which cannot be obtained unless the surface normal and distances to the new location is known. To address this problem, we developed a Spherical Motion Average Radiant Temperature Sensor system that reads both the surface temperature and distances at a known angle to create a radiant temperature spatial distribution model that can be used to calculate the MRT of any given point in space upon obtaining the new view factors. Approaches to obtain these view factors, however, may drastically vary: linking three measured points in the measured data to create a triangle for its surface normal is one approach; projecting the measured surface on a sphere of the radius of the measured distance is another. Since both methods will have systematic errors - the former will carry a higher temperature for all adjacent triangles and the latter may distort the view factor slightly for calculation of new MRTs - it is necessary to conduct an analysis to investigate how these methods lead to a different MRT results. The analysis will determine which is a better fit for indoor (smaller, flatter) or outdoor environment (larger, more concave/convex surface). The analysis will be done by comparing the results obtained experimentally from the two methods with a simulation of the space in 3D modeling using Rhinoceros and Grasshopper algorithmic modeling. In this paper we will present the method comparison and the consequent margin of errors, and demonstrate a visualization of the simulation we conducted.



ANALYSIS OF THE EXPLOSIVE INTERNAL IMPACT ON THE BARRIERS OF BUILDING STRUCTURES

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ABSTRACT

Work issues concern the safety of construction in relation to the hazards arising from explosion of the explosive charge located inside the building. The algorithms proposed in the paper for determining the parameters of the overpressure wave resulting from the detonation of clustered explosive charges, determine the basis for numerical simulation analyzes. Determination of the maximum value of peak pressure on the wave forehead of an internal explosion is presented on the basis of reflected wave analysis. Changeability in time of the internal explosion action describes the overpressure phase only. The analysis of the load caused by the internal explosive charge detonation was carried out under conditions of the undisturbed standard atmosphere. A load determination algorithm has been developed, taking into account the geometrical characteristics of the building barriers and the rooms as well as the parameters of environment in which the detonation occurs. The way of taking into account the influence of venting surfaces, i.e. windows, doors, ventilation ducts, on the overpressure wave parameters, was presented. Discloses a method to take into account the effect of the surface relief, ie. Windows, doors, air ducts, pressure wave parameters. Modification of the method for explosive overpressure determination presented by Cormi, Smith, Mays (2009), was proposed in the paper. This modification was developed on the basis of substitute impulse analysis for multiple overpressure pulses. In order to take into account the pressure distribution of explosive gases on the barrier surface, the method of modification the relationship for determination the changeability over time and space of the pressure of explosive gases, was presented. For this purpose, the changeability of the pressure wave angles of incidence to the barrier and the distance of the explosive charge to any point on the surface of the barrier, was taken into account. Based on the developed procedure, the overpressure changeability over time was determined for selected measurement points of the reference room. A comparative analysis of the determined loadings with experimental results and theoretical results of other authors, taken from the original work of Weerhiejm et al. (2012), was carried out.



World Multidisciplinary

12-16 June, 2017 - Prague (Czech Republic)

Civil Engineering-Architecture-Urban Planning Symposium - **WMCAUS**



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EVALUATION AND ANALYSIS OF EFFICIENCY OF SAFAGA PORT USING DEA-CCR, BCC AND SBM MODELS –COMPARISON WITH DP WORLD SOKHNA

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ABSTRACT

The competition among maritime ports is increasing continuously; the main purpose of Safaga port is to become the best option for companies to carry out their trading activities, particularly importing and exporting the main objective of this research is to evaluate and analyse factors that may significantly affect the levels of Safaga port efficiency in Egypt (particularly the infrastructural capacity). The assessment of such efficiency is a task that must play an important role in the management of Safaga port in order to improve the possibility of development and success in commercial activities. Drawing on Data Envelopment Analysis (DEA) models, this paper develops a manner of assessing the comparative efficiency of Safaga port in Egypt during the study period 2004 - 2013. Previous research for port efficiencies measurement usually using radial DEA models (DEA-CCR), (DEA-BCC) ,but not using non radial DEA model. The research applying radial - output oriented (DEA-CCR), (DEA-BCC) and non-radial (DEA-SBM) model with ten inputs and four output. The results obtained from the analysis input and output variables based on DEA-CCR, DEA-BCC and SBM models by software Max DEA Pro 6.3. DP World Sokhna port higher efficiency for all outputs compared to Safaga port.



**EVALUATION OF EFFECTIVE FACTORS ON TRAVEL TIME IN OPTIMIZATION OF BUS STOPS
PLACEMENT USING GENETIC ALGORITHM**

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ABSTRACT

In congested cities, locating and proper designing of bus stops according to the unequal distribution of passengers is crucial issue economically and functionally, since this subject plays an important role in the use of bus system by passengers. Location of bus stops is a complicated subject; by reducing distances between stops, walking time decreases, but the total travel time may increase. In this paper, a specified corridor for the city of Rasht in north of Iran is studied. Firstly, a new formula is presented to calculate the travel time, by which the number of stops and consequently, the travel time can be optimized. An intended corridor with specified number of stops and distances between them are addressed, the relations related to travel time for it are made, and its travel time is calculated. Then the corridor is modelled using a meta-heuristic method in order that the placement and the optimal distances of bus stops for that are determined. It was found that alighting and boarding time along with bus capacity are the most effective factors affecting travel time. Consequently, it is better to have more concentration on indicated factors for improving the efficiency of bus system.



**ANALYSIS OF CROSSING SPEED OF THE PEDESTRIANS IN MARKED AND UNMARKED CROSSWALKS
IN THE SIGNALIZED AND UN-SIGNALIZED INTERSECTIONS: CASE STUDY OF RASHT CITY (IRAN)**

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ABSTRACT

Pedestrians affect the traffic in the signalized and un-signalized intersections. Therefore, identifying the behavioural features of the pedestrians is of great importance and may result in better designing facilities for them. In this study, by shooting the four intersections in Rasht for 15 hours and inventory from 4568 pedestrians, crossing speed of the pedestrians in the marked crosswalks and unmarked crosswalks was evaluated and analysed. Results showed that pedestrians' crossing speed in the marked crosswalks is higher than their crossing speed in the unmarked crosswalks in both signalized and un-signalized intersections. Moreover, in the unmarked crosswalks in the signalized intersections, 15th percentile speed of male pedestrians, female pedestrians and group of pedestrians' decrease 6.4%, 5.4% and 12.2%, respectively, compared with the 15th percentile speed in the marked crosswalks. Above-mentioned values in the unmarked crosswalks in the un-signalized intersections for male pedestrians, female pedestrians, and group of pedestrians decrease 1.2%, 3.8%, and 1.4%, respectively.



CARGO SECURING DURING TRANSPORT DEPENDING ON THE TYPE OF A ROAD

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ABSTRACT

The article is concerned with the evaluation of a transport experiment conducted in the Czech Republic in order to prove the inappropriateness of the input data used for the purpose of cargo securing in vehicles. For the experiment, a TATRA truck was used. In a statistical evaluation, an overview of basic statistical characteristics, including an interpretation of significant values, is provided. In the article, a model of loading is presented illustrating the problem associated with the application of average – normative – values of acceleration coefficients when calculating inertial forces acting during transport on different types of roads.



TERMINALS FOR SUBURB BUS TRANSPORT IN BRATISLAVA (SLOVAKIA)

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ABSTRACT

The main objective of this article is to describe the strategy for development of the public transport terminals in the city of Bratislava, Capital of Slovak Republic. The reason goes from the private operator Slovak Lines, who operates the suburb bus transport in the agglomeration of the city. For this operator was created a transport model, while placing emphasis on optimizing the compliance of suburban public transport with urban public transport in the city of Bratislava and evaluating the significance of the new Bus Station to be constructed at Mlynské Nivy – in a new down town centre of the city. The main issue is to ensure the best available offer of public transport (PT) to passengers in the Bratislava agglomeration. The subject of the study was oriented to specify and propose changes in the transport infrastructure and integrated public transport organisation on the area of the city in terms of the significant position of the new Mlynské Nivy Bus Station (MN BS), which is under preparation with realization in this year 2017.



**PREDICTING AVERAGE VEHICLE SPEED IN TWO LANE HIGHWAYS CONSIDERING WEATHER
CONDITION AND TRAFFIC CHARACTERISTICS**

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ABSTRACT

Analysis of vehicle speed with different weather condition and traffic characteristics is very effective in traffic planning. Since the weather condition and traffic characteristics varies every day, so the prediction of average speed can be useful in traffic management plans. In this study, traffic and weather data for a two-lane highway located in Northwest of Iran were selected for analysis. After merging traffic and weather data, the linear regression model was calibrated for speed prediction using STATA12.1 Statistical and Data Analysis software. Variables like vehicle flow, percentage of heavy vehicles, vehicle flow in opposing lane, percentage of heavy vehicles in opposing lane, rainfall (mm), snowfall and maximum daily wind speed more than 13m/s were found to be significant variables in the model. Results showed that variables of vehicle flow and heavy vehicle percent acquired the positive coefficient that shows by increasing these variables the average vehicle speed in every weather condition will also increase. Vehicle flow in opposing lane, percentage of heavy vehicle in opposing lane, rainfall amount (mm), snowfall and maximum daily wind speed more than 13m/s acquired the negative coefficient that shows by increasing these variables, the average vehicle speed will decrease.



DEVELOPMENT OF PUBLIC RAIL TRACK TRANSPORT IN NORTH-WESTERN AREA OF BRATISLAVA

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ABSTRACT

The article deals with the development plans and possibilities of the Bratislava north-west expansion direction. Its focus is on the sites in the Lamaňská Brána area - Bory and CENTROP - which with their size of approximately 817 hectares are owned by two major developers. The article describes variants of possible rail transport system extension, as it is classified as the cordial system of public transport by the Bratislava urban planning documentation. The traffic service proposal deals with the new traffic infrastructure on given future and realised locations and generates input for the traffic planning itself, which will define the build intensity restriction using the traffic model. Particular variants of the rail transport in given area are proposed to be the primary tool for future area development possibility. Along with the urban tram with narrow gauge of 1000 mm defined in urban planning documentation, the area service is considered by the introduced standard gauge (1435 mm) tram-train track connected to the international railway link. This track is intended to be a part of the integrated suburban public transport system aiming to access the satellite town Stupava inside the Bratislava city agglomeration.



TRANSPORTATION NETWORK ROLE FOR CENTRAL ITALY MACRO-REGION DEVELOPMENT IN A TERRITORIAL FRAMES MODEL BASED

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ABSTRACT

This paper refers to an interdisciplinary planning research approach that aims to combine urban aspects related to a territorial spatial development with transport requirements connected to an efficiency and sustainable mobility. The proposed research method is based on "Territorial frames" (TFs) model that derived from an original interpretation of the local context divided into a summatory of settlement fabrics characterized in terms of spatial tile, morphology and mobility axes. The frames are the main plot that can reassemble the settlement systems and their posturbane forms; they can have autonomous and often diverse size and structure. An University of L'Aquila research is addressing the issue of socio-economic sustainable development of the Median Macro-region in central Italy by using, a broader European macro-regional territorial context, the TFs model. Due to the high level of complexity, this case study is representative of the issues that are common to a great number of European macro-regions. The research defines a TFs configuration model consisting of a settlement system, natural system and city network, able to support a polycentric region sustainable development, in line with the European interpretation. In TFs macro-scenario view, the completeness of the transportation networks represents one of the main key issues. In particular, this study proposes and examines, within the Median Macro-region, starting from the Adriatic and ending at the Tyrrhenian coast, a sustainable passenger and goods transportation network, the nodes of which coincide with ports, inter-ports, airports, main cities, industrial and agricultural production areas and the most important natural parks systems in Europe. Within this territorial configuration, a new high speed railway line is also proposed in order to rapidly connect, in a one global urban context, the cities of Rome and L'Aquila which represents the biggest Italian urban polarity, and one of the main nodes of the macroregional internal area, respectively. The transportation network has been designed to ensure urban-type connection times between all the territorial nodes, in order to trigger a new process of development of the internal areas of central Italy. This process tends to rebalance the current modal distribution of the traffic demand, in order to advance the collective transport system with reduction of costs, both for the user and the environment. Moreover, the TFs model is also designed to activate an economic and sustainable process of territorial development. In this vision, the landscapes become economic resources able to improve the territorial potentials. Further, the transportation network represents the system necessary to connect the local requirements to global ones, avoiding the territorial fragmentation.



EVALUATION OF CONGESTION IMPACT ON THE EMISSION OF PARTICULATE MATTER, ITS SPATIAL DISTRIBUTION AND FUEL CONSUMPTION RATE

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ABSTRACT

In terms of environment and health, particulate matter (PM) emitted from road transport is one of the most challenges in 21st century. Traffic congestion, as a long term problem, not only depresses the mobility in the urban areas, but also deteriorates the living condition of inhabitants and decreases environment welfare at the same time. Although it is important to understand the relationship quantitatively between PM emission and traffic congestion for further air quality control and transport management. It is difficult for general mobile measurements on road to achieve dynamically. Hence, in this study, a single lane NaSch model, automaton cellular style, was applied to simulate the traffic flow on road with open boundary condition, and get the instantaneous velocity of every vehicle. Adjusting the influx and outflow probabilities and taking averages, the profiles of velocity-influx (or outflow) were gained for the whole road at different traffic flow scenarios. Besides, empirical functions of emitted particulate matter and fuel consumption were used and exported simultaneously. Then, by dividing the whole lane into five sections, the trend of mean emitted particle concentrations and influx (or outflow) were plotted, and corresponding spatial distributions were gained for each section. Lastly, the rates of fuel consumption and correlated relation to particle emitted load along the whole lane could be assessed. The results provide an empirical way for evaluating the traffic related particle levels in different road sections, and the relevant analysis would shed light into the future design of the roadside microenvironments, particle exposure estimation and its protection.



DETERMINING THE CAPACITY MODEL OF URBAN ROUNDABOUTS CONSIDERING THE DRIVERS' BEHAVIOR IN ACCEPTING AND REJECTING OF GAPS

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ABSTRACT

Nowadays, urban roundabouts are of the most popular types of intersections that have grown highly all over the world. Thus, the accurate and engineering design of these types of intersections has a significant effect on improving their traffic performance. The capacity is one of the important traffic parameters in different intersections, which represents the maximum volume of vehicles entering the roundabouts. There are two general methods for determining the capacity of intersections including the use of analytical models such as gap acceptance model and the use of empirical methods (regression model). In the present paper, using the collected data such as entry and circulating volume, both accepted and rejected gaps were studied for three urban roundabouts and the capacity model have been determined by the use of analytical method. After implementation of the data, they became consistent and homogeneous in four different groups and the most optimized range of critical gaps as well as the follow up time were separately determined for each of these groups by using conventional methods such as Sigloch, Raff, Wu, and Harder and according to statistical analyses with a confidence level of 95%. From the obtained results, a range of 3.03 - 3.32 s for critical gap of the studied roundabouts and the range of 1.3 - 1.7 s for follow up time could be mentioned. It was used from the theory of gap acceptance in order to determine urban roundabouts capacity model, in which these gaps have a random nature and follow negative exponential distribution and by conducting this analysis (also has been used by Sigloch), some relations were obtained for determining the capacity of the roundabouts according to the impact of circulating volume and drivers' behavior. The results indicate that the maximum capacity of the roundabouts in the microscopic models is equal to 2400 veh/h, when the circulating flow rate is reached zero. Moreover, according to the obtained capacity model, the circulating flow never falls down to zero in the case that it reaches its peak value.



DETERMINING THE CAPACITY MODEL OF URBAN ROUNDABOUTS CONSIDERING THE PEDESTRAIN CROSSING

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ABSTRACT

Nowadays, urban roundabouts are of the most popular types of intersections that have grown highly all over the world, especially in Iran. Thus, the accurate and engineering design of these types of intersections has a significant effect on improving their traffic performance. The capacity is one of the important traffic parameters in different intersections, which represents the maximum volume of vehicles entering the roundabouts. There are two general methods for determining the capacity of intersections including the use of analytical models such as passing gap acceptance model and the use of empirical methods (regression model). In addition, various factors could influence the roundabout capacity, from which is the pedestrian traffic from the roundabout entrance. In this paper, it has been attempted to determine a model for the studied roundabouts by using the empirical method (multi-variable regression) and using the variables of circulating and pedestrian flow rates. One of the striking results obtained from this paper is the lack of influence of pedestrians in suburban roundabouts with low pedestrian traffic, which is occurred regarding a meaningful value of more than 0.05 in the correlation test between independent and dependent variables. In determining the capacity model of the studied roundabouts by using linear multi-variable regression, the reducing effect factors of circulating and pedestrian flow rate with a determination coefficient of 0.927 and a statistic value (F) of 871.562 are equal to 0.666 and 0.832, respectively. Additionally, the maximum capacity of the roundabouts, affected by the above factors reaches 2618 veh/h, when the circulating traffic and the pedestrian rates are equal to zero.



ANALYSIS OF BICYCLE ACCIDENTS TO IMPROVE CYCLIST SAFETY BY NETWORK BASED POINT PATTERN METHOD: VIENNA CASE

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ABSTRACT

Examining of the spatial distribution of bicycle accidents in different conditions and periods is a very important issue for increasing cyclist safety. This paper describes a point pattern analysis methodology of 1437 bicycle accidents resulted in injury or death in Centre of Vienna, Austria between the years 2012-2014. The Network-based Kernel Density Estimation was used to examine the hotspots of bicycle accidents and the Network-based Nearest Neighbor Distance method was taken into account to check the significance of the hotspots. Moreover, The Global Cross Nearest Neighbor Distance Method was performed to test the effect of urban components on the distribution of bicycle accidents. In order to understand the temporal and conditional differences, the accident data were analyzed in terms of four different classification orders. In the first classification approach, all accident data were considered. Then the accident data were classified according to season, light condition and precipitation condition, respectively. It can be concluded that the bicycle accident hotspots varies in space according to season, light and precipitation condition. Also, these detected hotspots are significant for the pattern of accidents, no matter what classification is used. Besides these points, at the 0.95 confidence level, bicycle accidents tend to cluster by signalized intersections, bus/tram stations, subway stations and also city bike stations. As a result, a systematic framework was proposed for spatio-temporal analysis of bicycle accidents for the built environment. The framework can serve as a guide to determine effective strategies for cyclist safety in urban areas.



TRAFFIC MODEL IN URBAN ROADS PLANNING FROM SURVEYS AND COUNTS. APPLICATION TO THE CITY OF BADAJOZ (SPAIN).

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ABSTRACT

This paper describes the methodology used for the construction of a traffic model in Badajoz (Spain) starting with the allocation of the origin-destination travel matrix derived from surveys and traffic counts conducted in the southern and eastern accesses of Badajoz. The traffic model describes the mobility in potentially-captable future southern traffic relationships and allows the calculation of savings in traveled distance and travel times on the current situation. The traffic model allows knowing different alternatives behavior in the construction of a new high-capacity road. The model is able to select the one which captures more traffic and produces a bigger saving in travel time, meaning, the one which produces a better socioeconomic improvement. The research concludes in favor of the nearest corridor to the city center, being this one the most crowded and the greatest time savings. It is also the corridor that allows giving the Southern Bypass a dual purpose of collecting-distributing in the city of Badajoz.



THE OVERLOOKED TRANSPORTATION PARTICIPANTS: MENTALLY IMPAIRED BUT STILL MOBILE

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ABSTRACT

Providing an inclusive transportation system is a global ambition. Whereas, mobility needs and mobility problems of people suffering from a physical impairment have already been observed frequently, people suffering from mental impairments (due to e.g. anxiety disorders, obsessive-compulsive disorders, dementia or other degenerative diseases) are often overlooked. Numerous studies already suggest that the number of people with mental impairment will significantly increase due to the demographic change and the prevalence of mental diseases. Nevertheless, it is assumed that many cases remain unreported. Therefore even the data collected do not necessarily give the full picture of the situation. Thus, the importance of mobility needs and mobility problems of people with mental impairments will gain dramatically. Participating in the transport system is a basic need that furthermore requires the ability of adopting different roles (e.g. driver, pedestrian). Due to explanatory studies of the authors it could be shown what kind of problems people with mental impairment are faced with while participating in the transport system or interacting in public space. Thus, these studies represent the first step that is needed to consider the specific needs of people with mental impairments in future planning. The identified problems of people who are suffering from mental impairment are various. Thereby it can be distinguished between problems triggered by structural (e.g. absence of emergency buttons, spacious stations), organisational (e.g. absence of security stuff, lacking information according time table of public transport) or social conditions (e.g. crowded places or vehicles, stigmatisation). This paper presents an overall view of specific requirements of people with mental impairment and suggests possible solutions for a transportation system.



RELIABILITY OF TRAVEL TIME: CHALLENGES POSED BY A MULTIMODAL TRANSPORT PARTICIPATION

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ABSTRACT

Travel time reliability represents an essential component in individual decision making processes for transport participants, particularly regarding mode choices. As criteria that describe the quality of both transportation systems and transportation modes, travel time reliability is already frequently compiled, analysed and quoted as an argument. Nevertheless, travel time reliability is solely mentioned on monomodal trips, while it has remained unconsidered at multimodal transport participation. In addition, given the fact that multimodality gained significantly in importance it is crucial to establish how travel time reliability could be determined on multimodal trips. In the last few years, it became increasingly common to compile travel time data for 1) specific travel routes (e.g. along a segment of a frequently used road), 2) traffic infrastructure (e.g. expressway, highway), 3) transportation services (e.g. usage of a certain bus or tram) or 4) trips (e.g. for a certain purpose like commuting). Firstly, this paper evaluates current approaches to determine travel time reliability. With regard to their specific conditions of application different concepts from literature (e.g. mean-variance-model, mean-lateness-approach) will be reviewed and criticised. Secondly, particularities of multimodal trips that are relevant to determine travel time reliability will be mentioned. Therefore, trips in (sub)urban areas made by commuters will be taken as an example. On the basis of these aspects "stemming from current concepts and particularities of multimodal trips" this paper outlines unmet challenges as a basis for further discussion. Finally, a new procedure to determine travel time reliability on multimodal trips is going to be presented.



REVIEW ON FEASIBILITY OF USING SATELLITE IMAGING FOR TURNOUT RISK MANAGEMENT

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ABSTRACT

One of the emerging significant yields by advancement in engineering, satellite imaging often begins to be popular in any kind of civil engineering projects e.g., bridge, canal, dam, earthworks, power plant, water works etc. to provide an accurate, economical and expeditious means of acquiring a rapid assessment. Satellite imaging services in general utilise combinations of high quality satellite imagery, image processing and interpretation to reach specific intended information e.g. surface movement analysis. To extract, manipulate and provide such a precise knowledge, several systems including geographic information systems (GIS) and global positioning system (GPS) are generally used for orthorectification. Although such systems are useful for mitigating risk from projects, productiveness of those is arguable, and operational risk after application is open to discussion. As applicability of any novel application to the railway industry is often measured whether or not it has gained deep knowledge on, and to what degree, as a result of errors during its operation, this novel application yields risk on ongoing project. This study reviews what can be achievable for risk management of railway turnouts thorough satellite imaging. The methodology is established on the basis of other published articles in this area and the results of applications to understand how applicable such imagining process is on railway turnouts, and what sub-systems in turnouts can be effectively traced/operated with less risk than now. As a result of this review study, it is aimed that the railway sector understand better a risk mitigation in particular applications.



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DERAILMENT-BASED FAULT-TREE ANALYSIS ON RISK MANAGEMENT OF RAILWAY TURNOUT SYSTEMS

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ABSTRACT

Railway turnouts are fundamental mechanical installation, which allows a rolling stock to divert one direction to another. As those are of a large number of engineering sub-systems, e.g. track, signalling, earthworks, huge potential with high risk is highly likely to be expected through various kind of failure mechanisms in this particular sub-systems. This could be a cause of any catastrophic event. A derailment, one this undesirable events, often results, albeit rare occurs, in damaging to rolling stock, railway infrastructure and disrupt service, and has the potential to cause casualties and even loss of lives. As a result, it is quite significant that a well designed risk analysis is performed to create awareness of hazards and identify what parts of the systems may be at risk. This study will focus on all types of failures as a result of numerous contributing factors reported officially as accident reports. This risk analysis is designed to help industry to minimise this accidents occurrence at railway turnouts. The methodology of the study relies on accurate assessment of derailment likelihood, and is based on statistical multiple factors-integrated accident rate analysis. As outcome of the study is prepared in a way of ranking product risks and failures, and showing the impact of potential process.



**LOD BIM ELEMENT SPECIFICATION FOR RAILWAY TURNOUT SYSTEMS RISK MANAGEMENT USING
THE INFORMATION DELIVERY MANUAL**

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ABSTRACT

Railway turnouts are complex systems designed using complex geometries and grades which makes them difficult to be managed in terms of risk prevention. This feature poses a substantial peril to rail users as it is considered a cause of derailment. In addition, derailment leads to financial losses due to operational downtimes and monetary compensations in case of death or injury. These are fundamental drivers to consider mitigating risks arising from poor risk management during design. Prevention through design (PtD) is a process that introduces tacit knowledge from industry professionals during the design process. There is evidence that Building Information Modelling (BIM) can help to mitigate risk since the inception of the project. BIM is considered an Information System (IS) where tacit knowledge can be stored and retrieved from a digital database making easy to take promptly decisions as information is ready to be analysed. BIM at the model element level entails working with 3D elements and embedded data, therefore adding a layer of complexity to the management of information along the different stages of the project and across different disciplines. In order to overcome this problem, the industry has created a model progression specification named Level of Development (LOD). This study will fill the gap found within the Risk Management literature between tacit knowledge, which is experienced driven knowledge and explicit knowledge which can be considered as data represented by attributes. The present study will use the Informational Delivery Manual methodology (IDM) to record Risk Management knowledge within a BIM IS. The outcome of the study is a LOD driven Risk management database which will set the basis for future PtD BIM techniques such as Risk management LOD data validation or visualisation of BIM hazards based on the LOD standard. This will therefore, help the industry to minimise risks since the inception of the design process.



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PREDICTION OF CONGESTION IN TRAFFIC MODELLING USING DUFFING HOLMES OSCILATOR

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ABSTRACT

Prediction of congestion in traffic is an innovative and new process of identification and detection chaotic features in times series analysis. Chaotic identification forecasting model is focused on short term forecasting due to hardware limitations. We estimate the emergence of traffic flow congestion in road traffic when the traffic load on a specific section of the road in a specific time period is close to exceeding the capacity of road infrastructure. Under certain conditions, it can be seen in concentrating chaotic traffic flow parameters. The orientated model is validated on six locations with a specific requirements. The paper points out the issue of importance for traffic flow forecasting and simulations for preventing or rerouting possible short term traffic flow congestions.



DEVELOPMENT OF LOW-COST HYDRAULICALLY ACTUATED CYCLIC TRIAXIAL TESTING SYSTEM FOR GRANULAR MATERIALS

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ABSTRACT

The mechanical response of granular pavement materials is mostly measured by dynamic triaxial testing systems. The outputs of these tests are material parameters which are commonly used in design of pavement structures. Present hydraulically actuated cyclic triaxial testing systems are very complex and expensive systems. So, only limited research centers have ability of doing these cyclic triaxial testing. In this study, a low-cost dynamic triaxial testing device having hydraulic loading actuator was developed to determine the mechanical properties of granular materials such as resilient modulus and Poisson's ratio. This apparatus is fully computer controlled, by means of specially designed control software, so that, new design parameters can be added to the program or modifications can be made. The cyclic load is measured by a load cell, and applied load is controlled by an electro-hydraulic control system. The max available size for cylindrical testing specimens is 150x300mm for geomaterials. The performance tests and preliminary studies show that, through the data obtained from dynamic triaxial tests that considerably successful results have been realized as compared to similar test results. The most important advantage of developed device is the reduced cost, which is approximately one third of equivalents.



BUS-STOP BASED REAL TIME PASSENGER INFORMATION SYSTEM - CASE STUDY MARIBOR

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ABSTRACT

One of key elements of promoting public transport are widely available, easy to understand and attractive information about public transport services as real time passenger information. For the successful implementation of real time passenger information systems various components should be considered as: passengers needs and requirements, stakeholder involvement, technological solution for tracking, data transfer, etc. Maribor was investigated and tested implementation of bus real time passenger information system. The design phase included development of methodology for selection of appropriate macro and micro location of the real time panel, development of a real time passenger algorithm, definition of a technical specification, financial issues and time frame. The evaluation shows that different people have different requirements; therefore the system should be adaptable for use of various types of people, according to the age, the purpose of journey, experience of using public transport, etc. The average different between perceived waiting time for a bus is 35% higher than the actual waiting time and grow with the headway increase. Experiences from Maribor have shown that the reliability of real time passenger system (from technical point of view) must be close to 100%, otherwise the system may have negative impact on passengers and may discourage the use of public transport. Among considered events of arrivals during the test period, 92% of all prediction were accurate. The cost benefit analysis has focused only on potential benefits from reduced perceived users waiting time and foreseen costs of real time information system in Maribor for 10 years period. Analysis shows that the optimal number for implementing RTPI system at the bus stops in Maribor is set on 83 bus stops (approx. 20 %) with the highest number of passenger. If we consider all entries at the chosen bus stops the total perceived waiting time on yearly level could be decreased for about 60,000 hours.



HUMAN PATHWAYS ANALYSIS - A STATE OF THE ART APPROACH

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ABSTRACT

Human pathways, also known as desire paths or trails, are ways as a consequence of erosion on open unpaved areas caused mostly by pedestrians. The occurrence of these pathways is as old as mankind. They are rudimental traffic facilities which are worth studying, as they allow deep insights into human behaviour in traffic situations. In previous researches and papers we showed an investigation method based on an analogy between such visible trails and local stresses in shell structures caused by static load. Elaborated tests have shown, that this examination method is possible, and of great promise. With this method forces, which drives human traffic participants can be visualised, with the global goal to establish a tool for traffic engineers which can determine where pathways in a city are most human-friendly and energy-efficient. In recent research, limits of this specific technique were examined, together with connections to related investigation methods of this field. In this following up paper we only give a brief introduction to the methodology, but point out the possible applications and restrictions of this analogy, as well as give a review of different finite-element techniques.



EFFECT OF PEDESTRIANS ON THE SATURATION FLOW RATE OF RIGHT TURN MOVEMENTS AT SIGNALIZED INTERSECTION: CASE STUDY OF RASHT CITY

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ABSTRACT

Saturation flow rate is one of the important items in the analysis of the capacity of signalized intersections that are affected by some factors. Pedestrian crossing on signalized intersection is one of the factors which influence on the vehicles flow. In addition, the released researches determined that the greatest impact of pedestrian on the saturation flow occurred in the Conflict zone where the most chance of encounter pedestrians and vehicles has in turning movements. The purpose of this paper is to estimate the saturation flow rate considering the effect of pedestrian on right turn movements of the signalized intersections in Rasht city. For this goal, 6 signalized intersections by 90 cycles of reviews was selected for the estimation of saturation flow rate by the microscopic method and also 3 right turn lanes contains differences radius by 70 cycles of reviews for investigation of the pedestrians effects was collected. Each phase of right turn lanes cycle was divided in pieces of 10-second period which was totally 476 samples considered volumes of pedestrians and vehicles at that period. Only 101 samples of those were ranged saturated conditions. Finally with using different regression models, the best relationship between pedestrian's volume and right turning vehicles flow parameters were evaluated. The results indicate that there is a primarily linear relationship between pedestrian volume and right turning vehicles flow with $R^2=0.6261$. According to this regression model with the increase in pedestrians, saturation flow rate will be reduced. In addition, by comparing the adjustment factor obtained in this study and other studies was found that the effect of pedestrians on the right-turn movements in Rasht city is less than the rest of the world.



DETERMINING OF THE PARKING AND THE TAXI BLOCKAGE ADJUSTMENT FACTOR FOR THE SATURATION FLOW RATE AT THE OUTLET LEGS OF SIGNALIZED INTERSECTIONS: CASE STUDY FROM RASHT CITY (IRAN)

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ABSTRACT

The presence of taxi stops within the area of signalized intersections at the outlet legs due to unnatural behavior of the taxis such as sudden change of lanes, parking activities and stopping the vehicle to discharge or pick up the passengers have led to reduction of saturation flow rate at the outlet legs of signalized intersections and increased delay as well as affecting the performance of an adjacent lane. So far, in term of evaluating effective adjustment factors on saturation flow rate at the inlet legs of the signalized intersections, various studies have been carried out, however these adjustment factors influenced by parameters including geometrical characteristics, number of lanes, the characteristics of traffic flow and driver's behaviors are not similar at inlet and outlet legs; and due to the difference in mentioned parameters, there has not been any studies yet at the outlet legs. Hence, the consideration of the traffic effects of these behaviors on the saturation flow rate of the outlet leg is very important. The present paper evaluates and analyzes the parking maneuver time and taxi blockage time based on the lane width as well as determining the effective adjustment factors on the saturation flow rate using recording related data at four signalized intersections in Rasht city. The results show that the average parking maneuver time is a function of the lane width and is increased as the lane width is reduced. Also, it is suggested to use the values of 7.37 and 11.31 seconds, respectively for the average parking maneuver time and the average blockage time of taxis at the outlet legs of signalized intersections for the traffic designing in Rasht city.



ESTIMATION DELAY VARIATION AND PROBABILITY OF OCCURRENCE OF DIFFERENT LEVEL OF SERVICES BASED ON RANDOM VARIATIONS OF VEHICLES ENTERING AT SIGNALIZED INTERSECTIONS

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ABSTRACT

Estimation of delay in signalized intersections is a difficult and complicated process that depends on many variables. Among the factors influencing the intersection delay, variable of saturation degree (X) is one of the most important variables. In the present study, a new analytical method has been proposed for calculating delay variation at the intersection isolated in under-saturated conditions and under the influence of vehicles' different entry distributions in the paths leading to the intersection. Unfortunately, the average delay is calculated as a point form for average values of vehicles' entering to the intersection in today's common methods for calculating the delay at the intersection; then, the level of service of intersection is specified from the resulting delay; on the other hand, the influence of vehicles' different entering distributions to the intersection cannot be seen in such methods. But the delay is expressed as a range of values for different values of saturation degree and for vehicles' different entering distributions to the intersection in the proposed method that this leads to achieve more real results from level of service of intersection.



THE RELATIONSHIP BETWEEN PSYCHOMOTOR EFFICIENCY AND SENSATION SEEKING OF PEOPLE EXPOSED TO NOISE AND LOW FREQUENCY VIBRATION STIMULI

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ABSTRACT

At the workplace of the machine operator low frequency whole body and hand- arm vibrations are observed. They occur together with noise. Whole body vibration in the range of 3-25 Hz are detrimental to the human body due to the location of the resonant frequency of large organs of the human body in this range. It can be assumed that for this reason people working every day in such conditions can have reduced working efficiency. The influence of low frequency vibration and noise on the human body leads to both physiological and functional changes. The result of the impact of noise and vibration stimuli depends largely on the specific characteristics of the objects, which include among other personality traits, temperament and emotional factor. The conducted in the laboratory pilot study was attended by 30 young men. The aim of the study was to look for correlations between the need for stimulation of the objects and their psychomotor efficiency in case of vibration exposure and vibration together with noise exposure in variable conditions task. Defined in the study need for stimulation of the objects it is based on theoretical assumptions of one dimensional model of temperament developed by Marvin Zuckerman. This theory defines the need for stimulation as the search for different, new, complex and intense sensations, as well as the willingness to take risks. The aim of research was to verify if from four factors: the search for adventure and horror, to seek sensation, disinhibition and susceptibility to boredom, can be chosen that which in conjunction with varying operating conditions, may significantly determine the efficiency of the task situation. The objects performed the test evaluation motor skills consisting in keeping the cursor controlled by a joystick through the path. The number of exceeds of the cursor beyond the path and its maximum deviation was recorded. The collected data were used to determine the correlation between the working efficiency and the need for stimulation of the objects under the influence of vibroacoustic factors. Analysis of the results allowed to define a set of criteria that make up the arduous working conditions. The obtained results indicate the need for the continuation of the research.



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WORK AND RESEARCH OF ROBERT BARTINI IN THE FIELD OF TRANSPORT AND AVIATION

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ABSTRACT

After the First World War, the young Soviet Union (USSR) desperately needed new engineers and scientists who would provide the new country with development of modern industry and transportation. At that time, Western European countries had knowledge and experiences, especially in the field of aviation. One of the young engineers was Robert Bartini, who was educated in Austria-Hungary and Italy, and graduated from Milan Polytechnic Institute. In 1923, he fled Italy to escape Fascists and emigrated in Soviet Union. This article is a brief description of aircraft designer Robert Bartini and his role in the development of the military, passenger and transport aviation. In addition, it presents his vision of the intercontinental and continental high-speed transport, which was his focus in the last years of his work and creation. He worked as a researcher and expert in the former Soviet Union, therefore, more detailed and relevant information of his work has been revealed to the public in recent years. In Russia, he is very popular as a researcher and developer. There are many books about him in Russian and Italian language, but not in English. Thus, his work is still quite unknown in the West. He was born in Kanjiza (today Serbia) in 1897, and spent his youth in Fiume (Rijeka, today Croatia).



LIFE-COURSE MOBILITY OF ELDERLY IN BUCHAREST-ILFOV METROPOLITAN AREA

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ABSTRACT

The paper reveals aspects of travel behavior during the life-course of pensionnaires currently living within the metropolitan area of Bucharest, capital city of Romania. Travel behavior is studied along with residential dynamics and workplace changes since the political system change occurring in 1989. The data was collected by means of an online life-course survey among a representative sample of Bucharest-Ilfov area, and it makes a correlation among travel behavior to work, and several socio-economic characteristics during respondent's life course in a transitional, post-communist country.



A MODE TO PRIORITIZE PEDESTRIAN FACILITIES REQUIREMENTS IN AN URBAN ENVIRONMENT

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ABSTRACT

The modal share of pedestrians in developing cities has the tendency of being very high as opposed to developed cities. For example, between 25-50% of trips in major Indian cities and about 50% of all trips in major African cities are made entirely on foot. However, though a significant number of trips are made by foot in majority of developing cities, pedestrian infrastructure, amenities, and services are often neglected in municipal planning and budgets (Fang, 2005). Pedestrian facilities in an urban area have a significant influence on the traffic flow and socio-economic environment. Improved walking facilities not only will generate new pedestrian flows, but it will also increase the comfort of the current walking population. Consequently, a need was arisen to measure the performance of pedestrian facilities for improvements and priority setting. In response, this study developed a model to prioritize road links for provision of pedestrian facilities in developing countries; small and medium cities. The model developed with three basic parameters namely; pedestrian demand, connectivity and evaluation of existing pedestrian facilities. When developing the model, a GIS based model for pedestrian demand was developed. Lastly a point scoring framework was developed for prioritization of road links with an evaluation of existing pedestrian facilities. The model estimated and validated in this study can be applied to other developing countries with same socio-economic conditions in developing countries. The researcher recognizes several limitations in the application of this model. Finally, the model can be applied to a variety of research problems and practical applications. In addition, the results from this study can be used for several research topics such as the impact of land development patterns and urban design on travel behavior, connections between built environment, physical activity and public health outcomes, assessment of potential transit markets, and understanding pedestrian risks.



BALLAST FOULING MECHANISM IN RAILROAD TRACKS

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ABSTRACT

Almost all of the inter-state railroad in Turkey made of ballasted track. Granit, basalt, crushed lime-stone or granular aggregate is used as ballast. As ballast ages, it is progressively fouled with fine-grained materials filling the void spaces. Some of these fine grained materials are; coal dust, metal dust and fine parts of crushed aggregate. If ballast fault reach a critical level, the track's stability and flexibility and drainage ability of ballast fails. Even, ballast fault can cause the derailment of trains. In Turkey, approximately 35% of all rail freight comes from coal, lignite, coke, iron ore and metal waste in last five years. In other word, approximately 35% of all rail freight occurred in Turkey has potential to make ballast fault. In this study literature has been surveyed compressively to find out the ballast fouling mechanism. The loss of performance in the ballast layer is often caused by very fine materials such as clay and silt sizes. When the gaps between the ballast are filled with fine material, the ability of drain of railroad track is seriously reduced. Laboratory studies have found that 15% to 25% fouling ratios for coal dust and clay are at critical levels. As railroads become widespread day by day in Anatolia, such an investigation deals with ballast fault is very important in the meaning of safe, economical and sustainable rail freight.



URBAN NOISE RECORDED BY STATIONARY MONITORING STATIONS

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ABSTRACT

The paper presents the analysis results of equivalent sound level recorded by two road traffic noise monitoring stations. The stations were located in Kielce (an example of a medium-size town in Poland) at the roads out of the town in the direction of $L_{\text{A}^3\text{dz}}$ and Lublin. The measurements were carried out through stationary stations monitoring the noise and traffic of motor vehicles. The RMS values based on A-weighted sound level were recorded every 1 s in the buffer and the results were registered every 1 min over the period of investigations. The registered data were the basis for calculating the equivalent sound level for three time intervals: from 6:00 to 18:00, from 18:00 to 22:00 and from 22:00 to 6:00. Analysis included the values of the equivalent sound level recorded for different days of the week split into 24h periods, nights, days and evenings. The data analysed included recordings from 2013 - 2016. The agreement of the distribution of the variable under analysis with normal distribution was evaluated. It was demonstrated that in most cases (for both roads) there was sufficient evidence to reject the null hypothesis at the significance level of 0.05. It was noted that compared with $L_{\text{A}^3\text{dz}}$ Road, in the case of Lublin Road data, more cases were recorded for which the null hypothesis could not be rejected. Uncertainties of the equivalent sound level measurements were compared within the periods under analysis. The standard deviation, coefficient of variation, the positional coefficient of variation, the quartile deviation and was proposed for performing a comparative analysis of the obtained data scattering. The investigations indicated that the recorded data varied depending on the traffic routes and time intervals. The differences concerned the values of uncertainties and coefficients of variation of the equivalent sound levels.



PEDESTRIAN SAFETY IN ROAD TRAFFIC IN POLAND

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ABSTRACT

Every third road accident in Poland involves a pedestrian as a participant or, most of the time, a casualty. Pedestrian accidents are usually the result of complex situations and the outcome of a number of factors related to driver and pedestrian behaviour and road infrastructure. Safety depends largely on how well the traffic condition is perceived and on visibility in traffic. The paper presents the results of analyses of methodologies for systematic studies of pedestrian behaviour and pedestrian-driver relations. The effects of the location of the site, type of cross-section and other selected parameters on pedestrian and driver behaviour are demonstrated. The analyses showed that pedestrians are most often put at risk by too long pedestrian crossings, vehicles going too fast around pedestrian crossings, lack of proper sight distance and poorly lit or unlit pedestrian crossings. The reason for such defective infrastructure is that planners, designers, contractors and maintenance services are not receiving any support from design, marking and maintenance regulations for pedestrian traffic. In addition, the Road Traffic Law is not restrictive enough when it comes to drivers' obligations towards pedestrian safety. Polish design regulations allow long pedestrian crossings up to four lanes in one direction or three lanes in two directions irrespective of traffic control and speed limits. Pedestrian crossings should be kept at a maximum of three lanes. There is nothing in the design regulations about the required driver-pedestrian sight distance. Neither does the Road Traffic Law help engineers with that. It is legal to park vehicles within 10 m of a pedestrian crossing which does not guarantee the necessary sight distance. Drivers must be able to see a pedestrian waiting or stepping onto the crossing from a distance that will help them come to a stop safely. It is safer to follow the principle of providing adequate pedestrian sight distance. Recommendations for pedestrian crossing design are also provided.



INFLUENCE OF ZONES NUMBER IN TRANSPORTATION MODELS INTO RESULTS OF COST-BENEFIT ANALYSIS OF TRANSPORTATION INVESTMENTS

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ABSTRACT

Nowadays feasibility studies need to be prepared for all planned transportation investments, mainly those cofounded by UE grants. One of the fundamental aspect of feasibility study is economic justification of given investment, evaluated in an area of so called cost-benefit analysis (CBA). The main goal of this CBA calculation is to prove the given transportation investment is really important for society and it should be constructed as economically efficient one. It can be said number of hours (PH - passengers hours) in trips and traveled kilometers (PK - passengers kilometers) are the most important for CBA results. The differences between PH and PK calculated for particular investments scenarios are the base for benefits calculation. Typically transportation simulation models are the best source for these data. Transportation simulation models are one of the most powerful tool for transportation network planning. They make it possible to evaluate forecasted traffic volume and passengers flow in public transport system for defined scenarios of transportation and land usage development. There are many different transportation models. Their construction is often similar, and they mainly differ in the level of their accuracy. Even models for the same area may differ in this matter. Typically these differences come from the accuracy of supply side representation: road and public transport network representation. In many cases only main road and public transport network is represented, while local and service roads are eliminated as a way of reality simplification. This also enables faster and more effective calculation process. However description of demand part of this models based on transportation zones is often stable. Difficulties with data collection, mainly data on land use, cause there is no changes in the analyzed land division into so called transportation zones. In this paper author presents an influence of land division into results of traffic analyses, and this way into results of CBA. Moreover it is presented in the paper the effectiveness of investments represented in results of cost-benefit analyses are strictly correlated to a transportation model detail.



DESCRIPTION OF ATTRACTIVENESS OF TRANSPORTATION ZONES FOR URBAN AREAS

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ABSTRACT

Transportation simulation models are one of the most powerful tool for transportation network planning. Basing on the result of traffic volume and passenger flow simulation most of invented or planned transportation investments projects can be evaluated from the economical point of view. One of the most important issue is these transportation simulation models should be up to date. All actual and forecasted changes in transportation network, like new roads, junctions, parking lots etc. and changes in land use should be taken into account during analyses process. Data on land use and its forecasted changes are one of the most important ones. Transportation zones, that represent particular parts of analyzed land, should be carefully defined. Attractiveness of transportation zones are base for description of transportation potential for selected areas of analyzed land. Lack of proper data and high cost of their achievement are ones of the biggest problem during transportation simulation model construction. Moreover correct data on zones" transportation attractiveness including work places, malls, shops, schools, universities, factories and others objects maybe called the most important data in these models, while these places are origin and destinations for inhabitants' daily trips. In the paper authors are going to present the proposal and examples of data collection basing on example of two different size towns for which such models were successfully constructed. The idea of GIS data usage and sources of these data are going to be presented. Moreover sources of demographic data and the method of theirs implementation in transportation simulation model will be described.



ROAD INFRASTRUCTURE SAFETY MANAGEMENT IN POLAND

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ABSTRACT

The objective of road safety infrastructure management is to ensure that when roads are planned, designed, built and used road risks can be identified, assessed and mitigated. Road transport safety is significantly less developed than that of rail, water and air transport. The average individual risk of being a fatality in relation to the distance covered is thirty times higher in road transport than in the other modes. This is mainly because the different modes have a different approach to safety management and to the use of risk management methods and tools. In recent years Poland has had one of the European Union's highest road death numbers. In 2016 there were 3026 fatalities on Polish roads with 40,766 injuries. Protecting road users from the risk of injury and death should be given top priority. While Poland's national and regional road safety programmes address this problem and are instrumental in systematically reducing the number of casualties, the effects are far from the expectations. Modern approaches to safety focus on three integrated elements: infrastructure measures, safety management and safety culture. Due to its complexity, the process of road safety management requires modern tools to help with identifying road user risks, assess and evaluate the safety of road infrastructure and select effective measures to improve road safety. One possible tool for tackling this problem is the risk-based method for road infrastructure safety management. European Union Directive 2008/96/EC regulates and proposes a list of tools for managing road infrastructure safety. Road safety tools look at two criteria: the life cycle of a road structure and the process of risk management. Risk can be minimized through the application of the proposed interventions during design process as reasonable. The proposed methods of risk management brings together two stages: risk assessment and risk response occurring within the analyzed road structure (road network, road stretch, road section, junction, etc.). The objective of the methods is to help road authorities to take rational decisions in the area of road safety and road infrastructure safety and understand the consequences occurring in the particular phases of road life cycle. To help with assessing the impact of a road project on the safety of related roads, a method was developed for long-term forecasts of accidents and accident cost estimation as well as a risk classification to identify risks that are not acceptable risks. With regard to road safety audits and road safety inspection, a set of principles was developed to identify risks and the basic classification of mistakes and omissions. This work has added to the Polish experience of preparing and implementing such tools within the competent road authorities.



THE EFFECT OF THE ROAD ENVIRONMENT ON ROAD SAFETY IN POLAND

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ABSTRACT

Run-off-road accidents tend to be very severe because when a vehicle leaves the road, it will often crash into a solid obstacle (tree, pole, supports, front wall of a culvert, barrier). A statistical analysis of the data shows that Poland's main roadside hazard is trees and the severity of vehicles striking a tree in a run-off-road crash. The risks are particularly high in north-west Poland with many of the roads lined up with trees. Because of the existing rural road cross-sections, i.e. having trees directly on road edge followed immediately by drainage ditches, vulnerable road users are prevented from using shoulders and made to use the roadway. With no legal definition of the road safety zone in Polish regulations, attempts to remove roadside trees lead to major conflicts with environmental stakeholders. This is why a compromise should be sought between the safety of road users and protection of the natural environment and the aesthetics of the road experience. Rather than just cut the trees, other road safety measures should be used where possible to treat the hazardous spots by securing trees and obstacles and through speed management. Accidents that are directly related to the road environment fall into the following categories: hitting a tree, hitting a barrier, hitting a utility pole or sign, vehicle rollover on the shoulder, vehicle rollover on slopes or in ditch. The main consequence of a roadside hazard is not the likelihood of an accident itself but of its severity. Poland's roadside accident severity is primarily the result of poor design or operation of road infrastructure. This comes as a consequence of a lack of regulations or poorly defined regulations and failure to comply with road safety standards. The new analytical model was designed as a combination of the different factors and one that will serve as a comprehensive model. It was assumed that it will describe the effect of the roadside on the number of accidents and their consequences. The design of the model was based on recommendations from analysing other models. The assumptions were the following: the model will be used to calculate risk factors and accident severity, the indicators will depend on number of vehicle kilometres travelled or traffic volumes, analyses will be based on accident data: striking a tree, hitting a barrier, hitting a utility pole or sign. Additional data will include roadside information and casualty density measures will be used - killed and injured.



THE CHANGE IN STIFFNESS OF PAVEMENT LAYERS IN THE LINEAR DISCONTINUOUS DEFORMATION AREA

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ABSTRACT

The underground mining exploitation causes deformations on the surface of the area which are classified as continuous and discontinuous. Mining deformations cause loosening or compression of the subsoil. Loosening has an impact on the reduction of the subsoil stiffness. As a result the reduction of subsoil stiffness causes loosening of construction layers built in that subsoil. Pavement is a specific case. If there happens to be loosening then the fatigue life of pavement is reduced and premature damages can be observed such as fatigue cracks or/and structural deformation. Discontinuous deformations are an especially interesting case. They not only cause the reduction of the stiffness of the subsoil and pavement layers but also cause rapid deterioration in roughness. Change of roughness is very dangerous especially on fast roads such as a highway. Lately there can be observed the so called linear discontinuous surface deformations in the lanes in the mining area. Unfortunately, the "in situ" research, presenting experiments on the effect of linear discontinuous deformations on the pavement, is in short supply. It is especially crucial with regard to the design of pavement reinforcement and the specification of optimal length of the reinforced part of the road. The article presents the results of "in situ" tests carried out on the chosen pavements where the so called linear discontinuous surface deformation has appeared. The genesis of the damage is connected with the underground mining exploitation. Falling Weight Deflectometer (FWD) has been used in researches. Measuring points were carried out with high frequency which helped to acquire a very interesting distribution of deflections. The distribution of deflections well shows the impact of linear discontinuous deformation on the changes in stiffness pavement layers. In the analysis of data from FWD there has been used back calculation which worked modulus of layers out. The results of researches and analysis have allowed to specify the scale of stiffness reduction of subsoil and pavement layers and, above all, to specify a minimal area of reinforcement. Therefore, the results of the analysis can be very helpful in determining the range of reinforcement as well as designing reinforcement. Of course, researches should be continued for better knowledge about the impact of discontinuous deformations on pavement.



INVESTIGATIONS OF SECTION SPEED ON RURAL ROADS IN PODLASKIE VOIVODESHIP

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ABSTRACT

Excessive speed is one of the most important factors considered in road safety and not only affects the severity of a crash but is also related to the risk of being involved in a crash. In Poland the problem of speeding drivers is widely common. Properly recognized and defined drivers behaviour is the base for any activities taken towards road safety improvements. Effective enforcement of speed limits especially on rural road plays an important role but conducted speed investigations basically focus on spot speed omitting travel speed on longer sections of roads which can better reflect drivers' behaviour. Possible solutions for rural roads are limited to administrative means of speed limitations, installations of speed cameras and police enforcement. However due to their limited proved effectiveness new solutions are still being sought. High expectations are associated with the sectional speed system that has recently been introduced in Poland and covered a number of national road sections. The aim of this paper is to investigate section speed on chosen national, regional and district roads located in Podlaskie voivodeship. Test sections included 24 road segments differ in terms of geometry characteristics. Speed measurements on regional and district roads were conducted with the use of a set of two ANPR (Automatic Number Plate Recognition) cameras while the section speed data recorded on national road was achieved from the section speed system operator. Spot speed was tested with the use of a radar gun. Conducted research allowed to compare drivers' behaviour in terms of travel and spot speed as well as to evaluate the relation between geometry parameters and section speed.



ANALYSIS OF FLEXIBLE ANCHORED HOLLOW WPC QUAY WALLS OF THE NEW TUR BERTH

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ABSTRACT

A seawall, also known as a bulkhead or retaining wall, is a structure built to reduce the effects of strong waves and to defend costal land from erosion. Traditionally, seawalls are made of steel, timber or concrete construction. Composite materials, however, have been recently introduced for their ease of installation/maintenance in dry processing, low cost, and environmentally- friendly materials. A WPC seawall system has been developed and patented for its unique hollow structure that can give greater stiffness and stability under various external stresses. This paper describes the development of design method used in the analysis of the WPC walls. The main challenge during the physical excavation works is to limit the deformations involved in order to minimize damage on adjacent structures. The deformations depend largely on the excavation and strutting procedures, but also on the properties of the structural elements like the soil, the sheet pile and strutting members. The detailed design procedure involves numerical analyses, national regulations and common practice considerations. The contribution of finite element method in this field was used herein to determine the lateral movements, the bending moments of the wall, the passive earth pressure of the soil and the tensile force exerted by the anchor rods. The overall objectives of this research can be divided into two categories, First calibration of the finite element model for the new TUR quay walls (the case study) and reviewing the results of the steel cross section that chosen and the suggested one. Second, analysis and comparing the results of WPC cross-sections with the designed Steel SPW.



USING THE THEORY OF GAMES TO MODELLING THE EQUIPMENT AND PRICES OF CAR PARKS

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ABSTRACT

In large cities there are two serious problems connected with increasing number of cars. The first problem is the congestion of vehicles' movement. The second one is too small of car parks, especially in centres of the cities. Authorities of cities and management of municipal streets introduce limitations in vehicles' movement and reduce the number of car parks to minimize streets crowd. That acting seems logical, but this is only the one point of view. From the other point of view municipal governments should aim to improve the level of the occupants' life and assure the financial incomes, which enable to cover indispensable expenses. From this point of view, the municipal car parks are needed and bringing the profits element of municipal infrastructure. Cracow, which is one of the largest cities in Poland (about 760 thousands of occupants, and Cracovian agglomeration is about 1,4 million persons), was chosen as the object of the investigations. The zone of paid parking in Cracow, administered by the company belonging to city, has possessed 28837 parking places in 28.01.2016. In the zone there are assigned car parks or parking places near to the curbs and on pavements. The zone operates from Monday to Friday, from 10.00 to 20.00. Assuming using car parks only in 50% and fare of about 0,7 euro per hour, we receive incomes figuring out about 740000 euro/month. The purpose of the investigations was the identification of technical parameters of car parks being preferred by drivers. The investigations had executed made by method of questionnaires. Next the mathematical model of competition was made. The model was executed basing on the theory of games. Strategies of "Player 1" were prices and technical equipment of car parks and parking places lying in the zone of paid parking, administered by municipal company. Strategies of "Player 2" were prices and technical equipment of car parks belonging to private owners and two commercial centres in the city centre. There were assumed that from the city's point of view it is one rival, independently on the actual ownership of private car parks on which strategy of acting the city do not have an influence. It is consistent with the basic foundations of the game theory. Both players compete for consumers - drivers using car parks, with such parameters like: price, distance from the destination, car parks' equipment. The built model allows to indicate the best strategy with the counted probability. Knowing that strategy one can was can form prices and equipment of car parks. That model may be used by municipal governments and companies which administer car par parks. However, one should remember about limitations, which occur in reality, e.g. law restrictions referring to maximum prices for parking. The increasing pressure of cities' authorities in Poland for changing those regulations, and examples of such solutions received, e.g. in USA, which concern varying prices for parking according to the demand on different car parks, and different hours, permit to have hopes, that the proposed model will be possible to use practically, soon.



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12-16 June, 2017 - Prague (Czech Republic)

Civil Engineering-Architecture-Urban Planning Symposium - **WMCAUS**



Session Title:

Architectural Space



SHIPS: INSPIRING OBJECTS IN ARCHITECTURE

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ABSTRACT

Sea-going vessels have for centuries fascinated people, not only those who happen to work at sea, but first and foremost, those who have never set foot aboard a ship. The environment in which ships operate is reminiscent of freedom and countless adventures, but also of hard and interesting maritime working life. The famous words of Pompey: "Navigare necesse est, vivere non est necesse" (sailing is necessary, living - is not necessary), which he pronounced on a stormy sea voyage, arouse curiosity and excitement, inviting one to test the truth of this saying personally. It is often the case, however, that sea-faring remains within the realm of dreams, while the fascination with ships demonstrates itself through a transposition of naval features onto land constructions. In such cases, ship-inspired motifs bring alive dreams and yearnings as well as reflect tastes. Tourism is one of the indicators of people's standard of living and a measure of a society's civilisation. Maritime tourism has been developing rapidly in recent decades. A sea cruise offers an insight into life at sea. Still, most people derive their knowledge of passenger vessels and their furnishings from the mass media. Passenger vessels, also known as "floating cities," are described as majestic and grand, while their on-board facilities as luxurious, comfortable, exclusive and inaccessible to common people on land. Freight vessels, on the other hand, are described as enormous objects which dwarf the human being into insignificance. This article presents the results of research intended to answer the following questions: what makes ships a source of inspiration for land architecture? To what extent and by what means do architects draw on ships in their design work? In what places can we find structures inspired by ships? What ships inspire architects? This article presents examples of buildings, whose design was inspired by the architecture and structural details of sea vessels. An analysis of these examples formed the basis for an evaluation of the impact of this inspiration on the shaping of public spaces and the aesthetic aspect of architectural structures.



"SHAPING SPACE" PROGRAMME AS A TOOL FOR EDUCATING YOUTH ABOUT ARCHITECTURE

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ABSTRACT

The Polish Spatial Planning Policy's vision of a systematic promotion of spatial culture has made its way into the national curriculum for 2009 - 2016 designed for various stages of child and teenager education. The objective of this effort was to furnish a basis for a system of architectural education which allows teaching society to be more conscious in their decisions as to spatial order with the effect of improving the quality of our living space. Educating individuals to engage consciously in activities related to the protection of space and transformations taking place within that space requires an understanding of basic issues connected with space, the nature of space and the interrelations of various elements which form it. The Shaping space programme under the patronage of the Republic of Poland's Chamber of Architects is one of the tools dedicated to students of lower and higher secondary schools, designed to assist teachers as architectural educators. The aim of this paper is to present the results of a survey related to the implementation of the programme in Lower Secondary School 3 in Malbork in the years 2013-2016. The programme involved observation of students (of grades 1 to 3) in architecture-oriented classes, assistance for the teacher in the class rooms well as an evaluation of the usefulness of educational materials. A number of problems became evident during the implementation of the "Shaping space" programme which is now available in book form. The size of the book is large enough to discourage any potential readers. The subject matter of the book is not suitable for the intended age group (age: 13-16). Another issue was the teacher's suitability to conduct this type of class. Class observation in grades 1-3 of the lower secondary school and discussions with teachers in charge of that programme served as a basis for developing our own tools and materials in the form of multimedia presentations, templates and lesson scenarios designed to convey and put in order the knowledge related to spatial planning. The conclusions drawn based on these observations have been used in classes at the Faculty of Architecture of the Gdansk University of Technology with a group of students in the 3rd semester of their MA studies, who have helped to prepare auxiliary materials for teachers conducting this type of programmes in primary schools. The joint effort has produced a dictionary entitled Pomeranian ABC of Space, which is designed as a tool for teachers in their own work related to architectural education.



THE MUSEUMS OF GDANSK - TOURISM PRODUCTS OR SIGNS OF REMEMBRANCE?

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ABSTRACT

Museum buildings constitute a significant element in the composition and functionality of contemporary cities. They are both their attractions and landmarks. The article presents a case study illustrating the relation between museum buildings and their location, as well as the showcased exhibition. The article aims at demonstrating the way in which those elements form a harmonious whole - a cultural tourism product affecting the economics of the region. In the context of perceiving a museum as an element shaping the dynamics of tourism development, the location planned for the museum is not without significance. Enhancing the popularity of a city on the basis of the existing museums has become a common phenomenon and is viewed as a driving force of museum tourism development. Sometimes, the museum building itself is considered as one of the elements adding to the attractiveness of the city. The relationship between the exhibition as such and the location - the city - is not the most important factor. Gdansk is an example of a city which contradicts that approach. Four new museum seats built in the 21st century serve to demonstrate how interesting it may be to seek the right architectural form of museums for the places where they are erected. Furthermore, the thematic scope of exhibitions is strictly related to the history of the place. Particularly worthy of attention are the National Maritime Museum, the European Solidarity Centre and the Museum of the Second World War. The examples discussed in the article prove that the value of a place as such in displaying the building and the museum collections is significant. It is impossible to disregard that connection, if the city aims at promoting not only the architectural form of the museum building, but also the exhibits, especially if they are related to its history. Gdańsk is an example of a place with museum buildings of interesting architectural forms which are not only style icons, but also unique symbols commemorating events important in the history of the city.



**CLASSICAL AND MODERN DESIGN SOLUTIONS IN CONCEPTUAL SOLUTION OF STEEL PEDESTRIAN
BRIDGE OVER WISLA RIVER IN CRACOW**

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ABSTRACT

Intensive tourist traffic around the Wawel Castle in Cracow, directed towards the historic Kazimierz district, Wawel Hill and the Old Town Market Place requires the creation of a bridge structure over the Wisla River that will meet both the communication and recreation functions. An additional aim was to design a structure that will not excessively and adversely interfere with their form in the historic surroundings and will join the technical capabilities of the XXI century with the charm of historic buildings. In the paper the structural concept of the steel footbridge with spans 15.5+120.0+15.5 m designed with steel pipes as a truss structure of variable height with Warren truss webs and arched bottom chord has been presented. The use of truss system has ensured a high degree of transparency of the structure and minimally obscures the view of the surroundings. An additional advantage of the application of steel pipe is to achieve a favorable aesthetic effects. In proposed structural concept a classical forms of arches well fitted to the environment and not dominate in the historic surroundings were used. In order to avoid the risk of flooding of the footbridge the possibility of lifting of the structure over the high flood water with a set of pneumatic actuators was designed. Presented concept indicates the possibilities of using trusses in modern and aesthetic design solutions.



URBAN LANDSCAPE ARCHITECTURE IN THE RESHAPING OF THE CONTEMPORARY CITYSCAPE

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ABSTRACT

The contemporary urban landscape is the evolving image of dynamic social, economic and ecological changes and heterogeneity. It constitutes the mirror of history, natural and cultural, urban processes, as well as locations of hybrid character, such as degraded and fragmented spaces within the urban fabric or in the city boundaries - areas in between, infrastructures, post-industrial and waterfront sites, but also potential grounds for urban development. Along with the awakening of the global ecological awareness and the ongoing discussion on sustainability issues, the cityscape with its new attributes, constitutes a challenging field of research and planning for various disciplines, further more than landscape architecture, such as architecture, planning, ecology, environment and engineering. This paper focuses on the role of urban landscape architecture, via its theory and practice, in the reshaping of the city territory. It aspires to broaden the discussion concerning the upgrading of the contemporary cities, aiming firstly at the determination of a wider vocabulary for the urban landscape and its design, and secondly at the highlighting of landscape architecture's contribution to the sustainable perspective of urban design and planning. The methodology is based on a comparative research implemented both on a theoretical level and on a level of applied work. Urban landscape architecture is described through theory and practice, along with correlative approaches deriving mainly from landscape urbanism and secondarily from the field of architecture. Urban landscape is approached as a socio-ecological and perceptual legible, a territory of culture, process and production; operating as an entity of ecological, infrastructural systems and planning needs, it is also regarded as a precedent for urban development. Furthermore, the research is supported by selected European and International urban landscape projects, presented in a cohesive multiscale approach, from the node to the region. Theory is reflected upon: a/smaller scale projects-cultural landscapes, b/infrastructural projects, c/extended process territories and d/grand metropolitan projects. The particular case studies constitute representative design approaches dealing with the urban complexity and are hierarchized on qualitative criteria, spatial and functional; they are indicative of the spectrum of project's scale, type of intervention -redesign, reclamation, reuse, planning, but also of the project's operational value -cultural, infrastructural, strategic. They stress the importance of landscape's flexible and open-ended nature and ultimately, they underline the crucial role of urban landscape architecture, within transdisciplinarity and sustainable design strategies, in the regeneration of the contemporary cityscape.



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MODULAR CONSTRUCTION AND IT'S USE IN EMERGENCY SCHOOLS AFTER 27F

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ABSTRACT

The following research has as main objective, to determine if the modular design and construction of "Emergency schools", influences the development of academic performance in basic education schools located in the province of Concepción, arising post-earthquake and Tsunami in the year 2010. It will also be defined if the modular constructive system implemented complies with the technical specifications of the current Chilean Standard. On the other hand, the student's perception regarding the relation of two concepts will be analyzed: the constructive system and the development of the academic performance. Independent of the above, considering the experience gained in this research, a prototype classroom will be made for a modular emergency school. This study focuses on the construction of modular emergency schools. The Paradigm used in this research is interpretive in nature, with a mixed approach of descriptive type, where the data collection process is supported through the application of surveys to students, and in field observation.



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12-16 June, 2017 - Prague (Czech Republic)

Civil Engineering-Architecture-Urban Planning Symposium - WMCAUS

ARCHITECTURAL AND URBAN IDENTITY TRANSFORMATION OF ESKISEHIR- AN ANATOLIAN CITY

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ABSTRACT

City is the arena where we identify ourselves and interact with others and our urban and architectural environment; they are epicenters of interaction, transition and fusion of different communities and their cultures. Thus it is important to discuss elements of change and their consequences in architectural - urban spaces and their products in the context of identity. Urban identity can be defined generally as the impression invoked on its inhabitants by the environmental, historical, socio-cultural and spatial values. Both architectural and urban identity has a dynamic structure, susceptible to every change on both social and administrative. Both global and national economical fluctuations in the last decades, and industrialization through the 20th century causes dramatic and diverse changes on conditions of life, consumption forms, perception of time and space consequently transforming architecture and city. These changes in all the different aspects of the city life and structure with time cause transformation on architecture and urban identity. This dynamism caused by changes and new formations in the cultural life and environmental conditions, also leads to transforming customs and the ways we occupy/use/live in a place. Consequently, we can assert that these changes and new social norms transform the way we occupy a space and our demands from a place. All new requirements caused by these new conditions of the urban life transform the existing the architecture and spaces. In this presentation, the transformation of architectural and urban identity of Eskisehir will be discussed through its dynamics like architectural and urban transformation, industry and politics.



THE DIALOGUE BETWEEN INNER AND OUTER SPACE OF THE BUILDING

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ABSTRACT

The article presents issues related to the creation and flow of the dialogue between the interior and the exterior of existing buildings of architecture. As the development of construction and contemporary architecture man still turns to the nature. Longing for the landscape and the natural environment of which we are a part, an attempt to find order of the near space and the desire to improve the quality of life leads to the construction of internal space in relation of property and its immediate neighbourhood. In many cases, building absorbs into the self interior the closest environment creating illusion of oneness with nature. Such solutions are widely used and justified especially in urban locations, where the natural landscape is the inspiration of all spatial solutions. Analysis of functional and spatial solutions of buildings with different functions prove that the role of the flow space in the relationship of interior and exterior architectural objects is of great importance in shaping the quality of space, comfort, utility and attractiveness of the aesthetics of the object. Another activity is preferable to use transparency in the planned buildings, letting natural light into the interior and the use of open spaces such as courtyards and atriums. In building up the relationships between inside and outside of the object it is important to use right materials and combination of materials that brings similarities to these two distinct environments. Finally, the creation of lookouts and scenic panoramas of the interiors or interior designed rooms emphasizes relationship of the building with the natural environment. Which of the solutions can create the best microclimate? Is possible that the creation of relationships inside and outside of the building can make architecture more human, bring closer a human to the nature and pretend freely naturalness of not natural landscape? What is the role of inner and outer space dialogue from the viewpoint of environmental psychology? Is it desirable phenomenon or confusing fun in architecture? Or can become soothed the senses and cure for contemporary social ills of mankind?



SHAPING PLACE IDENTITY THROUGH INTERACTION ON THE EXAMPLE OF THE EUROPEAN SOLIDARITY CENTRE IN GDANSK

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ABSTRACT

The article presents process of shaping place identity on the example of an important for Pomerania region investment - European Solidarity Centre. The idea of a Solidarity social movement is strongly associated with the formation of post-socialist national identity of Poland as well as local identity of Pomerania, from which movement originates. The analyzed object is located in a inextricably linked with the idea of Solidarity area - namely the Gdańsk Shipyard. The realization of the European Solidarity Centre aims to be one of the essential elements of shaping Young City identity of space. The article is an attempt to analyze how the presence of realization gradually affects the formation of the place identity of new urban space. Analysis of this realization will allow on the one hand to verify design assumptions made by authors, on the other provides the opportunity to search for best description of still vague notion of local identity. This concept, though intuitively close to everyone still seems to elude conceptual apparatus of theory of architecture. The intention of this article is to explore the notion of identity based on the observations of the newly realized significant cultural space. This analysis approaches the concept of identity from two perspectives. The first approach draws from the concept of identity of Christian Norberg-Schulz. Here, local identity is seen as a unique set of characteristics of space. So seen the concept of place identity is a correlate of concept of personal identity. In this analysis, methods of description of personal identity were transferred to the identity of the place. In the second approach, the identity of place is understood as a unique for that place way of being in space, way to spend time and development of the site-specific urban rituals. Such a concept of identity, draws from the concept of place of Kim Dovey. Both presented approaches seems to complement each other but they also emphasize different qualities. The now-traditional concept of Genius Loci sees architecture as a structural system of meanings. Meaningful elements are seen here primarily from aesthetic perspective. As something we can see. In this perspective, the concept of place identity is seen as a static formation. This perfectly corresponds to design determinants of historical spaces associated with the concept of cultural heritage. In the authors' opinion identity of the place is also built on the interactions that occur between users in space. The space in this approach becomes a catalyst for social contact. What is important for the user is the formation of identity through customs, rituals and urban traditions - that create new network of social connections. This concept of place recognizes dynamic nature of space identity - as a changeable formation which is continuously co-created. Such recognition can give better understanding of identity for specific design conditions, such as gradual formation of new urban spaces. It is so because this approach places emphasis on the processual nature of space identity - as in the case discussed in the article.



LIGHT IN ARCHITECTURE AS AN INSPIRED THEME

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ABSTRACT

The theme of the article is to highlight the important role of natural light in architecture. Natural light, or solar radiation received by our sense of sight was a strong inspiration from ancient times. Originally constituted as a link between heaven and earth. It played a major role in shaping the places of worship, such as even Stonehenge. In the church architecture it was and still is the guiding element, the main matrix around builds a architecture narrative. Over the centuries, the study of the role of light in architecture, and in fact chiaroscuro, led to the culmination of solutions full of fantasy and “quirks” in the Baroque era (Baroque with Italian barocco: strange, exaggerated). Enamored of carved body and the use of multipurpose ornament topped was the discovery of a concave-convex facade parete ondulata created by Francesca Borromini. Conscious manipulation of light developed, at the time, to a maximum of the art illusion and optical illusions in architectural buildings. Changing the perception of privilege in detail and introduce the principle of “beauty comes from functionality” in times of modernism meant that architects started to look for the most extreme simple. Honesty form, and thus the lack of ornamentation, however, did not result in a lack of interest in light. On the contrary, the light became detail, eye-catching element against a smooth surface of the wall. The continuation of this concept of creating a strong password exposing Mies Van der Rohe’s less is more” took over the architecture created in the current minimalism. To minimize the detail with the introduction of large glazing resulted in strengthening the effect of opening the flow of light and penetrate the interior to the exterior. The principle of deep reflection on the light is certainly used In the design of monumetal buildings, such as galleries, museums. It could be used more widely in the generally architecture, noting the heritage and experience gained in the different architecture styles in working with natural light.



THE ROLE OF SPORTS FACILITIES IN THE PROCESS OF REVITALIZATION OF BROWNFIELDS

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ABSTRACT

The paper gives an evidence that building a large sports facility can generate beneficial urban space transformation and a significant improvement in the dilapidated urban areas. On the basis of theoretical investigations and case studies it can be proved that sports facilities introduced to urban brownfields could be considered one of the best known large scale revitalization methods. Large urban spaces surrounding sport facilities such as stadiums and other sports arenas create excellent conditions for designing additional recreational function, such as parks and other green areas. Since sports venues are very often located on brownfields and postindustrial spaces, there are usually well related with canals, rivers and other water routes or reservoirs. Such spaces become attractors for large groups of people. This, in effect initiate the process of introducing housing estates to the area and gradually the development of multifunctional urban structure. As research shows such process of favorable urban transformation could be based on implementing several important preconditions. One of the most significant one is the formation of the new communication infrastructure, which links newly formed territories with the well structured urban core. Well planned program of the new sports facilities is also a very important factor. As research shows multifunctional large sports venues may function in the city as a new kind of public space that stimulates new genres of social relations, offers entertainment and free time activities, not necessarily related with sport. This finally leads to the creation of new jobs and more general improvement of a widely understood image of the district, growing appreciation for the emerging new location and consequently new investments in the neighboring areas. The research gives new evidence to the ongoing discussion on the drawbacks and benefits of placing stadiums and sports arenas in the urban core.



REASONS FOR IMPLEMENTING MOVEMENT IN KINETIC ARCHITECTURE

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ABSTRACT

The paper gives insights into different forms of movement in the contemporary architecture and examines them on the background of the reasons for their implementation. The main objective of the paper is to determine to what degree the complexity of kinematic architecture results from functional and spatial needs and what are the other motivations. The method adopted to investigate these questions involves theoretical studies and comparative analyses of architectural objects with different forms of movement imbedded in their structure. Using both methods allowed to develop the original analytic matrix for delving into reasons that stay behind implementation of movement in the contemporary kinetic architecture. As research shows there is a constantly growing range of applications with kinematic solutions inserted in buildings' structures. The reasons for their implementation are manifold and encompass pursuits for such features as functional qualities, spatial effects, and new aesthetic impressions. In the early projects based on simple mechanisms the main motives were focused on functional values, in the later concepts rather on factors related to alternative aesthetics and innovative spatial effects. However, in recent proposals, a significant quest could be detected toward implementing kinematic solutions that are focused on improving buildings' environmental performance. In most recent architectural proposals the kinematic mechanisms are customized and final effects are unique. Concluding, the research reveals that the more complicated form of movement, the more often the reason for the movement is different from purely functional and involves also critical investigation into spatial qualities of architectural objects and their adaptation to the environment.



OFFICIAL ART AS A TOOL FOR PROMOTION IN FOREIGN DIPLOMACY

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ABSTRACT

“Official art” is one of important element in promoting culture of particular regions, countries and cities. It is presented during the cultural events organized by embassies, consulates, cultural institutes, as well as special exhibitions like World EXPO or biennale. Each of these activities has limitations in art accessibility for recipient. Often, due to safety reasons or insufficient space, embassies, consulates and institutes are not able to organize in those buildings events for larger audience. Another barrier might be financial considerations, as in the case of exhibitions such as world EXPO or biennale. During those events, recipient additionally face with cognitive problem. Too large amount of artworks, from all over the world, blur the perception of art. It is worth considering whether there are solutions that take to overcome these limitations. Certainly, United Buddy Bears is one of the examples that can be considered. It is a collective work of artists from 140 countries, who painted Bear sculptures - a symbol of Berlin. The use of this form of communication was intended to promote tolerance and understanding between people, cultures and religions from around the world and simultaneously advertise the city of Berlin. Another interesting solution in German capital city is shared cultural space of Nordic region countries in the embassies complex of Norway, Sweden, Denmark, Finland and Iceland. This allows to promote in one place art and culture of the Nordic region as well as each of the listed country. This synergy creates an important place on the cultural city map.



MOVE-TECTURE: A CONCEPTUAL FRAMEWORK FOR DESIGNING ARCHITECTURAL SPACE THROUGH MOVEMENT

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ABSTRACT

Along with the technological improvements in our age, it is now possible for the movement to become one of the basic components of the architectural space. The integration of the movement into the architectural structuring changes both our architectural production practices and our understanding of architectural space. However, existing design concepts and approaches are insufficient to discuss and understand this change. In this respect, this study aims to form a conceptual framework for the design of architectural space through movement. In this sense, the concept of move-tecture nominalized within this article is developed to describe an architectural design approach in order to be able to think and produce dynamic spatial formation. Move-tecture, which is used in the sense of construction of movement, treats movement as a basic building component. It forms the framework of a qualitative categorization for the movement and the design of the dynamic structural elements. However, this is a flexible categorization that can grow in the direction of the expanding possibilities of the architectural medium and the changing living conditions. With this understanding, five categories have been defined to describe move-tecture within the context of the article: topological organization, choreographic formation, kinetics potentiality, materiographic constitution, technological configuration. A current understanding of the dynamic structural elements that play role in the design of architectural space through movement is promoted in line with the developed categories. It is aimed that such an understanding constitutes a new initiative in the design practices carried out in this area and provides a conceptual basis for the discussions to be developed.



**THE MUSEUM OF THE SECOND WORLD WAR IN GDANSK AS AN EXAMPLE OF CONTEMPORARY
DESIGN TRENDS IN MUSEUM BUILDINGS**

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ABSTRACT

At the time when history gives us one of the last opportunities to confront our knowledge of World War II, with the knowledge of people living in those days, there are created buildings with strong transmission not only architectural, but also of a great emotional baggage. At the same time, when the political system does not forbid to speak openly about the past period, and the technology allows you to create structures, about which we could only dream of even several dozen years ago, objects such as World War II Museum in Gdansk are designed. In the paper, with the example of the Museum of World War II, were presented the current trends shaping the museum facilities. The diversity of forms, materials and technology makes it impossible to establish a single standard for this type of public buildings, and that makes each of these objects unique. At the same time it is possible to identify some common spatial treatments noted in the sector of architecture devoted to exhibitions and commemoration. Museum of World War II is a newly created structure, in the design of which the authors used advanced technologies (which allowing the implementation of its ideas) in order to meet the ever-growing needs of users. The popularity of museums depends on many factors, such as the type and form of the offered exhibitions, the transfer of information and emotional value, location of the building, connection of museum with the rest of the city and adaptation of the facility to the users' needs, which differ in many respects (age, the efficiency of psychomotor, education or wealth). Given that museums are usually buildings that have noticeable form in the urban landscape, the paper will describe how to set up the idea, and later its implementation, impact on urban space. Additionally for some time exhibitions and architecture surrounding them have become a tool for the promotion of towns, regions, or even the whole countries. The fact is that the exhibitions are visited not only by local residents but also by tourists. If the museum is well integrated into the urban spatial structure (landscape), it has a good chance to become one of the symbols of the city. Additionally, it can promote creating and deepening the sense of identity of the local users.



URBAN TERA RATIO

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ABSTRACT

Urban settlements have been a sign of human evolution in diverse type and morphology, from early configurations up to the most sophisticated form of organization; known as Metropolis. Romans used to refer "Urbs" as the entity where all human activity contrives within physical envelope that contains it; a materiality sense envelope. Meanwhile "Civitas" as the notion of inhabitants which lives navigate through cities. Then Physicality + People can be taken as elements of constant evolution on the notion of Infrastructure and Density do define it in modern times. In the last 20 years the cities in China has been transformed from villages up to megalopolis while understanding two key elements: Infrastructure diverted in; Mobility, transportation (Roads, trains, airports, ports subways, etc), Resources, potable water, power grid, home gas, and an extensive list of utilities to facilitate the life comfort, Health and Education, large number of schools -campuses, Cultural-Leisure, vast quantity of civic buildings, parks and space for people to celebrate live, and Density, crucial factor that has made the difference regarding sizes and scale. Nowadays the notion of providing services up to the demand has sculpted cities to larger extensions, multi layered, multi-functional but mostly a substantial larger scale than ever before. Rapid increment urban population has also requested a novel vision to tackle design and program growth for the Metropolitan habitat. Taking it to a new dimension Urban Argot jumping from simple big cities in the late 80s to Mega, Giga or the definition of "URBAN TERA RATIO" being the next frontier of the exponential size / complexity has triple and keeps in continuous trend. Urban Planners and Architects working in China have been exposed a practice of anticipation of functions in larger scale, dimensions all urban planning projects and execution of the most refined sample of Interurban latitudes footprints, strategies, mix, shapes the correlation between physical presence and habitants. The last 10 years the Tera-Ratio has become a tacit norm to affront projects at all levels (Planning - Architecture). Giving a new vocabulary that talks directly to scale and proportion, larger by far than it was considered as an enlargement to current standard for 10million people-city made the mark as high dense environment in the USA post Second World War when all kind of metrics reacted accordingly as American city model (worth it to mention New York, Chicago, Los Angeles, etc.). China has made its own road to development facing bigger proportions in number and scale of the urban habitat we have worked at and studied. Not only as a final finished result but most importantly as a process that it's changing our understanding City evolution, buildings of larger scale-functions and its implications in the configuration of our next Urbs at substantial Larger and Denser. It's becoming imperative to revisit contemporary cities of China, understanding their correspondence with growth model, the value of being bigger as urban pattern and its articulation with better living standards, balanced nature presence at all times which this study is bringing today.



ABOUT POSSIBILITIES OF CONTEMPORARY ADAPTATIONS OF FLATS CARRIED OUT IN INDUSTRIALISED TECHNOLOGIES IN POLAND

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ABSTRACT

About half of Poles lives at present in buildings carried out in the second half of the 20th century in industrialized technologies. Economic conditioning shows that this state won't surrender to the essential change within of the closest decades. This situation is forcing circles dealing with the forming of places of settling to take action which results will pick up value of the technical and moral decline existing housing substance. As a result of research the author showed that the so-called revitalization of the housing environment was being led on levels of residents, administrators of buildings and housing estates. Their effects often are not coming under correlation and straight out are standing in contradiction. He also emphasized the importance of comprehensive action and the need to run system solutions, connecting actions from the area of legislation, administration (of management) and executions. As the crucial element of this action he showed the need to draw up the catalogue illustrating possibilities of the reconstruction of flats. In the article the author presents the results of his research works, illustrating possibilities of the reconstruction of flats located in buildings of the system OW-T. The analysis were carried out on the group of flats (about the area of the about 85² m) carried out in years 70. and 80. of the 20th century. In the period of the realization they were allocated for settling by families minimum 6 personal and were the biggest ones. Their structure consists of the row relatively little rooms (in it of very small bathrooms and kitchens). The author made the critical analysis of this housing offer. He determined contemporary needs of investors who are interested in purchase of the flat of such a size - families with one or two children. Outlines of plans of the reconstruction of flats are notable effects of conducted works. In the article four specific design solutions which are showing the direction of possible actions will be expressed. According to the author's popularizing the possibility of the reconstruction of that kind of flats should be with one of elements of strategy of the restoration and the improvement of the quality of the Polish housing environment carried out in the latter part of the XX century.



TACTILE ARCHITECTURAL MODELS AS UNIVERSAL "URBAN FURNITURE"

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ABSTRACT

Since the second half of 20-ies in the external public spaces of Polish cities tactile architectural models are built. These objects are designed for the blind, but also other observers - tourists, children, and those who arrive in wheelchairs. This collection has currently more than 70 of the implement, which places Poland in the group of European leaders. Unfortunately, these "furniture", are not always "comfortable" and safe for all recipients. Studies, conducted with arch. Maciej Kłopotowski in the year 2016 across the country, showed a number of serious design and executive mistakes or examples of misuse. The purpose of this article is to draw attention to these issues and point out ways to avoid them. This may cause these objects to become completely valuable, universal tool for learning and a great way of studying architecture in an alternative way.



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**STANDARDS OF HOUSING FOR RENT BUILT BY MUNICIPAL SOCIAL BUILDING SOCIETY IN
BIALYSTOK (POLAND) DURING 1996 - 2012**

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ABSTRACT

The period of economic transformation in Poland started from 1989 and resulted in significant changes on the housing market. Flats became goods and process of privatizing of the housing market took place in last decade of the 20th century. It became clear, that it was necessary to create the system of housing for the people who cannot afford to buy the flat on free market. Such solutions were implemented in 1996 and since then affordable housing associations started coming into existence – organizations building flats for rent, supported by city and government budget. Large complex of such housing for rent was built in Bialystok, the major city of north-eastern Poland, and it is regarded as one of the biggest in the country. The purpose of the study is characteristics of the contemporary social housing for rent in Bialystok, as good example of that kind of housing realized in Poland. The author analysis some aspects of housing environment: the urban concepts of housing developments, architectural ideas, standards of flats, and also solutions of parking places, road systems and access to basic services, including recreational areas.



World Multidisciplinary

12-16 June, 2017 - Prague (Czech Republic)

Civil Engineering-Architecture-Urban Planning Symposium - **WMCAUS**



Session Title:

Social Sciences and Architecture



THE INFLUENCE OF PROFESSIONAL EXPERIENCE ON THE READABILITY OF BUILDING FACADES: A SURVEY OF ARCHITECTS AND ARCHITECTURAL STUDENTS

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ABSTRACT

In this context, the aim of this study can be explained as, to investigate architect and architectural student subjects, for the perceptibility and readability of the functions of the buildings when their façades considered. The study consists of four chapters; Introduction, Research (explanation of the problematic and the method), Outcome, and Conclusion. In the first phase, the photographs of many public and semi-public buildings in Turkey have been studied. Among these photographs, the ones that have information or sign related to the function of the buildings are eliminated. In order to limit the study, three examples for each function; commerce, transportation, religious, and sports among the public ones, and socio-cultural, health related, educational, State and industrial for the semi-public buildings, is selected. Total of 27 photographs have been displayed to 120 of the subjects. The subjects are supposed to mark the buildings which are reflecting the given behavioural positions best, concerning their functions. The writers significantly give importance to the selection criteria of the examples, as being contemporary. In the second phase, they are supposed to presume at least two functions that they find appropriate for the buildings. And at the third phase, they are supposed to mention about their presumptions, whether it is based on, a media related knowledge or the similarity of their mental schema / form relation. Right and wrong presumptions are classified and interpreted by the help of tables.



TOWARDS SOCIALLY SUSTAINABLE TOWNS

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ABSTRACT

The relationship of human beings with their physical environment has been fundamental to their development up to now; but mainly it has been their social context. Prompting individuals to count on a physically and socially sustainable environment, and agreed with its needs, has facilitated the performance of communities for their progress for tens of centuries. However, the social dimensions of the present western culture deserve a deep revision in terms of an adjustment towards more sustainable social structures, like a healthy living organism that includes diverse constituents to survive under its possible best conditions. Social cohesion is a value that derives when people appreciate community life. This leads to solidarity, which in turn creates social sustainability.



RECONSTRUCTION OF SOCIAL-ECONOMIC TRANSFORMATIONS ON THE BASIS OF EXISTING RESIDENTIAL BUILDINGS IN SUBURBAN AREA: CASE STUDY OF WARMIAN VILLAGES, POLAND

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ABSTRACT

Poland has complicated and colourful history. Over centuries, this country has been experiencing many political, legal, social and economic transformations. Annexations, wars, centrally planned economy typical for the socialist system and rapidly introduced market economy took their toll. Changes that took place in the sequent decades of XX and the beginning of XXI century are still visible and can be observed in the Polish space. Stormy history of this country shaped both social-economic conditions for living and land development, including character and style of buildings. Many traces of the past epochs have been preserved in almost unspoiled state in the residential buildings located in the suburban rural areas. Therefore Authors decided to study selected villages located in the mentioned areas. Studies covered the area of historical land Warmia (northern-eastern part of Poland), which was established 800 years ago, for almost 200 years was a part of Prussian annexation and nowadays belongs to Warmia-Masuria province. On the base of own observations and analysis of current state of buildings in the two representative villages located in XIV century and at our times belonging to the suburban zone of the city of Olsztyn (the capital of Warmia and Masuria), Authors attempted to reconstruct social, economic, legal and planning conditionings that shaped the buildings over the 1900-2017 period. It was the main aim of the studies and was realized with the use of monographic method in relation to two individual cases that was assumed to be representative for the Warmian villages. The character and particular styles of the residential buildings were treated as a historical evidence helping to read the specification of the particular decades in the considered period. Authors formulated thesis that changes in the conditionings for residential buildings development can be very accurately observed in the suburban villages, where original rural functions intertwine with functions typical for urban areas or transforming from rural to urban. Studies showed that in both selected villages the traditional layout of Warmian village was well preserved with buildings typical for pre-II world war period along with houses representing after-war economic crisis (including i.e. lack of building materials). Moreover, in these villages still exist buildings that are evidence for socialist state-owned farms, houses built in accordance to the strict normative in 70-ties and houses remaining early economic transition with the new possibility of individual projects and modern building materials. Suburban villages' landscape is also marked with building characteristic for the more mature market economy, where land price and exploitation costs are very significant factors. The results of conducted studies confirmed the accuracy of formulated thesis and appropriability of applied method to reconstruct transformations in the particular area.



OVER THE DECADES: CHANGES IN SOCIAL, ECONOMIC, LEGAL AND PLANNING CONDITIONINGS FOR THE RESIDENTIAL DEVELOPMENT IN THE SUBURBAN AREAS, AND EVIDENCE FROM OLSZTYN AND ITS SUBURBAN VILLAGES (POLAND)

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ABSTRACT

Poland has experienced many political, legal, social and economic transformations. For the last twelve decades this country was under foreign partition, on the war, under influence of socialist system with centrally planned economy and finally regained autonomy and rapidly introduced market economy. Each epoch had its own characteristic that can be recognized also in the residential buildings development. Therefore, Authors focused on the social, economic, legal and planning conditionings that shaped the development of the residential buildings with the most characteristic periods: pre-II world war, 50-ties, 60-ties, 70-ties, 80-ties, 90-ties and XXI century. Authors decided to conduct careful case study of the particular area – the city of Olsztyn (the capital of Warmia and Masuria Province, northern-eastern part of Poland) and its suburban villages. Studied area has a very long history (Olsztyn achieved urban rights in 1353) and experienced many changes. Some of them are visible in the still existing residential buildings, especially in the suburban villages. The most recent process that can be observed in the study area is urban sprawl. Since the beginning of the XXI century Olsztyn urban population has been gradually declining, while suburban villages transform into ‘urban-like’ districts. The aim of the study was to arrange and present in the decade-by-decade manner the social, economic, legal and planning conditionings that were valid in particular periods. It was realized by correlating information on the contemporary social trends, economic conditions, legal framework and planning regulations. Presentation was enriched by the examples of the buildings developed in the accordance with the contemporary restrictions.



ART AND HEALTHCARE - HEALING POTENTIAL OF ARTISTIC INTERVENTIONS IN MEDICAL SETTINGS

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ABSTRACT

The stereotype of a machine for healing seems to be well rooted in common thinking and social perception of hospital buildings. The technological aspect of healthcare architecture has been influenced for several years by three major factors. The first is linked to the necessity of providing safety and security in the environment of elevated epidemiological risk. The second concerns the need for incorporating advanced technology required for medical equipment and building infrastructure. Finally, the third relates to Cartesian dualism in medical sciences. Fortunately, healthcare architecture of 21st-century is in the process of dynamic transformations resulting from the change in approach to patients. The holistic perspective gradually enters into medical sciences, and as a result a patient is perceived as a human being whose needs are discussed on three equally important dimensions: biological, social and psychological. The new trend has influenced the design process of contemporary hospitals. One can observe a turn from the primacy of medical technology over environmental conditions towards the balance between medical requirements and psychological and social needs of hospital users. The research on the impact of hospital environment on therapeutic process gave rise to a new trend of incorporating arts into the space and form of medical facilities. Both architecture and interior design details are more carefully negotiated in terms of esthetics. Designers expand the possibilities of exhibiting visual art in functional and spatial arrangement. The initiatives introducing artistic objects, installations and activities into medical spaces aim at increasing the efficiency of medical services, transforming the image of sterile hospital architecture and introducing high quality public space. These interventions generate the impact both on micro and macro scales and they concern several fields of activity and forms of art. The paper presents the scope of possibilities for introducing art into contemporary medical spaces and discusses the influence of selected solutions incorporating artistic interventions on healthcare users.



THE CITY AND URBANITY IN THE SOCIAL DISCOURSE

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ABSTRACT

The aim of our article is an attempt to present the concept of urbanity that has been shaped throughout centuries along with the development of European civilisation and now entered a new phase of social production of space based on cultural dimensions. The future of the majority of World's population is connected currently with the urban life with the assumption that qualitative characteristics of life in the 21st century define the quality of civilisation itself. Contrary to many scientists' predictions of the decline of the city and urbanity, new reviving urban projects, social local activities and everyday urbanism appear which are connected with redefinition of the city as a community. The rebirth of cities, currently referred to as "urban renaissance", "urban resurgence" or "urban revival", can be also defined in terms of new urbanity regarded as a insightful and creative attitude towards the city and its culture. The elementary order of things was determined in the last decades not by the space but by the time and its acceleration and simultaneously the role of architecture alters. The course of thinking about the city is changing from a single space-time city towards a personalised city, based on individual identities and corresponding places in the physical and virtual space. That can mean a new role of the city in the creation of urbanity. In the era of advanced communication technologies a question arises about the ontological status of the city when the emphasis is placed on independence and individuality in interactions between people, together with "disembedding mechanisms". We are interested in the urbanity understood in the wider context of cultural urban studies which are focused on new ways of organising the communication space and social relations. We will refer in this article to the values constitutive for the city and urbanity that guided the idea of the city since the dawn of time as well as its new deconstructed forms (e.g. the pop-up city, neo-bohemia, the creative class, neighbour communities, urban guerrilla gardening, experimental urban farms, etc.).



ART AND HEALTHCARE: HEALING POTENTIAL OF ARTISTIC INTERVENTIONS IN MEDICAL SETTINGS

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ABSTRACT

The stereotype of a machine for healing seems to be well rooted in common thinking and social perception of hospital buildings. The technological aspect of healthcare architecture has been influenced for several years by three major factors. The first is linked to the necessity of providing safety and security in the environment of elevated epidemiological risk. The second concerns the need for incorporating advanced technology required for medical equipment and building infrastructure. Finally, the third relates to Cartesian dualism in medical sciences. Fortunately, healthcare architecture of 21st-century is in the process of dynamic transformations resulting from the change in approach to patients. The holistic perspective gradually enters into medical sciences, and as a result a patient is perceived as a human being whose needs are discussed on three equally important dimensions: biological, social and psychological. The new trend has influenced the design process of contemporary hospitals. One can observe a turn from the primacy of medical technology over environmental conditions towards the balance between medical requirements and psychological and social needs of hospital users. The research on the impact of hospital environment on therapeutic process gave rise to a new trend of incorporating arts into the space and form of medical facilities. Both architecture and interior design details are more carefully negotiated in terms of esthetics. Designers expand the possibilities of exhibiting visual art in functional and spatial arrangement. The initiatives introducing artistic objects, installations and activities into medical spaces aim at increasing the efficiency of medical services, transforming the image of sterile hospital architecture and introducing high quality public space. These interventions generate the impact both on micro and macro scales and they concern several fields of activity and forms of art. The paper presents the scope of possibilities for introducing art into contemporary medical spaces and discusses the influence of selected solutions incorporating artistic interventions on healthcare users.



DESIGN HAPPINESS? A CLOSE UP TO THE HOUSING RECONSTRUCTION PROCESS AFTER THE CHILE EARTHQUAKE AND TSUNAMI, ON FEBRUARY 27TH, 2010.

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ABSTRACT

In its report prior to the development of the post-Hyogo 2015 approach, the United Nations International Strategy for Disaster Risk Reduction (UNISDR), noted that in the last decade during the implementation of the Hyogo Framework for Action (HFA), progress and strengthening of the legal and policy frameworks can be appreciated in the national approaches to disaster risk reduction, particularly in the implementation of early warning systems and preparedness to respond to a disaster threat. These developments have contributed to a reduction in mortality from disasters, especially in the case of floods and tropical storms. However, some 300 biennial reports of countries where HFA is being implemented, point out that, although vulnerability to risk has declined, exposure of people and their assets has increased. This brings about new risks and a continuous escalation in loss due to disasters, which have an important socio-economic impact in the short, medium, and long term, particularly at the local and community levels. The research presents a study about the level of citizen satisfaction for the housing solution provided during the reconstruction process, after the Chile Earthquake-Tsunami, on February 27th, 2010, in Dichato Bay, through a multidisciplinary approach. This implied, on the one hand, the application of a survey aimed at determining the level of agreement or disagreement with the Reconstruction Programme; and, on the other hand, an architectural and urban study, based on an analysis of the planimetric design and the location of the housing received by the beneficiaries, to outline the relation between the fulfillment of technical aspects and the social perception of satisfaction. The main results seem to reflect a positive regard for the reconstruction plan, as well as a limited relation between the level of user satisfaction and the final housing solution provided.



PUBLIC SPACES AS THE REFLECTION OF SOCIETY AND ITS CULTURE

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ABSTRACT

Spatial structure of places on has gone through significant changes in last 70 years, caused by modernistic approach towards urban design. This approach has brought retraction from traditional spatial form and has started introducing free form design of urban spaces since the 1960's. Tighter urban structure has started to be applied since the 1980's, but in a less significant way than in other developed European countries, as a result of starting mass-housing period. However modernistic approach legacy is quite heavily maintained and present in our cities. Single-use commercial areas and family-house "landscapes" located mostly on the outside of city border represent the mentioned system. In those structures, a man usually identifies himself with his own house or apartment rather than with space that commonly surrounds him. Therefore the role of spaces, their image perceived by men and their character is more and more important. Supporting the distinctive individual character of a city and its places and the identification with districts is fundamental. Urban resident and occupant identify himself with the city and urban environment via arrangement of spaces. Social sustainability is an integral part of the effective urban development. Quality of public spaces, which support the city of neighbourhoods, vibrant city and short distance city are the important pillars of sustainability. Cultural environment and the sense of place is another important dimension of sustainability. The paper is focused on mapping and evaluation of the public spaces in Bratislava with the emphasis of their social development and cultural value, as factors of their identity.



THE RESIDENTIALIZATION OF PUBLIC SPACES: BRATISLAVA EXAMPLE

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ABSTRACT

The housing estates in Bratislava saturated the housing needs of a large number of inhabitants who come after World War II to the city. Design of public spaces, often did not have priority in the process of designing. The solutions for mentioned exterior spaces had been planned after blocks of flat realization, but many of them are not re-alized to this day. The article analyzes the example of the unrealized public spaces in existing housing estates Devinska Nova Ves and PetrÁ¼alka (city districts of Bratisla-va) and offer practical solutions in relation to residencialization method. Residenciali-zation of missing public places is an effective method of adding identities to settle-ments. It improves the quality of residential environment and public spaces. The main aim is to create better conditions for social activities in public areas, which are miss-ing on the present. The research will be focused on the examination of the urban, cul-tural and construction potential of the existing residential enviroment in Bratislava. The main aim of residencialization is not only to enhance the quality of spatial and building structures in the selected residential area and maintain long-term sustainabili-ty in the pertinent programme area, but mainly to improve the quality of living for the residents. The outputs of the project are proposals and practical procedures develo-ped with regard to planning documents for local municipal authorities and regional or-ganizations. The solutions will have a positive impact on the enhancement of the qua-lity of public spaces, attractive social activities and of a conceptual link -residencialization.



**USING OF NEW MANAGEMENT APPROACHES IN THE FIELD OF PERSONAL MARKETING IN THE
TRANSPORT COMPANY**

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ABSTRACT

Personal marketing is a relatively new field in the theory and practice of human resources (HR) activities in the corporate and business sector. As a separate area of HR management was established of the earmarking of personnel management. In the article is mentioned about the facility manager. This position introduces a specific category - behaviour of manager. The facility manager has to dispose the skills from the areas: operation and maintenance, property, facility management processes, and human factors of environment, planning, function devices, finance and quality management and innovation, communication. In the article is described the situation in transport company, specifically - Železnica spoločnosť Slovensko (ZSSK). Employees of the company works in departments like: managers, sellers, operators (for services and maintenance), economists, controllers. In 2015, the transport company had 5,949 employee, what is about 108 employee more than the previous year. Facility manager and the company set the targets, which want to achieve within the planned time. Beyond the objectives are fundamental the values of company, business vision and mission.



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THE HISTORIC CHURCH OF THE HOLY CROSS IN KIELCE - THE VALUABLE MATERIAL AND CULTURAL HERITAGE IN THE CONTEMPORARY CITY

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ABSTRACT

The objects of religious architecture in the urban tissue, the structure of which is a frequent modifications, still play a very important role in defining a clear language of forms and their spatial relationships of composition with the environment. The historic Church of the Holy Cross in Kielce (1903-1939) remains today a distinctive and recognizable point in the structures of the modern city. The architecture of the building is characterized by a strong and recognizable form - due to the large size and method of formation of dominant vertical blocks. Original and distinctive landscape neo-gothic city block is the recipients of the universal acclaim. Church co-creates spatial structure of the urban fabric. It is a testament to the aesthetics of the era in which it originated, shows the transformation of contemporary life and social contacts, an image of change and transformation of the economic and legal and social Polish. The church received the rank of a symbol of the city.



METHODOLOGY FOR THE DETECTION OF RESIDENTIAL VULNERABLE AREAS. THE CASE OF BARCELONA

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ABSTRACT

In a context of a shifting environmental, economic and social paradigm, European cities face a situation that is at the same time challenge and opportunity: the need for urban rehabilitation of the vulnerable degraded socio residential fabric. Public administrations in big cities and metropolitan areas are confronted with both the undercurrent need of actualization of the built stock and the rise of urban residential vulnerability. The city of Barcelona, as many others, is the result of multiple phenomena with high urban and social consequences. The socio spatial integration of immigrant population, the touristic rise and gentrification processes are current situations simultaneously taking place in the city. In parallel, a framework of economic crisis in which public investments in urban and social matters decrease, provides a temporal juncture that results into an increase of social polarization and socio economic inequality that becomes evident and expressed in the territory. This research focuses in the case of Barcelona, and presents a methodology based on a system of indicators elaborated through the exploitation of statistical data complemented with very specific data supplied by the Barcelona City Council. The accurate knowledge of socio demographic, socioeconomic and residential and urban characteristics is crucial in order to define the very complex urban dynamics that describe in the city neighborhoods and areas. Residential vulnerability is defined as an assembly of objective conditions that relate to residential space and indicate situations of social discrimination and structural disadvantage of the population, related with a specific temporal context. Thus, it is relevant to analyse the evolution in time in order to identify tendencies. The results of this study are based on the analysis of two temporal moments (mainly between 2008 and 2016) at a neighborhood scale. The present study contributes to the identification of data sources and a system to calculate the purposed indicators, the elaboration of a GIS analysis in order to determine the characterization of neighborhoods and census sections according to each indicator, and the identification of areas with a higher degree of problematic based on synthetic analysis. A very relevant knowledge basis that can be used by public policy makers in order to establish measures that define vulnerable areas where to carry out actions that foster urban equality.



TOURISM IN CAPE VERDE: ARCHITECTURE, URBAN SPACE AND THE CONSTRUCTION OF AN IDENTITY IN CAPE VERDE - CIDADE VELHA AND BOAVISTA RESORT'S

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ABSTRACT

This article aims to analyze cultural tourism and its importance in the development of Cape Verde, with reference to the Old Town, island of Santiago, that from the XV century, was an important cosmopolitan center, benefiting in 2009 the Heritage status and the way in which the local identity is represented in both the Old Town and the Resorts of Boavista Island, one of the main tourist attractions in Cape Verde. It seeks to understand how Architecture, how urban design, can be able to materialize the immaterial, involve the local populations, without the culture, the cultural heritage, the city and its inhabitants, not being transformed into mere actors in a scenario built for "tourist see", at the same time as we analyze the construction of an identity based on the imagination of a reality that in no way shows the local culture and that dematerializes the place and the country, as in Boavista. Architecture, urban design and context can be topics to explore. In order to carry out this work, qualitative and quantitative methodologies were used, using interviews and the analysis of its contents to technicians, both from the old curatorship of Cidade Velha and from Sal Rei (Boavista). It should be noted that the information was obtained through questionnaires sent to the inhabitants of the Old City, as well as tourists who see it, with the results obtained by a study where 1000 tourists were interviewed by the old curatorship of the Old City. The analysis and cross-checking of the statistical data provided by the National Statistical Institute allowed the study to be completed, and the analysis of the image of both the Old City and Boavista Resorts is of paramount importance. The feeling, the atmosphere, the urban design and the architecture of some spaces are also analyzed. From the current study, it is already possible to conclude that a way of materializing the immaterial, in the Old City will be with the involvement of local populations to engage them in the process avoiding them to mere actors in a Set design for "tourist see". At the same time, the old discussion about context and architecture is discussed specially in Boavista resort's where we try to find simple solutions of urban design an architecture that can be innovated and can show the new forms of leading with this spaces: a methodology of intervention where participatory inventory, context, our senses, are some of the things to be considered.



THE EMOTIONAL AND SOCIAL POTENTIAL OF ART IN THE CITY

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ABSTRACT

In the city residents are more often consumers than creators. Due to evolving specialization and the division of public tasks, citizens do not have an active influence on their surroundings and public spaces. They remain passive users who are detached from the process of creation. As a result, they often have no emotional connection to public space. On the basis of literature research, case studies, questionnaires as well as in-depth interviews with the inhabitants of Tri-City Metropolis (Poland), it has been noted that art capable of evoking emotions has a particular impact on both their attitudes and engagement in the process of city revitalisation. Shared participation of artists and residents in shaping space through creative acts and artistic expression may contribute to greater satisfaction with the place of residence as well as a perceived increase in the quality of life. Creative acts and processes influence the sense of dignity and personal freedom and integrity, they may serve as a catalyst to unleash the residents' authenticity, creativity and agency. The quality of art being created and its social impact depend on the model of cooperation, adopted and professed values as well as the principles being followed by the process of revitalisation. This presentation discusses the what art, including street art, becomes after revitalisation: a memory, an inspiration, a work of considerable material or social value or a feeling of insufficient fulfillment arrived upon due to compromise.



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CONTEMPORARY SPACES OF MEMORY - TOWARDS TRANSDISCIPLINARITY IN ARCHITECTURE

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ABSTRACT

The paper explores new phenomena in the contemporary practice of commemoration implemented through architecture. Architectural objects related to memory can be a place where new trends and phenomena appear earlier than in other architectural objects. The text is an attempt to prove that these new spaces of memory are a kind of laboratory where new ideas taking place in architecture and related disciplines are being tested. Research focuses on the bond between the complex and difficult problem of memory and the issue of transdisciplinarity in architecture. Over the last few decades architecture has been - in comparison to other areas - a relatively closed domain of knowledge. Contemporary places of memory - different from the traditional - may be the evidence of changes. On the basis of theoretical approaches, interdisciplinary surveys, in-field analyses and case studies the paper gives insight into the relationships between architecture and other areas, emerging in the recently created spaces of memory of different types. The text indicates that today both the study and the design of such places is difficult without going beyond the field of architecture. There is a need for further extensive research, but the paper confirms the potential of this research direction. Spaces of memory offer the opportunity to capture the transformation of the discipline at the moment when the process begins.



**STUDY OF SELECTED COMPONENTS OF ARCHITECTURAL ENVIRONMENT OF PRIMARY SCHOOLS -
PREFERENCES OF ADULTS AND ANALYSIS OF THE SPECIALIST LITERATURE**

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ABSTRACT

The school is one of the oldest social institutions designed to prepare a young man for an adult life. It performs a teaching and educational function in child's life. It is a place where, apart from home, the child spends most of the time in a day, therefore it is one of the most important institutions in the life of a young person. The school environment has a direct impact on the student's personality and ambition, and it shapes an attitude of the young person. Therefore, the design process preceding the establishment of school facilities is extremely responsible and should be conducted in a conscious and thoughtful way. This article is a summary and an attempt to synthesize the data obtained from the survey carried out by the author in the context of the design guidelines contained in the specialist literature. The questionnaire survey was designed to make an attempt to determine adult's preferences, opinions and perceptions about selected components of the primary school environment, including the factors which determine the choice of school for children, the priorities of architecture components made for early childhood use, also to specify the type and the scale of existing drawbacks and problems in the school construction industry, as well as expectations about the contemporary architecture of primary schools and its future changes. Moreover, in the article, based on the analysis of the available specialists literature, the following are broadly discussed: the general division and characterization of school spaces, issues related to the influence of selected components of the architectural environment on the physical, mental and psychological safety of children. Furthermore the author raise the subject of the influence of the architectural interiors and furniture on the mood, emotions or comfort of children in the early school age, based on the anthropometric characteristics of children and issues related to the perception of space with an extra attention on the subject of perception of colors and the influence of the architectural space components on the frame of mind, fettle or comfort of children in the given age. Although there exists a limited body of literature on the subject and the results of the study show that the aspects of elementary school architecture relevant to adults, including parents of children, are different from those described in the literature, the analysis was necessary to show these differences and to highlight the different values ??and priorities of users and designers. The paper is also an introduction, which identify qualities ??and social preferences on educational architecture, to the deeper research aimed at developing the criteria of designing and shaping the architectural environment for primary school children, which takes into account the regularity and developmental needs of children at studied age.



ANALYSIS OF GEOMETRIC CONCEPTION OF THE HISTORICAL TRUSS CHURCH OF ALL SAINTS IN VLCOVICE

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ABSTRACT

Church of All Saints in Vlčovice was built likely in the second half of the 16th century and was consecrated in 1597 by catholic bishop Stanislav Pavlovsky from Olomouc. The vault in nave of the church was built in Baroque. The truss of the church was dendrochronological dating to 1767/68. Some elements of structure were dendrochronological dating to 1586 when it was constructed primary truss structure. Today's appearance of the church is given by historicist modifications from the last quarter of the 19th century. Analysed truss has a rafter-collar tie structure with collar beams, pedestal struts. The roof structure has archaic form and we can include the structure into the earlier period by typology. These trusses were commonly used in this region and the wider cultural sphere at that time. Analysis of geometric conception is based on historical-structural, archival and dendrochronological research of the object as a whole. The method of geometrical analysis of the concept of the roof is based of acquiring information from period literature and from previous analyses. The Proportional Relationship of historic trusses was analysed mainly from Slovakia and Czechia. The results show further comparisons. Object of research is analysing the proportion of historical structure and relation into floor plan of building and layout of the building solution. Building space solution is also built on the concept of proportional relationships. Significant part of method is determining the roof height. The roof height is proportionally and geometrically derived from the ground plan of the building. This principle has also been identified in other historical roof trusses of Slovakia and Czechia, which we were analysing (eg. roof trusses on a churches in the village of Bela Dulice, Abramova, Okolicne, Klimkovice and others).



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EVALUATION OF CONDUCTED COMPREHENSIVE THERMAL MODERNIZATION AT AN ANGLE OF ENERGY SAVING AND REDUCTIONS POLLUTANTS

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ABSTRACT

The article presents the real results of the thermal modernization activity based on the monitoring of their effects conducted in selected educational building from 2011 to 2015 which was a representative of the evaluated group of buildings. The analysis includes energy consumption for heating, ventilation and domestic hot water preparation and electricity consumption in chosen building. The monitoring of the results from conducted thermal modernization showed significant energy reduction effect and therefore also fuel consumption and exploitation costs of this building.



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Session Title:

Architectural Culture and Historical Heritage



TWO ARCHITECTS AND ONE ENGINEERING: THE RECONCILIATION OF DISCIPLINES

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ABSTRACT

At the end of the 17th century, when the Académie royale d'architecture was created in France, architecture was studied for the first time from a theoretical and analytical point of view. 100 years later the École royale des ponts et chaussées was found, also in France. This division of responsibilities within the building discipline varies from country to country and within the specific historical period but, the idea of two professional branches related to architecture, remain to the present day. Through the centuries this division has been perceived as a problem or as an advantage depending on the specific event, project or construction. In the late fifties of the last century two architects, Bruno Zevi and Angelo Mangiarotti and an engineer, Aldo Favini, worked closely in Italy building amazing and very significant works. Such as the Church of Mater Misericordiae which was constructed in Milan between the years 1956 and 1958. Taking as starting point the analysis of this work, as well of other project from the same team, and some additional collaborations between Favini and other architects, this paper intends to identify the areas where harmony between both branches can be appreciated. The following characteristics have been taken into account for the analysis: a. Main structure visible, b. Structure is part of the core project, c. Structure defines the space, d. Calculation of the structure intend to optimize the structure, e. Structural assembly system coherent and effective, f. Innovative structural system. One of the main conclusions is that an adequate approach in the collaborative work of architects and engineers, results in impressive and amazing works in which the combination of aesthetic qualities and structural efficiency results in a harmonious building with plenty of significance.



LANDSCAPE ROUTES OF EUROPE: TREE FORMATIONS AND THEIR DISTINCTIVE ROLE FOR THE CHARACTER OF REGION

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ABSTRACT

Roadside tree avenues are a distinctive element of the landscape of Warmia and Mazury, which is a testament to the history of the region from the Prussian time. Their emergence was imposed top-down (for example by the Prussian royal edicts, including those by Friedrich Wilhelm and Friedrich II the Great) and was dictated both by practical and aesthetic reasons. Today they are a problematic heritage in the view of current tendencies of infrastructural development of the country that favour highways and the opportunity to cover the distance between start and destination point as fast as possible. Nevertheless, the literature and conducted scientific studies indicate a change in perception of the in-car experience which underlines a pleasure of travel itself. The research also suggests the growing need for planning route on the basis of the attractiveness of its elements. This paper attempts to survey the existing scenic routes as well as the trends and actions in their development and protection in selected European countries and to present the tree-lined roads of northern Poland on the background of the examples. This has been done on the basis of personal experience and observation, as well as the literature. There have been juxtaposed routes' common elements and the elements distinctive to individual countries and regions. The results of the survey indicate that the scenic route, as an element of cultural landscape, is the result of not only the prevailing climatic and natural conditions, but above all human actions. It is a picture of the economic, historical, social and political situation of the place, and therefore it constitutes the uniqueness of the region not only from the biological, but also cultural point of view. Furthermore, in the view of contemporary philosophical and social sciences, nature cannot be, as it used to, considered in opposition to the culture. There is emphasised both the culture-forming role of the landscape, and the fact that the landscape is fully the result of transformations related to human activity. Then, apart from the obvious economic importance of scenic routes for the development of non-invasive tourism in the region, there is indicated their important role in shaping local identity. The work also distinguishes the conditions that must occur for the scenic route be established and put under protection. Moreover, it presents different views of assessing the value of such a road and the cultural landscape in which it is inscribed. It also describes the impact of the individual elements of scenic route on well-being of a participant of road traffic and his perception of the space. In the light of the above, the paper estimates possibilities for protection of tree-lined roads of northern Poland as the network of scenic routes characteristic for the region.



ARCHITECTURAL SYMBOLS OF A CITY: CASE STUDY

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ABSTRACT

The identity of a city is understood as a collection of individual features, which give the city its individual character and distinguish it from other places; it undoubtedly constitutes a cultural value, which should be cherished. A city is made special thanks to its geographical location, landscape values, urban layout and - architecture. In the case of Sopot - a spa located on the Bay of Gdansk, the mosaic of the above-mentioned features has created a unique image of a seaside resort. Sopot architecture is distinguished by a complex of buildings dating back to the turn of the 20th century, which is the largest one in the country. The architecture of the city is dominated by eclectic influences, mainly Neo-gothic and Art-Nouveau, as well as early modernism; it is also possible to find examples of holiday architecture, with characteristic wooden verandas. The identity of a city and its image is not always permanent and unchanging in time. In the case of Sopot, only 5% of the existing buildings were damaged during the Second World War. However, the most important ones, characteristic for the city and located in its representative part, were destroyed. The war was followed by a period of economic stagnation and isolation from the free world, which lasted for almost 45 years. At that time there were no comprehensive revitalisation projects for this prestigious area of the city. The buildings constructed in the 1960s did not create an architecturally and spatially coherent urban tissue. The situation changed in 1989, when Poland regained its sovereignty. Since that time numerous investment projects have been carried out in Sopot, including the prestigious ones, located in the representative part of the city. This paper has been devoted to Sopot architecture - both historic and modern, the dominating architectural trends and the issues connected with the coexistence of "the old and the new". The buildings characteristic for the city, historic and modern ones, which constituted (or constitute at present) important landmarks in the urban area, and which were (or still are) the city symbols, have been analysed. Unfortunately, some of the buildings constructed over the last 25 years in the representative part of the city are not consistent with its unique character. The decisions made by investors, architects, city authorities and the monument preservation office may have serious negative effects; they may cause degradation of urban space and, as a result, harm its image. In the summary of this paper possible dangers connected with realising investments in the most important city locations, the ones with historic context, have been indicated, and recommendations aimed at elimination of such dangers have been presented. The priority - particularly in cities with an established, unique image - should be to ensure that architectural and cultural heritage is preserved, while new architecture ought to be subjected to certain specified stylistic limitations.



**SAN ISIDORO SCHOOLS IN PADUL, GRANADA (SPAIN). AN ARCHITECTURE FOR EDUCATION:
TIPOLOGICAL/CONSTRUCTION ANALYSIS**

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ABSTRACT

The small and unique building of “Las Escuelas de San Isidoro”, erected in Padul at the beginning of the 20th century, is a clear example of the new architectural type created for the innovative educational model created in Granada by Father Manjón. That model supposed a radical change for the methods of the Spanish teaching and it was the origin of the current educational system. Andrés Manjón y Manjón (1846-1923), priest, jurist and pedagogue, broke with traditional pedagogy and revolutionized the old-fashion model of education that was in force until that moment and universalized and socialized education. The pioneer model promoted an education based on aptitudes and faculties, using games and practice, addressed to all ages and social classes, in conjunction with nature. Outdoor education would be used wherever possible. In a historical context of profound social changes, this typology was the answer to the new educational needs using a “spearing” architectural language based on a constructive system that was both efficient and economic: Spanish regionalism of the first third of the 20th century that recreated historical forms and styles, far from the breakthrough modern movement that at that time was being developed in central of Europe. However, the model of the Manjonian School runs away from historicist models and remains in the simplicity of brick-faced walls or brick-wrapping walls and masonry drawers, with no more decorative concession that window lintels, jambs and sill jut out. The façades highlight made with simple semicircular arches and some glazed ceramics. Wooden rounded slabs supported on walls and simple wooden cover structures. The steel is rarely used in metal structural slabs and brick, and even less on the roof. Architects like Francisco Jiménez Arévalo, Juan Montserrat Pons or Fernando Wilhelmi Manzano will be the architects of this type of architecture that has as a mark of identity the massive use of brick in load walls and as a way to show the facade creating a modest appearance image but of a certain nobility. The Schools of Padul were projected by Wilhelmi, not being of the Manjonian type, follow a similar way. The knowledge of this architectural typology is basic to protect these simple buildings for educational use, reinforcing the attachment and identity of the citizens of Padul. For them it symbolizes a time and its economic and social context. Through the dissemination in this municipality of the End-of-Grade Projects of the students of the School of Building of the University of Granada related to this building, the following objectives are achieved: revaluing, strengthening and fostering the sense of identity of a village towards one of its most peculiar buildings, The Schools where many of them began their education. Through its study, the process of preserving its values has begun, which, with knowledge, are fully assumed contributing to the respect and conservation of this inherited heritage.



**SURVIVAL OLD MODEL “TAMPING” ON BUGIS HOUSE IN KAMPONG BUNNE REGENCY OF SOPPENG
SOUTH SULAWESI INDONESIA**

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ABSTRACT

Tamping is space circulation from terrace to inside home and also as space for sitting space for low rank social community. Position tamping is one of side of main house. The floor of tamping slightly low than main house floor, this model has seldom found today which community more refer on new model. It is the same level on main house floor and even majority new model Bugis house without tamping. Old model house or called genne house use tamping but the tamping and main house has the same floor level. This model consist of four modules which three modules on main house and one module tamping. in the past, old model of tamping ihas different level floor between main and tamping house. While new model of house or called eppa-eppa house did not use tamping. Community in Kampung Bunne is till survive on old model of Tamping on their house although several house has change their tamping like community applying now. This model is still found around 45 house of total number of house in the kampung. This study will explore applying old model of tamping on Bugis house kampung Bunne Regency of soppeng south Sulawesi. Qualitative research is used on this study. Taking data method use field study, sketch, photograph and interview.



THE IDEA OF MODERNITY IN INTERWAR SCHOOL ARCHITECTURE OF LITHUANIA

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ABSTRACT

The formation of the public education system of the restored Lithuanian state and creation of national school in 1918-1940 was expressed as the part of total Lithuanian culture and was perceived as the project of modernity. The exceptional efforts were made to implement the mandatory primary education and in general form the modern European education system worth of the new state. During this short but extremely dynamic period the architectural achievements and development of of the school's physical environment expressively manifests and indicates the transition of architectural styles and the transformation of nation's cultural identity. The interwar Lithuanian architecture was formed by architects, who have acquired their education in various European and Russian universities. In the homeland one expected of them very clear and socially responsible acting - to create a distinctive Lithuanian architecture corresponding to the identity of new nation-state. The terms and signs of modernity were connected with the Lithuanian architectural tradition and formed a unique and original architecture, based not on direct copying of ethnic motives, but more on creative rethinking of them, by their transformation and generating a new artistic quality. The aim of this research is to determine the spread and expression of modern ideas on interwar Lithuanian school architecture. The objective is to identify the school buildings of general education, built according the unique projects developed by the architects and to analyse their spatial structure, composition, artistic expression. The main focus on the manifestations of tradition and modernity, their scale, nature and correlation. The nature of the dissemination and expression of modernity in interwar school architecture can be partially explained by the various artistic attitudes of the architects, that designed the schools. The professional competencies and creative approaches of the architects" that worked in Lithuania were formed in different architectural schools: Petersburg Academy of Fine Arts, St. Petersburg Institute of Civil Engineers, Prague Higher Technical School, Civil Engineering School in Ghent, Royal High School of Architecture in Rome. The study covers the architecture of secondary schools, built in Lithuania during the period of 1918-1940 and created by 18 architects. The study aims to highlight the modernisation phenomenon of interwar period architecture in Lithuania, focusing on educational architecture. The research disclosed the prevalence of the traditional architectural trends in the first interwar decade that was manifested by historicism and eclecticism. Later, in the second decade of Lithuanian independence, there were intentions to legitimise ethnic architecture in Europe at reasonable artistic means and forms.



SILOS, REUSED MACHINE-BUILDINGS: A PROPOSAL FOR ITS TRANSFORMATION

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ABSTRACT

Second half of the 20th century: The Spanish rural landscape changes with the imposing profile of Silos. In the urban edge, next to the railroad, they are risen competing in height with church steeples. Today they are inseparable elements of the image of many peoples of cereal geography of any region of Spain. They are consequence of the autarkic economy of that time (storage of grain and state control over distribution and price) Silos were the answer given by the engineering efficiency and economy of means: A type of store operated by screw-conveyor moved with electricity, transport grain to fill high slender square plant cells. Hydraulic push offset between cells that form a matrix-walled plates constructed of thin sheets of brick or concrete block, armed only horizontally. And huge vertical loads carried by thick foundation reinforced concrete pillars. The political regime change and the energy crisis of the late seventies caused these magnificent building-machines stopped being used. Its radical specialization led them to death. After years of neglect and transfer of ownership between administrations, a consciousness has emerged in Spain (National Plan of Industrial Heritage, 2000) that has prevented its demolition, and recognize the values they bring to the landscape and structural-construction of its own, as beautiful works of Engineering which are worth cataloguing / protection. Hence this proposal tries to intervene these giants through new uses, transforming, allowing their conservation. This process investigates various structural types and implements strict standards of construction resolved with efficient construction solutions. The result is returned to society by publishing their work, while stressing heritage values, demonstrates the new strength of these local systems.



LEONARDO DA VINCI, ARCHITECT? A PROPOSAL FOR INTERVENTION IN THE DUOMO DE MILAN

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ABSTRACT

Leonardo da Vinci (1452-1519) is considered the best genius of the Renaissance. His studies developed advanced ideas for his time even in its most unknown facets: architecture, urbanism and restoration. He never studied in these subjects and his learning followed the method of observation, the study of other treatises and especially the group of colleagues with whom he collaborated. The study of his codices allows us to appreciate how he developed a great interest in architectural problems and solutions and how his proposals influenced the Renaissance, through the work of other authors, such as his architectural proposal on the dome of the Duomo Milan. Leonardo, without being considered as a professional architect, had knowledge related to design, structural calculation, building materials and construction systems, which allowed him to propose a brilliant performance in the indicated dome. A letter from Fancelli to Lorenzo de Medici dated August 1487 indicates that the architectural work was being carried out, but it was necessary to stop it as the dome fell. Circumstance that caused that the Venerable Fabrica of the Duomo convened a public contest with the objective of trying to solve this circumstance. The proposal of Leonardo contemplated the construction of an independent structure composed of four pillars braced by means of chains. This proposal was subsequently presented by the architect Francesco di Giorgio, who was the winner of the competition. The purpose of the present paper is to make a critical analysis of the excellent Leonardo proposal that was reflected in Manuscript B, Codex Atlántico and Codex Trivulziano. This is included within a discipline in which it has never been recognized as such, but in which it demonstrated the same qualities that in other fields in the yes it is recognized with prestige.



TECHNICAL LIMITATIONS IN MERGING SECULAR AND SACRED FUNCTIONS IN MONUMENTAL CHURCHES

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ABSTRACT

The abandonment of churches and their adaptation for secular purposes is a current subject in Europe and worldwide. Most cases involve objects that were desacralized and then rebuilt as a whole object for alternative functions. Thus far, the merging of secular and sacred functions in one monumental Catholic Church has not raised any issues. The paper describes the case of St. Catherine's Church in Gdansk, Poland, where sacred function exists parallel to the new secular function being implemented. The study is based on the authentic, professional experience of the author. It describes the technical limitations arising from the need to ensure destinies for the optimal conditions of both sacred and secular function, while avoiding undesirable interference between them. The author further identifies architectural solutions most relevant to current requirements for protection of sacred zones in the church, for preservation of the monument, and for optimal function of a modern science museum. Significant design issues include: the inviolability of the sacred zone, preservation of the historical value of the monument, proper operation of new secular zones in compliance with contemporary standards of safety, performance of the assumed mission and profitability. The research indicates specific areas where the highest probability of collision exists between the sacred and profane and where technical problems are likely to occur.



MUSEUM INSTITUTIONS IN MONUMENTS - POSITIVE AND NEGATIVE ASPECTS OF ADAPTATION: THE NEW AMBER MUSEUM AND MUSEUM OF SCIENCE IN GDANSK, POLAND

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ABSTRACT

The issue of creation and location of new museums is a current topic. The decision of where and how to create new museum facilities will impact successful function in the future. Museums are either located in newly designed buildings or in existing buildings. In general, existing buildings adapted for museum use are either formally under conservational protection or not. With regard to museum location in preserved monuments, the author notes that the true impact on authentic monumental building structure still needs intense research. The adaptation of two preserved medieval objects - the Great Mill and St. Catherine's Church - located in the historical city center of Gdansk provide case studies to investigate positive and negative aspects. In both cases, the author carried out architectural projects for the functional purposes of the New Amber Museum and Museum of Science. The author concludes that mutual benefits of adaptation result from: the financial means of the museum institution to invest long-term; the institutional respect of the museum towards heritage, which translates into respect for conservational protection; and the competitive advantage created by the monumental features of the building and the privileged location in a well-established, branded space. Negative aspects result from: the space limitations of monuments that disable the museum from extending its exposition and thus prevent institutional development; the overly restrictive requirements of restoration that take priority over the museum mission; the lack of technically functional space required for contemporary museum technologies, which forces unconventional engineering solutions that are more expensive than the location of the museum in newly constructed building.



**COMMERCIAL FUNCTION AS A THREAT TO THE MONUMENT - 25 YEARS OF EXPERIENCE IN
COMMERCIALIZATION OF MONUMENTS IN GDANSK (POLAND)**

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ABSTRACT

The principles of the market economy adopted in Poland in the nineties have significantly touched the resources of immovable monuments. As a result, monuments have become a product of culture subject to the rules of the free market; and state ownership, patronage and decision-making practice has now been replaced by private interest. Practical monument use has also changed with the shift in ownership of objects after privatization and further advances in technology and the economy. Accordingly, the subject of this research addresses the issue of ensuring protection as well as the profitability of monumental objects of heritage under private investment in association with municipal and state ownership. The nineties of the twentieth century in Poland marked a period of rapid revival in trade based on market principles and openness to contemporary global trends in the design of commercial facilities. Thus, commercial function as a new use has been used for the commercialization of the monument. After 25 years of experience, it turns out that this new use may pose a threat to the conditions of monument preservation. The spatial and location specifics of the monument are poorly matched to the organizational form of trade and product range, despite the huge variety of these forms; the result is bankruptcy of the commercial operation and the consequent loss of use for the monument. Unused objects will eventually be destroyed. Studies have shown that functions supporting culture, especially museums, are optimal for the use of monuments. The museum function provides sufficiently high prestige and spatial stability, and allows for the maximum preservation of authentic elements, thus performing an additional role as museum piece.



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POST-WAR DEVELOPMENT OF HOUSING ESTATES IN THE SORELA STYLE JOINT WITH THE BOOM OF MINING AND METALLURGY IN THE OSTRAVA-KARVINÁ COAL DISTRICT AND THEIR CURRENT SIGNIFICANCE FOR GEOTOURISM

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ABSTRACT

The post-war Czechoslovakia needed to deal with a complex and urgent problem of rebuilding the destroyed industry after the Second World War. The complicated circumstances shortly after the war divided Europe into two antagonistic units. The former Czechoslovakia fell under the influence of the Soviet Union. Apart from the political and many other changes, the influence of this power also affected the style of the contemporary architecture. A new style called social realism (sorela) evolved and dominated also the culture and arts. The initial ornateness and exaggerated grandeur of the buildings gradually faded out due to economic reasons. The classical ornamental sorela is irregularly represented in many localities of the former Czechoslovakia. It takes form of discrete buildings or whole blocks. Among the most interesting and extensive units to house tens of thousands of citizens employed in mining and metallurgy, there are the buildings in Ostrava-Poruba and Havířov. The localities are nowadays conservation zones due to their significance.



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Session Title:

Theories of Vision and Visuality



ANALYSIS OF THE VISUAL IMPACT OF THE TREATMENT PLANTS IN MONFRAGÜE NP

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ABSTRACT

In recent years, there has been a considerable increase in the construction of wastewater treatment plants (WWTPs) in rural settings as a result of the obligations set forth in Directive 91/271 and Framework Directive 2000/60, which require an improvement in the quality of wastewater effluent in order to meet certain quality parameters in the discharge receiving waters. These new structures substantially modify the landscape in the vicinity of the facility locations. Therefore, this study aims to provide certain solutions in an effort to reduce the visual impact of these facilities on their natural environments. To conduct this research, 4 treatment plants located in Monfragüe National Park and the surrounding area were selected. In order to perform the analysis of the visual impact, the quantitative landscape assessment method was applied, taking images of both the initial situation and different simulations, and using continuity and contrast models to identify the degree of integration of a WWTP into its surroundings. Subsequently, a survey was conducted to compare the results of the quantitative analysis and the visual perceptions of individuals with no knowledge of the methodology employed in the analysis. When the process was finished, the conclusion was reached that an ideal solution might be to bury these structures underground. As this solution is not feasible, recreation of the immediate natural setting is considered the most suitable option for mitigating the visual impact that the WWTP could have on the views seen by an observer from the outside.



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Session Title:

Architectural Design and Methods



POST-OCCUPANCY EVALUATION FOR A SCHOOL BUILDING: A CASE STUDY IN THE CITY OF PASSO FUNDO/ RS – BRAZIL

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ABSTRACT

This paper discusses the results of a study on user behaviour in relation to environmental comfort conditions at classrooms. A case study was conducted in a school building in the city of Passo Fundo, Rio Grande do Sul, Brazil. The technical data were collected and analysed according to the type of comfort. The measurements concerning indoor microclimatic data were collected over summer period and questionnaires were applied to users in order to analyse the relation between technical aspects of the school environment and of types of user behaviour. The comparison of the technical data and the occupants' perception shows that the opinions of the occupants were not consistent with the technical results. The results provided a diagnosis of the environmental comfort conditions to be used in future proposes of new architectural solutions aimed to improving energy efficiency for school buildings in this specific Brazilian climatic zone.



LIVING IN A FLEXIBLE SPACE

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ABSTRACT

How long does a space or an object have to last? If in the past an object or a building manufacturing was designed to last as much as possible, nowadays it is designed to have a life related to the time in which it will be used. Flexibility is what characterizes a space, it's the ability to be variable and adaptable to changes in the lives of users or in relation to the use which these will make over time. In the history of architecture and design there are examples of great impact: Schroeder house by Thomas Gerrit Rietveld in Utrecht, where the flexibility of the environment is achieved by sliding the thin dividers on ceiling tracks, the double house by Le Corbusier in Weissenhof quartier in Stuttgart, where the furniture is arranged in such a way that the bed can disappear to leave room to the living room, the Abitacolo proposed by Bruno Munari in 1971, is intended as the environment adaptable to the occupant's personality, convertible at any time at depending on requirements, the Total Furnishing designed by Joe Colombo in 1972 are elements monoblocks, a system of independent equipment from the housing container capable of ensuring high flexibility of performance able to offer thus a dynamic space, in continuous transformation, according to the requirements. The evolution of the labor market, the difficulty of inserting within it and the need to push more and more frequent moves today in the trial of living space models increasingly flexible: people, especially young people, are forced to move on territory outlining a new condition to which the flexible nomadic dwellings offer an adequate response, ensuring high functional performance in confined spaces. Though there are occasional examples in major world metropolis of housing experiments of flexible accommodation, in New York we have been tested in large-scale small cut dwellings where furnishing is assigned the specific task of organizing space at different times of the day. Examples of notable impact on overall Apartment Five to one of Michael K Chen Architect and My Micro NY nArchitects. In Italy in Turin a similar experiment sees the conversion in the city centre of the old eighteenth-century Augustinian monastery in small dwellings, where the rationalist concept of existenz minimum is applied in a contemporary way: qualitative increase of the implement and their performance follows to the reduction of dimension standards. This intervention was also an opportunity to experience in interior architecture courses and degree thesis furnishing systems, meaning hierarchical definition of functional requirements in a single environment, able to meet the need for high quality of living within a mesh of serial spaces typical of the original building.



THE USE OF MULTICRITERIA ANALYSIS IN ISSUES CONCERNING ADAPTATION OF HISTORIC FACILITIES FOR THE NEEDS OF PUBLIC UTILITY BUILDINGS WITH A FUNCTION OF A THEATRE

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ABSTRACT

Implementations concerning adaptation of historic facilities for public utility objects are associated with the necessity of solving many complex, often conflicting expectations of future users. This mainly concerns the function that includes construction, technology and aesthetic issues. The list of issues is completed with proper protection of historic values, different in each case. The procedure leading to obtaining the expected solution is a multicriteria procedure, usually difficult to accurately define and requiring designer's large experience. An innovative approach has been used for the analysis, namely - the modified EA FAHP (Extent Analysis Fuzzy Analytic Hierarchy Process) Chang's method of multicriteria analysis for the assessment of complex functional and spatial issues. Modification of the method eliminates occurrence of zero values. Lack of repeatability of designing and implementation conditions that every time require individual or even entirely unique approach to the issues of designing is characteristic for the construction undertakings. Made decisions are significantly influenced by different degree of experience and preferences of designers, translating into different assessment and selection of design solutions. Thus, one needs to reach for equipment and methods exceeding conventional approach, logic at first, and mathematics at more advanced stage. This gives enables including complex nature of decision-making process on one hand, and, on the other hand, of imitating not always strict interrelations. Despite high significance and potential of currently available tools of the multicriteria analysis, this method is not widely reflected in the literature. Sparse papers describe this subject selectively. Selection of an optimal spatial form of an adapted historic building intended for the multi-functional public utility facility was analysed (6 solutions). The assumed functional spectrum was determined in the scope of: education, conference, and chamber spectacles, such as drama, concerts, in different stage-audience layouts.



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A FORMAL LANGUAGE OF LANNA SHOP HOUSE'S FAÇADE IN LAMPANG OLD CITY, THAILAND

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ABSTRACT

This article aims to presents “the formal architectural language of Lanna Designs” that is a linguistic paradigms for decrypt the linguistic system which hided in the Lanna façade style. Lanna Designs present an identity of vital ordered and crucial articulated formal language which inherently set of mathematical rules for the arrangement of ornaments. The scope of this article is attempted to morphology of façades of the ten shop houses which located in Lampang Old city and have familiar proportion and style. In this article the sampling of façade buildings required proportion as three-stall and two-story with familiar style. The morphology is described based on terms of a symbolic encoding system that is represented as graphically building grammar. The system helps to emphasize commonalities in façade languages and propose a prototype of identified Lanna façade design. This methodology might be the option for decrypt or study in every facades style.



A METHOD FOR PARAMETRIC SHAPING ARCHITECTURAL FREE FORMS ROOFED WITH TRANSFORMED SHELL SHEETIN

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ABSTRACT

An innovative method for shaping attractive architectural free forms of buildings is proposed. Consistency of shell roofs and plane-walled oblique elevations of the building free forms is preserved due to utilization of specific geometrical tetrahedrons controlling a general forms of entire buildings. The method proposed enables shaping roofs as warped shell forms made up of plane steel sheets folded in one direction and connected to each other along their longitudinal edges to obtain a plane strip. Next, this strip is transformed elastically into shell shape so that a freedom of the width increments of each shell fold will be ensured. Such effective sheet shape transformations make it possible to limit the influence of these fold's shape changes on the strength and stability of the designed roof shell. The method also allows to shape oblique plane elevation walls almost freely both individual buildings and their complex structures. However, only complete free form buildings are considered in the present paper. A characteristic feature of the method is that it allows for parametric shaping the free form shell buildings with a relatively small number of independent variables in a really intuitive manner. Thus, the method makes it possible to obtain the desired proportions between dimensions of chosen elements and areas of roof and elevations. In the first step of an algorithm leading to creating a free form, a flat reference polygon representing general shape of a building's cross-section is created. Next, this cross-section is extended into a spatial tetrahedron. Finally, curved roof directrices are shaped. Restrictions imposed the geometrical, computational and mechanical models elaborated by the author of the present paper and related to geometrical and mechanical properties of the effectively transformed sheets are taken into account by the method. The method compensates Worsening of the mechanical properties of the initially transformed sheets is compensated by really great attractiveness the innovative and diversified architectural free forms of the designed buildings.



MORPHOLOGICAL SYSTEMS OF BUILDINGS ROOFED WITH TRANSFORMED CORRUGATED SHELL SHEETINGS

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ABSTRACT

An influence of geometrical and mechanical properties of individual structural elements as well as their locations in structural system on relevant properties, work and stability of an entire free form building roofing with transformed corrugated shell sheeting is initially presented in the paper. Plane folded sheets connected to each other along their longitudinal edges and transformed elastically into shell shapes are regarded as structural members bearing static loads including their own weight. Stiffnesses of the folded sheets are really different in orthogonal directions. Therefore they can be utilized both to improve the stiffness and stability of the shell roof and entire building and to achieve really attractive architectural shell free forms of the buildings. In addition, a worsening of the mechanical shell sheet's properties may be limited by adopting respective essential and natural boundary conditions for each shell fold in the sheeting. For example, for this purpose, proper technique of assembling each shell fold to skew roof directrices ought to ensure effective transformations of the folds. A key role in stiffening a free form structural system plays the way of supporting a shell sheeting with the help of intermediate purlins or without such elements. Stiffness of joints is also very important. In addition, lateral bracings including horizontal ones contained in roof shells and vertical ones passing orthogonally in relation to the horizontal bracings. The simplest and most effective steel structural systems are formed from poles fixed in foundations and supporting plane trusses by means of articulated joints. Very interesting solution is when stiff spatial frames or sets of arcs and additional bracings are used and articulated joints are employed to support the poles or directrices by foundations. The topics considered in the paper are going to be taken into account in an innovative geometrical method elaborated by the author of the present paper to shape the attractive stiff and consistent shell free form buildings. Similarly, individual free forms and compound shell structures of various types can be created, as a result of using of the author's method for geometrical shaping mentioned above buildings. Finally, an accurate method for structural shaping such buildings should be created on the basis of the author's examinations. The method ought to be aided by computer technique including graphical programming languages.



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ERGONOMIC ASPECTS OF TRANSPORT OF PATIENT THROUGH THE OPERATING THEATER

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ABSTRACT

One of the most crucial decisions to be made while designing and re-modernizing an operating theater is selecting a method of transporting the patient through the hospital's spatial arrangement. This decision, while irrelevant at first thought, implies numerous project and functional consequences. Designing an operating theater within a hospital is related to numerous specialist requirements with an aim of minimizing the risk of microbiological contamination. Surgeries conducted on the operating theatre take place within sterile areas, usually within a protection area provided with laminar air flow. Furthermore, currently in Poland, there are applicable rules requiring to have entrances secured with tract locks leading towards the operational rooms for hospital personnel, patients as well as hospital equipment and materials. Such construction of an operating theater provides the necessity of applying detailed procedures of transporting the patient, who in most cases is not able to reach the surgery on his or her own. In operating theaters functioning during the last decades, the operating tables were most often fixed to the floor. This resulted in the need to relocate the patient, who is ready for surgery, for several times. The consequences of this included risks related shock due to the relocations for the patient as well as physical overload for the medical staff. The aim of hereby article is to present modern designer solutions providing the opportunity to enhance ergonomics of using the operating theatre.



TRADITIONAL SOLUTIONS AND BUILDING TECHNOLOGY IN RURAL DWELLINGS IN ITALIAN ALPINE REGION: RETROFIT APPROACH AND LEED HISTORIC BUILDING APPLICATION

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ABSTRACT

Located in the Italian Alps, a traditional timber house is a great example of how to intervene in case of a vernacular house, originally built for protecting hay and kindling wood. In order to bring the three-storey wooden house up to high performance energetic standard, the retrofit and conservation project has undergone multiple phases, aiming at preserving the historical values of traditional roof and walls, and also at providing the exterior wall construction an adequate insulating layer suitable for this alpine region, without removing the two-sided blockbau walls and the existing wood flooring, both preserving and respectfully updating the alpine dwellings' original local character. The retrofit project has therefore focused the attention on the traditional rustic edifice, called *Tabiã*. The *Tabiã* here presented is the result of massive reconstruction interventions dated back to the 60s that poorly suited to the existing context. The goal is to give a historical character to the facade, trying to restore its typological features as well as responding to modern residential needs. The upgrading project aims at testing the potentiality of new materials and building technologies, to demonstrate how to integrate them with the materials typical of this area, such as larch wood beams, with XLAM panels and wooden fibre panels and other smart sustainable components. The final project has to be tested according to LEED Historic Buildings protocol to validate the environmental values of the new *Tabiã*, and demonstrate how to scale up the value of sustainability beyond the traditional building, fostering a new type of building regeneration thanks to an integrated design framework.



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MINIMALISM, MATERIALITY AND THEIR INTERPRETATIONS IN CONTEMPORARY JAPANESE ARCHITECTURE

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ABSTRACT

Minimalism is not a new phenomenon in Japanese architecture. Throughout the centuries scores of outstanding examples represent this artistic trend. In forwarding it on the highest levels of art, the sensitivity to, and special application of materials played significant roles in the history of Japan. However, in the latter part of the twentieth century and, especially during the flamboyant times of the bubble era, the emerging postmodernism shifted the interest toward commercialism and a more decorative architecture. Following the burst of the bubble, the economic recession and the still continuing more limited investment in construction substantially changed the conditions of architecture. The new realities of today have increased the necessity for sustainability, on the one hand, as well as rekindled the interest in the long-cherished genre of minimalism in architecture. Recognizing such needs, a growing number of Japanese architects modified their previous design strategies, or started their careers already with a strong promotion of new directions. Regarding minimalism and its relationship to materiality, three design practices stand out, those of Tadao Ando, Kengo Kuma, and SANAA. However, their lines of design articulate this relationship in rather different ways. This paper will discuss the contemporary context of minimalism, the divergences and intersections of its interpretations in the work of these three designers not only in regard to materiality, but also the applied technologies and perhaps a sense of continuity with the past, if any.



FALSE WINDOWS - YESTERDAY AND TODAY

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ABSTRACT

The article is concerned with a very interesting aspect of architectural design, namely, the common conflict between the building functions and the necessity of giving the building a desired external appearance. One of the possibilities of reconciling this conflict is using pseudo windows that are visible on the elevation and generally have the form of a black painted recess accompanied by frames and sashes and often single glazing. Of course, there are no windows or openings in the corresponding places in the walls inside the building. The article discusses the differences between false windows and blind windows (German: blende), also known as blank windows, which, in fact, are shallow recesses in the wall having the external appearance of an arcade or a window and which had already been used in Gothic architecture mostly for aesthetic reasons and sometimes to reduce the load of the wall. Moreover, the article describes various false windows that appeared later than blind windows, that is, in the 17th century. Contemporary false windows are also discussed and it is shown that contrary to the common belief they are widely used. The false windows constitute very interesting albeit rare elements of the architectural design of buildings. They have been used successfully for a few hundred years. It might seem that they should have been discarded by now but this has not happened. Quite contrary, since the second half of the 20th century there has been a rapid development of glass curtain walls that serve a similar function in contemporary buildings as the false windows once did, only in a more extensive way. In his research, the author not only used the Internet data but also carried out his own in situ exploration.



"TUBULAR HOUSE": FORM FOLLOWS TECHNOLOGY, CONCRETE SHELL STRUCTURE WITH INNER THERMAL INSULATION

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ABSTRACT

The aim of this paper is the theoretical analysis of the possibilities and limitations of using an unconventional technology and the original architectural form stemming from it - the building with external construction and internal insulation. In Central European climatic conditions, the traditional solution for the walls of heated buildings relies on using external thermal insulation. This stems from building physics: it prevents interstitial condensation of water vapour in the wall. Internal insulation is used exceptionally. This is done e.g. in historical buildings undergoing thermal modernization (due to the impossibility of interfering with facade). In such cases, a thermal insulation layer is used on the internal wall surface, along with an additional layer of vapour barrier. The concept of building concerns the intentional usage of an internal insulation. In this case, the construction is a tight external reinforced concrete shell. The architectural form of such building is strongly interrelated with the technology, which was used to build it. The paper presents the essence of this concept in descriptive and drawing form. The basic elements of such building are described (the external construction, the internal insulation and ventilation). As a case study, authors present a project of a residential building along with the description of the applied materials and installation solutions, and the results obtained from thermal, humidity and energetic calculations. The discussion presents the advantages and disadvantages of the proposed concept. The basic advantage of this solution is potentially low building cost. This stems from minimizing the ground works, the simplicity of the joints and the outer finish, as well as from the possibility of prefabrication of the elements. The continuity of the thermal insulation allows to reduce the amount of thermal bridges. The applied technology and form are applicable most of all for small buildings, due to limited possibilities of lighting the interior. The disadvantage of this technology is low heat accumulation of walls. A building in the proposed technology requires constant, forced ventilation. Further theoretical and practical research towards applying this concept would be necessary.



STRUCTURAL SUSTAINABILITY - HEURISTIC APPROACH.

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ABSTRACT

Contemporary challenges demand joining built structures with nature elements. That seems to be the paradigm of modern planning and design, but some questions arise. They refer to following categories: leading idea, relations between nature and built environment, features of the structure joining built and natural elements and perception of such structure. Taking into account overwhelming globalization and attempts to preserve local values naturalistic greenery seems to be the significant solution. Its uniqueness can add that attribute to any building and developed area. Elaborated holistic model, presented there, contains mentioned above categories in the scope of naturalism. Model is divided into principles, related actions and effects to obtain. It is giving useful tool for determination of design ways and priorities. There is no possibility of respond to all possible actions and solutions supporting sustainability in any particular design, but we can choose proper mode for our design according to local conditions. In that moment we can turn to heuristic method of choosing priorities and targets. These approach is an attempt to follow the way the nature works. In natural environment occur and survive optimal solutions, not ideal. Idealism is domain of mankind. We try to describe various processes in the manner comprehensible to us. It is always generalization of some kind. Naturalists call such definition - artificial. Artists and engineers presented it rather as the art or present state of knowledge. We all know that reality is always further more complicated that any simple definition can state. Heuristic method shows the way to optimization the design. It demands collection of possible information about local environment. The more we know, the less mistakes will be done. According principles, which are rather out of discuss, we can choose related actions. There is no need and probably no possibility to realize all of them in particular case. We must find our own way. In holistic model are given effects of the actions and one can compare them with his own targets. The scope of the method is to make decisions consciously not to fill all the gaps in the schedule. Every species has own capabilities and creates its habitat according to them, not to all benefits of Nature as some kind of universal idea. We, keeping rules of sustainability, have to do that in the same way. We must design approaching to ideality, not ideal - because the ideal we perceived it now, in present state of knowledge, is always incomplete. Te paper describes three case studies of heuristic approach in landscape design, different according to locality. All of them are located in Silesia region in Poland. First is GPP Business Park in Katowice where building and its surrounding with the greenery designed according to the method received Outstanding BREEAM Certification. Next is recreation area Rybaczowka near Strzelce Opolskie which redeveloping design was of the highest rating in government competition for support of ecological fund. Last is Row Rudzki - the ecological area in the centre of industrial city.



**DETAIL, FACTURE, AND COLOUR IN THE ARCHITECTURE OF POLISH SINGLE-FAMILY HOUSES
AFTER 1989**

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ABSTRACT

The article presents single-family houses architecture transformations since 1989, with particularly close attention paid to the significance of detail, facture, and colour. The article presents the architecture as an art of designing and building facilities with both use and aesthetic value, an art of shaping space and building forms. Architectural work should correspond to the intended function, technique, economic and aesthetic requirements, thus shaping all elements of human immediate environment, both inside and outside of the building. Architecture of the building is perceived as form, structure, and function, as well as detail, facture, and colour. Facture and colour are created through materials used for external finishes. The solid of the building is noticed first while looking at the building, then the finishes detail such as colour, facture, and detail. Materials for external finishes are commonly selected for their aesthetic value equally with their technical characteristics. The detail was always a characteristic element of style. However, currently the fashion for details can be observed, the fashion for usage of materials for external finishes and inter-connected with that colour and facture. The architecture of Polish single-family houses underwent considerable metamorphosis after system change of 1989 - from destitute in form, devoid in detail and colour socmodernism, to architecture extremely varied in terms of form, utilised structures, materials, and detail. Hence, appearance of the phenomenon called fashion can be observed in the architecture, understood as constant changeability, seeking novelty, and creation based on opinion-forming centres. The architectural fashion consists of form, function, structure, building materials, detail, facture, and colour trends, e.g. after rejecting socmodernism, steep roofs characteristic for single-family houses trend started. After 1989, initially individual single-family house projects were created; however, rapidly developing building market precipitated the creation of catalogue solutions, repetitive and conventional. Currently, potential customers have access to catalogues of numerous design studios and companies, every last one including few dozens of comprehensive constructions design options of single-family house at the fewest. In the conventional catalogue designs, steep roofs began to gain popularity, becoming increasingly complicated with various choices of roof windows as time passes. The entrances are frequently adorned with porticos and columns. So-called "mansion architecture" of the single-family houses has developed. Recently, fashion alluding to modernism of 1920s has developed in the single-family houses architecture. New trends among architects are adapted with increasing frequency by investors looking for unconventional solutions. The neo-modernism trend is noticeable predominantly in individual projects; however, it appears in catalogue propositions with increasing frequency. Designs of single-family houses of simplistic shape and distinct expression emerge, with flat roofs, minimalistic detail, and vital, carefully chosen in terms of facture and colour, material solutions of wall finishes. Apart from the conventional solutions, presently the building market offers a vast variety of meticulously prepared, factory-made, and thoroughly checked in various realisations details. Architects discontinued using manufactured and individually designed detail in favour of utilising conventional solutions for designed objects. In a well-designed single-family house, facture, colour, and detail of materials utilised in external finishes should harmonise with the building shape and form.



SMART MATERIALS IN ARCHITECTURE: USEFUL TOOLS FOR PRACTICAL APPLICATIONS OR FASCINATING INVENTIONS FOR EXPERIMENTAL DESIGN?

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ABSTRACT

For at least several decades smart or so called intelligent materials being the result of great advancement in material engineering appear in architecture in different applications. Most of them are called smart because of their inherent properties: the real-time response to environmental stimuli. There are also those considered to be smart due to smart design: their original structure or the composition of the material in nanoscale, that provide them unique properties. The change of color, physical state, temperature or shape -always repeatable and reversible, makes these materials attractive for architects, both from visual and practical point of view. Their spectacular reaction often inspire architects, scientists and artists to create for instance: city displays revealing various shapes and figures according to daily weather conditions, thermochromic urban seats that reflect people's presence, wallpaper with organic patterns that glow in darkness and many others. On the other hand more practical projects are being developed, among others: switchable partition glass walls, self-cleaning building envelopes, self-repairing concrete, phase changing materials diminishing cooling loads in the buildings, energy-generating highways, materials that harden at the moment of impact withstanding thus exceptionally great forces, shape memory alloys playing the role of actuators-opening and closing facade louvers or thin polymer films mimicking the function of the living skin, adopted as building envelope. All those projects result from the fascination of designers with the possibility to create materials and in the effect- complex built environment that is active, "flexible", that adapts to changing conditions and users' needs and is compatible with the real, natural environments. Smart materials that serve this purpose make those projects not only more unique and beautiful but as their inventors claim, may bring real environmental and financial gains in the future. The article presents the most crucial, selected examples of such materials and examines what benefits they could offer.



INNOVATIVE RAILWAY STATIONS

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ABSTRACT

In relation to modern demographic trends, evolving technologies and environment-friendly solutions increases the potential of rail transport. There are nearly 600 railway stations in Poland that are used for passenger traffic, most of which are not adapted to current standards and require investment activities. On the other hand a lot of work has already been done in this field. The primary objective of this presentation is to introduce contemporary problems with designing railway stations in Europe. How to combine the design, innovative technologies and good urban planning within a railway station? Based on examples provided within past 5 years there will be introduced a complexity of substantial pre-design decisions on the subject of railway stations. These examples will be analyzed as forms of "recycling" and revitalization of degraded spaces with potential to be restored to urban structure without losing their function. Another highlighted problem will be the social aspect associated with the design process in railway environment what also includes the role of social participation. Author would like to introduce to the audience the recent project of Innovative Railway Stations completed in Poland. These examples will be presented in the context of modern design trends in railway infrastructure: energy-saving solutions, space optimization and accessibility. The content of the speech should synthesize changes in approach to design of railway stations within the context of contemporary trends and the principles of sustainability.



MODERN METHODS OF MEASURING AND MODELLING ARCHITECTURAL OBJECTS IN THE PROCESS OF THEIR VALORISATION

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ABSTRACT

As well as being a cutting-edge technology, laser scanning is developing rapidly all the time. Laser scanners have an almost unlimited range of use in many disciplines of contemporary engineering, where precision and high quality of tasks performed are of the utmost importance. Among these disciplines, special attention is drawn to architecture and urban space studies, that is the fields of science which shape the space and surroundings occupied by people, thus having a direct impact on people's lives. It is more complicated to take measurements with a laser scanner than with traditional methods, where laser target markers or a measuring tape are used. A specific procedure must be followed when measurements are taken with a laser scanner, and the aim is to obtain three-dimensional data about a building situated in a given space. Accuracy, low time consumption, safety and noninvasiveness are the primary advantages of this technology used in the civil engineering practice, when handling both historic and modern architecture. Using a laser scanner is especially important when taking measurements of vast engineering constructions, where an application of traditional techniques would be much more difficult and would require higher time and labour inputs, for example because of some less easily accessible nooks and crannies or due to the geometrical complexity of individual components of a building structure. In this article, the author undertakes the problem of measuring and modelling architectural objects in the process of their valorisation, i.e. the enhancement of their functional, usable, spatial and aesthetic values. Above all, the laser scanning method, by generating results as a point cloud, enables the user to obtain a very detailed, three-dimensional computer image of measured objects, and to make series of analyses and expert investigations, e.g. of the technical condition (deformation of construction elements) as well as the spatial management of the surrounding environment while the measurements are being taken and processed. An example of the application of this technology provided in the article is a large-size building housing a swimming pool, which belongs to the University of Warmia and Mazury in Olsztyn, north-eastern Poland. With the help of a 3D laser scanner, it was possible to create a spatial model of the building, which is very useful for making inventories, preparing technical documents and evaluating the impact of a building on the surroundings and how its shape matches the urban spatial structure.



TIMBER-MATERIAL OF THE FUTURE: EXAMPLES OF SMALL WOODEN ARCHITECTURE STRUCTURES

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ABSTRACT

The aim of this article is to present various types of wood-based products, classified as engineered timber, while specifying the implications of their structural properties for their forms. Timber is used as a construction material due to its fire resistance, good structural characteristics and insulating properties. The advent of new technologies of wood processing and wood-based materials production has converted timber into a high-tech material, thus encouraging the architects to consider it ever more often in their projects. As wooden technologies overcome constraints, timber begins to compete with steel and concrete. The design characteristics of new wood-based products allow wooden structures to be higher, have larger spans, and more diverse forms than ever. Wood-based materials include materials made of solid wood, veneers, strand, and wood which, due to its inferior quality, would otherwise be unfit for constructions. Elements and layers of these products are glued using different kinds of strong and water-resistant adhesives. The article presents the history of development of new wood technologies, discussing increasingly popular wood-based materials such as glued laminated timber, cross-laminated timber, or structural composite lumber. The paper analyses their technical and fire-resistance properties, and points to ecological aspect, as a factors contributing to the growing popularity of these materials. Finally, the timber's characteristics are contrasted with those of steel and concrete. The article lists examples of wooden objects representing the so-called small architecture structures from across Europe. They illustrate the potential, the uniqueness and the versatility that wood-based materials offer for constructors and architects. All these features form sufficient grounds for stating that timber truly is a construction material of the 21st century.



ARCHITECTURAL MODELLING OF ALTERNATIVES FOR VERIFICATION OF NEW INTERVENTIONS ON THE EXAMPLE OF THE ROMANESQUE PALACE AT SPIS CASTLE IN SLOVAKIA

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ABSTRACT

The article presents the results of the first phase of the research project SK-VEGA 1/0951/16 on using transparent and translucent structures in historical buildings. The team of researchers from the Faculty of Architecture SUT Bratislava introduces possibilities of using lightweight roofs on the model example of a dominant medieval ruin (Romanesque Palace, SpiÅ¡ Castle, UNESCO site). Architectural 3D-modelling of alternatives gains new methodical importance in conditions, when in real practice only safeguarding conservation approaches are preferred. Research by design serves for decision making on how to continue the restoration process of particular cultural heritage object. The selected Romanesque Palace of the SpiÅ¡ Castle has passed through many structural periods. An interior doesn't exist and the perimeter walls create a raised landscape landmark. Romanesque, gothic and renaissance periods were identifiable. It would be possible to reconstruct these periods partially hypothetically on the basis of saved archive materials. Inner structures and the roofing of the palace were in individual historical periods changed. Exact frame models of a new roofing were created on the principle of hypothetical reconstruction: from the indication of the medieval form, renaissance form until contemporary new forms respecting the present day horizontal palace's topping. The aim of the first stage of the research was to present a few architectural alternatives of the roof structure refilling according to the given cultural heritage determinants and structural possibilities. We introduce 12 solutions in graphic and text, which present architectural models of a new roofing, covering the interior by transparent structure based on glass panels and translucent structures based on a textile membrane. We achieve a new space for new functional use of the palace by means of various ways of physical enclosing. On the other side we work with alternatives of the perimeter wall perforation according to historical periods. New inserted structures are designed in contemporary technologies and materials. An analysis of particular architectural proposals is the result. The shape, material selection (steel, timber), roof support structure selection and choice of transparent or translucent covering are subordinated to the architectural concept of the historical period's presentation including contemporaneity. The solved problem was, how new interventions are able visually coexist with historical original without diminishing its authenticity. Glazed and membrane structures used for covering authentic ruins request professional architectural modelling of alternatives based on exact historical facts. The decision making process is made easier by visualizations. Structural shapes issued from original tectonic rules (standard, order) appear from the point of visual and also monument restoration criteria more favorable than structural shapes, which were not inspired by these rules. Plane shaped glazed roof shapes from this point of view seem to be more intrinsic than rounded. On the other side, alternatives with use of textile membranes have soft shape morphology, which is beneficial for new and also historic shapes of roofing in this researched example.



World Multidisciplinary

12-16 June, 2017 - Prague (Czech Republic)

Civil Engineering-Architecture-Urban Planning Symposium - WMCAUS

SOCIAL SUSTAINABILITY TOOLS OF BUILDING RATING SYSTEMS

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ABSTRACT

A large number of tools have been developed to facilitate the efficient and consistent evaluation of a building's sustainability. The three pillars of sustainability: (1) economic, (2) social and (3) environmental are powerful instruments for defining the comprehensive sustainability problem. If any of these pillars is weak then the system as a whole is unsustainable. This article is focused on research results concerning social sustainability tools. Social sustainability is based on the concept that a decision or project promotes the improvement of society and quality of life. Existing systems investigate a range of design factors which are measurable - from indoor air quality, thermal comfort and daylighting, to acoustics, interior layout and other factors, but less takes into account the feelings and opinions of users of the building. Substantial shortcomings are even regarding the accessibility of the building, public involvement and participatory planning in accordance with international human rights instruments and conventions. This article presents the tools of social sustainability that should be included in the evaluation criteria in the context of existing building rating systems.



MODELS FOR EXPERIMENTAL HIGH DENSITY HOUSING

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ABSTRACT

The article presents the effects of research on models of high density housing. The authors present urban projects for experimental high density housing estates. The design was based on research performed on 40 examples of similar housing in Poland that have been built after 2003. Some of the case studies show extreme density and that inspired researchers to test individual virtual solutions that would answer the question: How far can we push the limits? The experimental housing projects shows strengths and weakness of design driven only by such indexes as FAR (floor attenuation ratio - housing density) and DPH (dwellings per hectare). Although such projects are implemented, the authors believe that there are reasons for limits since high index values may be in contradiction to the optimum character of housing environment. Virtual models on virtual plots presented by the authors were oriented toward maximising the DPH index and DAI (dwellings area index) which is very often the main driver for developers. The authors also raise the question of sustainability of such solutions. The research was carried out in the URBANmodel research group (Gliwice, Poland) that consists of academic researchers and architecture students. The models reflect architectural and urban regulations that are valid in Poland. Conclusions might be helpful for urban planners, urban designers, developers, architects and architecture students.



MODELS FOR HOUSES INTERIOR AND EXTERIOR: PHYSICAL OR VIRTUAL?

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ABSTRACT

The article presents the effects of research on different types of models of single family houses and multifamily houses. Exterior layout and interior functional layout is the main driver for the final result of a design. Models are an important medium for presentation of architectural designs and play a pivotal role in explaining the first idea to people and potential clients. Although 3d models have unlimited possibilities of representation, some people cannot understand or 'feel' the designed space. The authors try to test how to combine the interior and the exterior in a single synthetic model. Several models of different houses have been presented in the article. All the case studies were developed with physical models, 3d models, and 2d hand sketches. The main focus of the work with the models was to achieve a coherent vision for future feeling of open space in designed houses. The research shows how synthetic models might be helpful in the design process. Conclusions might be helpful for architects, developers, interior designers and architecture students. The research was carried in the URBANmodel research group (Gliwice, Poland) that consists of academic researchers and architects. The models reflect architectural experience gathered by the authors during their work on theoretical models, architectural projects and by supervision on site during construction site visits. Conclusions might be helpful for developers, architects, interior designers and architecture students.



THE ROLE OF URBAN INDICATORS IN SHAPING MODELS FOR HOUSING ESTATES

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ABSTRACT

Contemporary urbanisation is in crisis: greenfield acreage is decreasing and a large part of it is housing. All of this is strictly connected with progressing/expanding housing which is a large part of urbanisation. There are many examples of low density housing estates which help suburbanization and this is usually presumed perceived as a negative process. Many new housing estates are being built or planned and only some of them can be considered as high density settlements. All housing estates can be described by a series of urban indicators. The most important one is FAR (floor attenuation ratio) which reflects the density of an urbanised site, HEI (height index). There are many different urban indicators that are strictly connected with density. The authors discuss several other urban indicators and summarize the relationship between FAR, HEI and other indicators and propose a standardized layout for housing estate characteristics. One of the most important ratios is the car parking index per flat (CPF index) -eventhough it depends on location, it still has a strong influence on density. The presented research method is a framework for research on contemporary housing estates. Although there are many examples of research on density, only a few present all aspects and all indicators. Comparison of some of them might be helpful for planners , urban designers and architects for housing estates analysis and design.



THE EFFECT OF DAYLIGHT ON THE AESTHETIC IMAGE OF CONTEMPORARY BUILDINGS

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ABSTRACT

The paper deals with architecture of contemporary buildings in the aspects of their aesthetic image created by the use of natural light. Sustainability is regarded a governing principle of contemporary architecture, where daylighting is an important factor, affecting energy consumption and environmental quality of the space inside a building. Environmental awareness of architecture, however, involves much wider and more holistic view of design. The quality of sustainable architecture can be considered in its aesthetic and cultural context with regard to landscape, local tradition, and connection to the surrounding world. This approach is associated with the social mission of architecture - providing appropriate space for living, facilitating social relations and having a positive impact on human beings. The purpose of the research is to study the use of daylight in creating aesthetic image of contemporary buildings. The author mainly concentrates on public buildings open to visitors, the ones of high functional and aesthetic requirements, especially dedicated to art and culture. The work investigates the genesis and current trends in the aesthetic image of environmentally friendly buildings, focusing on the use of daylight. The main attention is dedicated to the shaping of facades and representative public areas by using daylight. The paper identifies and classifies different approaches and ways of using daylight in these areas. A case study, the method of analysis and criticism of literature, observation and synthesis are applied as a research method. This study points to changes in the aesthetics of architecture which uses daylight as a main design strategy. These changes are primarily caused by the development and dissemination of new building materials of facades, concerning glazing and shading systems. The use of digital technology, computer aided design and manufacturing process makes it possible to adapt individual architectural solutions to the specific situation. A characteristic feature of the presented examples is the use of technologically advanced design in harmony with the tradition of the place and local landscape.



A "LEARNING BY DOING" APPROACH IN THE ARCHITECTURAL EDUCATION: A PEDAGOGICAL ASPECT OF THE RESEARCH METHOD ON THE ARCHITECTURAL SPACE

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ABSTRACT

As we already know all the architectural projects lend themselves well to project-based learning. While in the traditional learning instructors start by teaching students all their skills, concepts, and information they know, asking students to apply what they learned, nowadays students tend to apply what they learned by an operational experimentation process in the field of architectural design. In other words, in project-based learning students are asked to solve an open-ended question or challenge that has real-world relevance. Open-ended questions should lead students to think analytically and critically (Dewey, 1938). This paper first analyses how the fields of architecture and design have developed during recent decades and discusses the relations and synergistic interplay between three constituent components: practice, education, and research. It relates to a number of experiments about the relationship between learning the theory and practise of Architectural Design. One of the best strategy is to learn through action and it has always been considered the most effective way of teaching methodologies. In order to understand and memorize, it is very important to have a practical confirmation of the theories studied (Gropius, 1955). Furthermore, this paper tries to demonstrate how "learning by doing" has an added value compared to the normal teaching practice (Negroponte, 1994). The students will learn the lesson through the simulations: all previously acquired knowledge will be put into practice through practical examples. This is a goal that can motivate and induce them to structure their prior knowledge, creating an ideal situation for the integration of new competence. The purpose is to improve the strategy for learning, where learning is not storing but above all understanding. Finally the paper regards the research for a general method, which evaluates the key elements of the structure of space in architectural design. The main asset of architectural composition has traditionally been the close association between the syntactic order of the elements and a semantic perception of space. The methodological experience here demonstrated refers to a specific case study that belongs to the scientific research carried out by a group of researchers at the Politecnico di Milano.



UTOPIAN KINETIC STRUCTURES AND THEIR IMPACT ON THE CONTEMPORARY ARCHITECTURE

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ABSTRACT

The paper delves into relationships between the twentieth century utopian concepts of kinetic structures and the kinematic solutions implemented in the contemporary architectural projects. The reason for conducting the study is to determine the impact of those early architectural conceptions on the today's solutions. The papers indicates close links that stem from the imagination of artists and architects working in 60. and 70. of the twentieth century and the solutions implemented by the contemporary architects. The method adopted to solve the problem of the research involves the analysis of representative examples of architectural solutions which take into account different forms of movement in utopian theoretical conceptions from the early years of the second half of the twentieth century and most recent examples. The research is based on the theoretical studies, archive drawings and comparative analyses. Combining these methods enabled creation of the comparison table for representative examples. The paper shows analyses of different forms of achieved movement in conceptual and completed architecture. Movement implemented in the early completed examples was often only an addition, changing or expanding its properties. The situation was different in the case of theoretical concepts, where in contrast to the constructed buildings, the projects often exceed technical limitations and capabilities of design tools. As a result, achieved spatial effects were diverse, and the movement itself was often their essential element. The conducted analyzes clearly show that there are many similarities between early theoretical utopian concepts and recently completed architectural objects. Concluding, the research indicates that modern kinematic design solutions are often based on conceptual designs form the beginning of the second half of the twentieth century, this dependency is more visible in complex kinematic architecture.



USING A SYSTEMATIC APPROACH IN THE ANALYSIS OF THE FACTORS THAT INFLUENCE ON A BUILDINGS OF HIGHER EDUCATION INSTITUTIONS FORM FORMATION

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ABSTRACT

Necessary pre-condition of architectonically-spatial decisions research of university building is all-round consideration and systematization of all factors that influence on their forming. Factors show a reason, motive force of form shaping process of any building. This review, that the basis on the conducted analysis, intended to light up the row of basic factors that influence on a forming of architectonically-spatial decision of higher education institutions buildings. The first step to factors systematization is determination of them general amount. A next action was realization of further analysis each of them to output the model of a whole form formation process of the university building. Thus, to the factors that commit a significant influence on architecture of the investigated object building belong: university specialization (determines functions), number of students, urban setting, constructive scheme, the ability to adaptation in the future, natural and climatic factors, personal vision and style of the architect, social value, economic factor (allocated budget for the construction), environmental friendliness, materials for construction, level of society development, psychological perception, state ideology, building traditions of country. Analyzing all factors expediently to group them in the hierarchical system. It will consist of three levels and have such kind. Hierarchy of levels that influence on a higher education institutions building form formation. Factors each of three levels linking power and influence priority, their validity relative to the situation. Indeed, on every stage of form development from its inception and to implementation there are the own priority factors. Such distribution factors is conditional because in practice, these factors are often closely related. Found that all factors should be combined into a holistic conceptual model of architectonically-spatial organization of the university, that is based on their simultaneous taking into account, every factor can be considered fundamental (and other - inferior), but none of them can be withdrawn.



THE HIGH RISE BUILDING: THE MEGA SCULPTURE MADE OF STEEL, CONCRETE AND GLASS

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ABSTRACT

High rise building has transformed from providing not only the expansion of floor space but functioning as mega sculpture in the city. The shift away from economic efficiency driven need is only expected to grow in the future. Based on literature studies; after analyzing planning documents and case studies, it was examined whether the presumption that gaining the maximum amount of usable area is the only driving factor; or if the need for the creation of an image for the city provided a supplementary reason. The results showed that forming high rise buildings as three-dimensional sculptures is influenced not only by aesthetics, but also marketing. Visual distinction in the city skyline is economically beneficial for investors gaining not only functionality but art, enriching the cultural landscape. Organizing architectural competitions, public debates and following the latest art trends is therefore possible due to large budgets of such projects.



THE MOTIVATION BEHIND DESIGNING AND CONSTRUCTING TWISTED TALL BUILDINGS

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ABSTRACT

After decades of conventional shapes, irregular forms with complex geometries are getting more popular for form generation of tall buildings all over the world. This trend has recently brought out diverse building forms such as twisted tall buildings. Despite their iconic forms that fascinate the community, designers' primary interest is still the structural robustness. Considering the difficulties arisen from inherent complexity of twisted forms, this study investigates the dynamic characteristics of these buildings, particularly those having adaptive structural systems. Since twisting the structural system give rise to additional challenges on structural system, dynamic performance of these forms have been examined. Modal and static linear analyses of an existing twisted tall building and its prismatic counterpart were performed and the results have been compared. The preliminary findings of this study shows the performance level of lateral load resisting system of twisted forms compared to their prismatic twins.



MULTICRITERIA APPROACH IN MULTIFUNCTIONAL BUILDING DESIGN

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ABSTRACT

The paper presents new approach in multifunctional building design process. Publication defines problems related to the design of complex multifunctional buildings. Currently, contemporary urban areas are characterized by very intensive use of space. Today, buildings are being built bigger and contain more diverse functions to meet the needs of a large number of users in one capacity. The trends show the need for recognition of design objects in an organized structure, which must meet current design criteria. The design process in terms of the complex system is a theoretical model, which is the basis for optimization solutions for the entire life cycle of the building. From the concept phase through exploitation phase to disposal phase multipurpose spaces should guarantee aesthetics, functionality, system efficiency, system safety and environmental protection in the best possible way. The result of the analysis of the design process is presented as a theoretical model of the multifunctional structure. Recognition of multi-criteria model in the form of Cartesian product allows to create a holistic representation of the designed building in the form of a graph model. The proposed network is the theoretical base that can be used in the design process of complex engineering systems. The systematic multi-criteria approach make possible to maintain control over the entire design process and to provide the best possible performance. With respect to current design requirements, there are no established design rules for multifunctional buildings in relation to their operating phase. Enrichment of the basic criteria with functional flexibility criterion makes it possible to extend the exploitation phase which brings advantages on many levels.



META-DESIGN AND THE TRIPLE LEARNING ORGANIZATION IN ARCHITECTURAL DESIGN PROCESS

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ABSTRACT

Architects optimize their design effort primarily through improvements within the design process. Therefore this is or should be one of the most significant subjects of research - to understand mechanisms of architectural design, its specific characteristics, its implementation and feedback, the importance of constraints and creativity combined with limits, cultural and social sensibility. There is implied and hard-to-be manageable plentitude of issues and relationships between them, affecting the ability to acquire satisfying, acceptable architectural result, and of course, fluctuating hierarchy of criteria, usually non-replicable beyond single case application. The overwhelming amount of data to be collected, particularly in case of more complicated architectural tasks, points towards information processing and calls for efficient management of information flow combined with multiple supportive actions undertaken by designers. However the discipline of architecture is unlike the majority of engineering disciplines, and it focuses very strongly on topics which are susceptible to typical research, to usual narrowing of optimization procedures. The paper delves into Meta-Design methodology introduced in 2007 and its alterations processed as a result of implementation of triple learning organization. The triple learning expands and re-arranges Donald Schon's concept of reflective practice, and it offers an opportunity to segregate and hierarchize both criteria and knowledge management otherwise so hardly controllable. The application of triple learning may be at least twofold: the first mode is acquired at an early stage of design, when concept is being transformed into materialized idea (spatial concept, physically manifested architecture) and conceptual, cognitive, validating, and contextual - social and cultural contents are processed, the second mode is when the conceptual principles are established and economic, technical, technological, managerial, and other issues are included in the process. Both modes are in Meta-Design intended to induce constant feedback loops recharging the basic level of "design" with second level of "learning from design" and third level of "learning from learning". While learning from design reflects the absorption of knowledge, structuralization of skills, management of information, learning from learning gives deeper understanding and provides axiological perspective which is necessary when combining cultural, social, and abstract conceptual problems. While the second level involves multidisciplinary applications imported from many engineering disciplines, technical sciences, but also psychological background, or social environment, the third level confronts these applications with their respective sciences (wide extra-architectural knowledge). This distinction may be represented in difference between e.g. purposeful, systemic use of participatory design which again generates experience-by-doing versus use of disciplinary knowledge starting from its theoretical framework, then narrowed down to be relevant to particular design task. The paper will discuss both modes of application using awarded competition proposal of Digital Arts Museum in Madrid and BAIRI university building in order to explain these cases as applications of Meta-Design combined with triple learning organization.



MINING CAMPS IN PERU: ARCHITECTURAL DESIGN GUIDE WITH AN EMPHASIS IN THE BIOCLIMATIC AND ENERGY OPTIMIZATION

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ABSTRACT

This study is focused on the analysis of the functional and constructive aspects as well as the thermal, lighting, and acoustic comfort variables of three mining camps located in Peru; with the purpose of determining architectural design guidelines and criteria, with an emphasis in the bioclimatic and energy optimization that seek to improve the quality of life, comfort and safety of the miner. Two types of assessments were utilized in order to determine the thermal conditions, lighting and acoustic quality within habitable environments: an objective assessment, using an electronic multimeter of light, air speed, humidity and temperature, as well as a sound level meter or decibel meter; and another subjective assessment by conducting surveys with the purpose of collecting the opinions and impressions of the workers. The methodology proposed by Ramos, H. (2012), which relies upon specific variables for the wellness and quality of life analysis was used on both information collection instruments. The objective results of the investigation in one of the camp sites, located at 4,700 AMSL, determined the necessity of implementing improvements in its facilities. In the thermal aspect, 37.9% qualified the nighttime resting environment as cold, 30% manifested lack of ventilation, 42,4% said that it does use a mechanical heating system during the day, and 100% agrees on using it at night to be able to sleep. The natural lighting of the space in most of the rooms is enough to rest (72.2% of respondents say). There is a good orientation to capture solar radiation, but the distance among modules is the main obstacle for the increase in thermal heat gain and the improvement of the amount of light on the inside. It was found that external noises do not provoke any disturbances inside of the modules, considering as "disturbances" levels of over 50dB at daytime and 30dB at nighttime. Acoustic problems are mostly generated in the interior of said modules. In functional aspects, the use of shared restrooms for the entire hall generates discomfort among the users. Lack of air renovation or exchange in the area produces condensations in the ceiling, fungus and corrosion in the construction material, compromising the high technical performance of the enclosures. In Peru we rely on legislation that regulates the minimum necessities that any mining company must contemplate "Ley General de Minería y Reglamento de Seguridad y Salud Ocupacional en Minería" (General Mining Law and Mining Occupational Safety and Health Regulations). The law demands to enforce the "RNE" rules but that does not guarantee its compliance nor the quality level, given that when they are located in underdeveloped areas there are no technical commissions to evaluate the projects. The contribution of this investigation is to broaden the knowledge of the design and construction of mining camp sites, through the elaboration of reference material for all architects and construction sector professionals interested in this type of temporary housing.



COHOUSING IN LIMA: A MODEL FOR ARCHITECTURAL DESIGN

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ABSTRACT

"Cohousing", also known as "Collaborative Housing" is a housing model that prioritizes community life, where private spaces and common services coexist. Homes are harmonized in such a way that people's intimacy is preserved and at the same time the needs for social interaction, intentional design of the place, and participatory design are satisfied. Lima presents the lowest percentage (56%) of housing satisfaction in Latin America and the Caribbean (IDB 2014), its expanding and accelerated growth has reinforced the urban isolation of our society as well as the disrespect for the physical and social environment. The real estate offer only satisfies 14% of the effective demand with "quasi" homogenous homes, solely seeking business profitability without having any real commitment to the City. In this context, and with the constant debate between the public and the private, it is possible that cohousing's inherent characteristics may have an unsuspected life or validity in our Country, where the product is not alien from our reality but an affirmation of existing traditions and reinforcement of a community life. The purpose of the investigation is to determine the viability of the Cohousing model in the Lima context as an alternative to the current housing satisfaction problems and the traditional real estate offers in the market, thus contributing with an improvement in the quality of life. In order to analyze the acceptance of this housing model, two representative surveys were implemented (people from 25 to 60 years old, residents of the NSE A,B,C and D districts of Metropolitan Lima) and Focal Groups (4 groups distributed in social strata A-B and C-D and subdivided in age ranges from 25 to 39 years old and from 40 up). Those tools helped us discover the perception and acceptance degree that this new "product" would generate in our society. The personal and collective needs of the families, the relevant attributes at the moment of acquiring property and the factors that influence the intention to purchase of the future users were identified. The analysis was concluded by performing an assessment of the financial viability of Cohousing through financial and economic flows to evaluate its competitiveness in the Lima market, obtaining as a result that Cohousing, with a figure of Escrow, could be beneficial by 15% for future inhabitants, also a project acquired through Escrow and self-construction can be paid in 13 years instead of the 20 years of payment for the purchase of a traditional real estate investment property. The investigation proposes Cohousing as an alternative in the real estate market where the future user actively participates in the design of his/her future home according to his/her financial possibilities, generating a safe environment thanks to the neighborly relations and dynamics. Cohousing is presented as an opportunity for architects to be the promoters of projects and as a Government program to ensure housing quality, entering in the framework of promotion for "self-construction" financing with technical assistance recently announced by the "MVC".



A SUSTAINABLE DEVELOPMENT APPROACH TO URBAN DESIGN IN ANKARA, TURKEY

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ABSTRACT

Ankara is changing rapidly and beset with developmental issues involving growth, sprawl, economic stagnation and stratification, a dearth of open space, congested transport, environmental degradation, as well as socio-cultural isolation. In our continuing search for “sustainable” design and planning solutions, we must consider an array of urban issues. Pedagogically, this project offers us an excellent opportunity to expose students to complex, multifaceted, real-world professional experiences. Many urban mobility, infrastructural and open space deficiencies throughout the city are being identified and discussed. This studio team will collaboratively generate, explore and synthesize alternative urban and site specific architectural concepts that address the creation of a sustainable and livable urban fabric. The project focused on the development of a mixed use urban waterfront node along the Ankara River watershed basin as it passes north of three strategically located Universities - METU, Bilkent and Hacettepe Universities. More specifically the site is located within the undeveloped open spaces south of the river and north of Bilkent Center. Projects of this sort have importance to a variety of user groups and our solutions could potentially have significant impact on surrounding social and environmental contexts. This studio therefore devoted itself to generating sustainable design and planning alternatives appropriate to Ankara. Simply stated, we have an opportunity to demonstrate how a variety of planning and design strategies can encourage intelligent development within the existing infrastructure of our CBD, thereby contesting wasteful urban sprawl. Although we should remain apprehensive regarding the use of the term “sustainability”, we will honor it as an elusive yet worthy goal integrated into all our planning and design efforts. It is likely that a truly sustainable urban environment must necessarily be defined across an array of dimensions: economic, cultural, environmental, functional, aesthetic, etc. Accordingly, in complex projects we evaluate the relative merit of our ideas per the following design and planning ordering systems: Economy; is the design economically sustainable? Does it create jobs and income sources for the community? Environment; is the design environmentally sensitive? Does it connect and enhance existing ecosystems? Does it reduce our carbon footprint? Culture; does the design create opportunities for meaningful social exchange and learning? Function; does the design circulate effectively? Is it safe? Is it easily maintained? Aesthetic; has the design identified and created an aesthetic sensibility appropriate to the history and culture of the region and its vision of the future? These systems can become a form of checklist deeply embedded in a design process, and an idea’s relevance and usefulness increases according to the number of different ordering systems that it engages.



EXPERIMENTATION IN ARCHITECTURE: PAVILION DESIGN

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ABSTRACT

Since the Great Exhibition in London in 1851, the field of exhibition design has been made an inevitable impact on both architectural practice and discourse. Any kind of exhibition design offers “new” architectural problem-solving techniques and this experimental process generates a direction towards to apply new methods, new materials and new concepts in architecture. This process leads to search, experience and open to new possibilities without the limitations of the established rules. Thus, architects can experience what the future holds for space design. Architectural design enriches by experimenting new solutions and new materials. This paper suggests that experimentation in architecture can be provided in terms of pavilion design and also question the position of the architect in re-establishing the conventional thinking of architecture. Thus, the architect searches for new possibilities in architecture and explore the limits of the interpretation. In the light of this experimentation, pavilion design can be interpreted as an architectural phenomenon to expose something new and innovative. The pavilion design has not the only impact on where they are located, but also it has the power to redefine the contemporary architecture, discourse, and their boundaries. The very limited nature of the pavilion forces the architect to design a work of clear-cut expression and to find different methodologies to the temporality. This experimentation not only has impacts on the architectural practice and discourse but also leads to comment on and critique new possibilities in the field of architecture. Architects gain freedoms to experience the “new” in architecture by means of this experimental process.



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ANALYSES OF PUBLIC UTILITY BUILDING - STUDENTS DESIGNS, AIMED AT THEIR ENERGY EFFICIENCY IMPROVEMENT

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ABSTRACT

Public utility buildings are formally, structurally and functionally complex entities. Frequently, the process of their design involves the retroactive reconsideration of energy engineering issues, once a building concept has already been completed. At that stage, minor formal corrections are made along with the design of the external layer of the building in order to satisfy applicable standards. Architecture students do the same when designing assigned public utility buildings. In order to demonstrate energy-related defects of building designs developed by students, the conduct of analyses was proposed. The completed designs of public utility buildings were examined with regard to energy efficiency of the solutions they feature through the application of the following programs: Ecotect, Vasari, and in case of simpler analyses ArchiCad program extensions were sufficient.



**APPLICATION THE LIFE CYCLE ANALYSIS (LCA) AND THE BUILDING INFORMATION MODELING (BIM)
SOFTWARE IN THE CLIMATE CHANGE-ORIENTED DESIGN PROCESS OF THE BUILDING
ARCHITECTURE**

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ABSTRACT

Whereas World's climate is changing (inter alia, under the influence of architecture activity), the author attempts to reorientations design practice primarily in a direction the use and adapt to the climatic conditions. Architectural Design using in early stages of the architectural Design Process of the building, among other Life Cycle Analysis (LCA) and digital analytical tools BIM (Building Information Modeling) defines the overriding requirements which the designer/architect should meet. The first part, the text characterized the architecture activity influences (by consumption, pollution, waste, etc.) and the use of building materials (embodied energy, embodied carbon, Global Warming Potential, etc.) within the meaning of the direct negative environmental impact. The second part, the paper presents the revision of the methods and analytical techniques prevent negative influences. Firstly, showing the study of the building by using the Life Cycle Analysis of the structure (eg. materials) and functioning (eg. energy consumptions) of the architectural object (stages: before use, use, after use). Secondly, the use of digital analytical tools for determining the benefits of running multi-faceted simulations in terms of environmental factors (exposure to light, shade, wind) directly affecting shaping the form of the building. The conclusion, author's research results highlight the fact that indicates the possibility of building design using the above-mentioned elements (LCA, BIM) causes correction, early designs decisions in the design process of architectural form, minimizing the impact on nature, environment. The work refers directly to the architectural-environmental dimensions, orienting the design process of buildings in respect of widely comprehended climatic changes.



**ACHIEVING COLOUR HARMONY IN CURRENT ARCHITECTURAL STRUCTURES THROUGH THE USE
OF DIGITAL METHODS IN COLOUR THEORY**

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ABSTRACT

There is no doubt that color is one of the most influential means of expression in global and local inhabitable environments. Studying the effect of colors is one of the core architectural principles as it plays an important role in understating the architectural context in relation to exterior building facade .This study will examine the chromatic environment in certain architectural regions in Egypt. It is evident from the initial screening that those regions clearly lack of chromatic coordination and harmony which highly impact the overall appearance and identity of their surrounding causing an overall scene of clutter and visual noise. This paper will focus on the use of color harmony especially in buildings facades to add greater value and complement the overall design. Moreover, the paper will present effective techniques to use color functionally and aesthetically based on sound scientific methods to avoid solely relying on designer capabilities. The lack of chromatic coordination in urban environments is a common problem that exists in abundance in most current urban and architectural contexts. This is due to the lack of systems or methods that clearly defines the successful chromatic coordination to create harmonious built environments. The Research is based on the use of digital techniques that employs the fundamentals of Color Theory from Color Management System point of view to reconcile the existing conditions of the existing urban environments in order to achieve the desired tonal harmony. Ultimately this will improve the rhythm of the visual impressions of those environments. The process is done through computer software that selects the harmonious colors based on the colors inputted in the system, then it identify the most harmonious combinations of hues, tints, tones and shades according to color theories.



MINING CAMPS IN PERU: ARCHITECTURAL DESIGN GUIDE WITH AN EMPHASIS IN THE BIOCLIMATIC AND ENERGY OPTIMIZATION

Fiorella Silvana Arispe Sevilla, Ofelia Giannina Vera Piazzini

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ABSTRACT

This study is focused on the analysis of the functional and constructive aspects as well as the thermal, lighting, and acoustic comfort variables of three mining camps located in Peru; with the purpose of determining architectural design guidelines and criteria, with an emphasis in the bioclimatic and energy optimization that seek to improve the quality of life, comfort and safety of the miner. Two types of assessments were utilized in order to determine the thermal conditions, lighting and acoustic quality within habitable environments: an objective assessment, using an electronic multimeter of light, air speed, humidity and temperature, as well as a sound level meter or decibel meter; and another subjective assessment by conducting surveys with the purpose of collecting the opinions and impressions of the workers. The methodology proposed by Ramos, H. (2012), which relies upon specific variables for the wellness and quality of life analysis was used on both information collection instruments. The objective results of the investigation in one of the camp sites, located at 4,700 AMSL, determined the necessity of implementing improvements in its facilities. In the thermal aspect, 37.9% qualified the nighttime resting environment as cold, 30% manifested lack of ventilation, 42,4% said that it does use a mechanical heating system during the day, and 100% agrees on using it at night to be able to sleep. The natural lighting of the space in most of the rooms is enough to rest (72.2% of respondents say). There is a good orientation to capture solar radiation, but the distance among modules is the main obstacle for the increase in thermal heat gain and the improvement of the amount of light on the inside. It was found that external noises do not provoke any disturbances inside of the modules, considering as "disturbances" levels of over 50dB at daytime and 30dB at nighttime. Acoustic problems are mostly generated in the interior of said modules. In functional aspects, the use of shared restrooms for the entire hall generates discomfort among the users. Lack of air renovation or exchange in the area produces condensations in the ceiling, fungus and corrosion in the construction material, compromising the high technical performance of the enclosures. In Peru we rely on legislation that regulates the minimum necessities that any mining company must contemplate "Ley General de Minería y Reglamento de Seguridad y Salud Ocupacional en Minería" (General Mining Law and Mining Occupational Safety and Health Regulations). The law demands to enforce the "RNE" rules but that does not guarantee its compliance nor the quality level, given that when they are located in underdeveloped areas there are no technical commissions to evaluate the projects. The contribution of this investigation is to broaden the knowledge of the design and construction of mining camp sites, through the elaboration of reference material for all architects and construction sector professionals interested in this type of temporary housing.



EVALUATION OF USER SATISFACTION IN PUBLIC RESIDENTIAL HOUSING: A CASE STUDY IN THE OUTSKIRTS OF NAPLES (ITALY)

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ABSTRACT

Nowadays the quality of homes and social life are two closely interacting categories which require a more careful interpretation of the users 'needs; their opinions, expectations and "desires" must be incorporated into both the design and evaluation processes. With specific reference to the experiences of public housing, the practice of "user satisfaction" should be increasingly incorporated during the ex-post (or monitoring) evaluation in order to verify the quality and validity of the service offered, thus activating a real co-participation of the user in the creation and improvement of the housing service. It is well-known that the principle of customer satisfaction derives from the field of marketing as a tool to evaluate how and how much the products/services offered meet the needs of consumers. In the field of the construction industry, customer satisfaction has been incorporated into the "Post-Occupation Evaluation", an evaluation tool of the performance of the building "in use" through the combination of objective and subjective variables expressed by the occupiers. Widely used since the 1970s in Anglo-Saxon countries, Italy is still struggling to find a systematic implementation. In this perspective, the article presents an application of the customer satisfaction method for the identification of some interventions aim to the improvement of the quality of a complex of public residential housing localized in Ponticelli, the second most populated district in the outskirts of the metropolitan city of Naples, in Campania Region (Italy). After a synthetic introduction on the theme and the explanation of the object of evaluation, the article shows the methodology and the results, focalizing some hypothesis of interventions verified also in terms of economic sustainability.



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Civil Engineering-Architecture-Urban Planning Symposium - **WMCAUS**



Session Title:

Architectural Historiography



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THE LARGEST SACRAL OBJECTS IN THE ARCHDIOCESE OF CZESTOCHOWA - ASSUMPTIONS AND REALITY

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ABSTRACT

The largest church buildings were erected in Poland during the communist era, when there were many difficulties in obtaining planning permission for churches. Today these buildings are usually too large for their users. This is a significant problem for the administrators of these facilities and their parishioners. Finding a way out of this situation is a major challenge for both the church authorities and local communities. One should look for opportunities to use these huge spaces for other purposes, which would not be contrary to the fundamental role of a parish church. In this article, the problem of large churches, of which there are a great many in Poland, will be discussed with particular reference to the Archdiocese of Czestochowa.



MARASTI VILLAGE, 1918-1924: A NEO-ROMANIAN EXPERIMENT

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ABSTRACT

Mara?ti Village, 1918, a village on the front line of the First World War, the place where General Mackensen and General Averescu met face to face for 12 days. After the 12 days of heavy fighting at an altitude of 536 meters, the Romanians won the battle, but they lost 4800 people and the village was destroyed. The village was rehabilitated due to Mara?ti Society, whose objective was to rebuild it as a “ historical village in the Romanian style”. The place was in a building site for 6 years. A number of 73 houses were rehabilitated and 20 new houses, a church and a school were erected. The village was provided with a water supply system and an electricity grid with diesel-generators. All this was designed in the Neo-Romanian style by 6 architects. In a short period and on a large territory, the terrible consequences of the war were changed into a reconstruction and modernization theme, from the infrastructure in general to the dwellings in particular. It was a tremendous effort because of the isolated position of the village, which required an impressive logistic support for those times. The new architectural products were designed in the style that was already considered the Neo-Romania style in the 1910-1920 decade. The village is important because it was modernized from the urban point of view. It was a completely new manner characteristic of the urban development in an area where the last Middle Ages peasant upheaval took place in 1907. In the Romanian context, the execution is unique in dimension, scale and theme. At the International level, it is considered a very precise and rare architectural intervention.



THE EARLY PERIOD OF MODERN ARCHITECTURE IN TURKEY: A CASE STUDY OF ESKISEHIR

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ABSTRACT

Modern architecture in the Western World bear fruit at the beginning of 20th Century in consequence of the process of modernity and seeking of the proper architecture for it. It has been formed firstly towards the end of the 1920s. The main reason of this nonsynchronous development was the inadequacy of enlightenment and industrial revolution during Ottoman Empire and the lack of formation of an intellectual infrastructure which provides the basis of modernity. However, the Ottoman Westernization occurred in the 19th century constituted the foundations of the Republic modernity founded in 1923. The earliest modern architectural designs in Turkey had first been practised by the European architects after the foundation of the Republic and internalised and practised extensively by the native architects afterwards. The early modern architecture of Turkey, which is named as "1930s Modernism", continued until the beginning of Second World War. This period was formed in between the periods of first and second nationalist architecture movements. The early modern architecture period of Turkey was a period which high-quality designs have been made. It had been practised and internalised not only in big cities such as Ankara and in Istanbul but also in the medium and small cities of the country. This situation was not just about a formal exception but about the internalisation of modernity by the society. Eskisehir is one of the most important pioneering cities of the Republic period in terms of industrial and educational developments. The earliest modern buildings have been built as the public buildings by the state and non-citizen architects in the inadequate conditions of the country in terms of economy and professional people. The earliest modern houses of the city designed by these architects were the prototypes for the latter practices which offered the citizens a new lifestyle. The modern houses were the symbols of prestige and status for the owners and the dwellers. The features of early modern buildings of Eskisehir as a medium scale city of Turkey will be examined in this study within the scope of the early modern architectural period of Turkey.



**HYDRAULIC STUDY OF THE WATER SUPPLY TO THE CITY OF SEVILLE THROUGH ITS AQUEDUCT
BETWEEN THE 17TH AND 19TH CENTURIES**

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ABSTRACT

The water coming from the aqueduct of the Caños de Carmona has been, from 1172 until its demolition in 1912, an essential resource to supply water to the city of Seville. This research tries to analyze the system of supply and distribution used in the city in the Modern Age. The study is focused mainly on obtaining water from the Santa Lucía spring to 19 km in Alcalá de Guadaíra, its route through the aqueduct, the division for the distribution between the different users in the general partition ark and its subsequent driving until the destinations. The purpose of this article is to reach to understand the system that supplied the city of Seville through its aqueduct. To this end, the following main objectives have been set: In the first place, to propose a hypothesis of the operation of the hydraulic infrastructures in this time. To know and compare the theoretical flow of water to the city by the aqueduct. Second, to interpret how the distribution in the ark of distribution and the different remodelings that suffered during the last three centuries were interpreted. Draw and size the measurements of the plant and elevation of the reservoir from the only known graphic source, a plan found in the historical archive of the municipal water company of Seville (EMASESA), taking into account that these distributions were modified due to the sale or barter of the concession made by the King. And, finally, to estimate the theoretical flow of water that should reach users from the dimensions of the pipes, based on the calculation in the unit of measurement; "The Castilian inch" and the "water straw". The methodology used for this research was based on, first of all, reviewing the bibliography to know the state of the question about the already investigated about the aqueduct. To carry out a critical study about the different hypotheses published so far on how the water came to the distribution ark and what were the statistical data of water capacity existed relative to the 17th and 19th centuries. One lifting plans at scale of the aqueduct has been carried out through the search of sources graphic, archaeological, documentary and literary. At the same time, a topographic work has been carried out analyzing in situ the still remaining material of the canal, which has served to establish the geographical coordinates of reference, the exact location of the sections of the aqueduct still standing and to take the quota Hydraulics above sea level. With all this, the planimetric survey of the longitudinal profiles was carried out to determine the level with which the water of the aqueduct of Seville arrived in the ark and went for the different users, because the energy principle of movement and distribution of the fluid was getting by gravity, reaching an extension of distribution of more than 2 km to the round. This study aims to develop a hypothesis about the principles of water distribution carried out through the city and also to estimate the percentage of water going to each client, knowing the theoretical concession that should reach to their homes.



SIGNS OF TIMES- AESTHETIC METAMORPHOSES OF HISTORICAL POSTMILITARY COMPLEXES IN POLAND

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ABSTRACT

In 1918 Poland regained independence after 123 years of the captivity. Former Rzeczpospolita was partitioned than by Russia, Austria and Prusia and didn't exist on Europe map more than one century. Numerous of historical barracks complexes are a legacy of those times in contemporary Poland. The purpose of science work is showing that in periods of contemporary history of Poland, there was different approach towards the problem of historical barracks was applied. In paper were presented aesthetic changes applaied to historical postmilitary architecture. The problem was presented in 3 main periods: 1) 1918-1939 - midwar period, when complexes of barracks were adapted for Polish army. New national symbols were applied, especially new sculptures, main gates, also new buildings conected with new technologies (f. e. hangars, pools, ..). They were realised in modernism style. 2) 1945-1989- period of socialist Poland. Barracks were applied to different functions: military and civil. Form of historical bulidings wasn't changed in drastic way. Possible extensions had utilitarian rather than aesthetic character. Existing building development was applied with new facilities. Secondary divisions of the area of barracks took place. 3) Afret 1989- period of the market economy. Conversion of postmilitary buildings to new functions. This procces often was confirmed new functions with spectacular changes in the historic architectural form - universal aesthetic, not conected with place or region. Granting the new identity objects was connected with raising the prestige of the place. They were regarded unattractive until those period. Analysis of the approach towards the aesthetic modernization of military complexess and their chosen objects, let the author to determinate features characteristic for individual periods. Knowledge of types of aesthetic changes realised in postmilitary ansambles, gives possibility to date implemented changes, and consequently assigning them to the chosen period from political-economic history of Poland. It gives also possibility to value of implemented changes.



THE FRENCH INFLUENCE ON THE PORTUGUESE ARCHITECTS IN THE AGE OF ENLIGHTENMENT

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ABSTRACT

This investigation shows the European influence on the work of the Portuguese architects of the Illuminist period. Based on previous studies we focus our attention on the design of "Praça do Comércio" square and on the hypothesis that it was based on the French Royal Square. We demonstrate that the design of Lisbon of the second half of the eighteen-century was influenced by the theories and best practices of the time. We also confirm that the architect Eugénio dos Santos e Carvalho, member of the reconstruction team for Baixa had in his private library several reference books of the French architectonic practice that certainly influenced his architecture. The main square of Lisbon's downtown plan, "Praça do Comércio", can be compared to the "Place de Nos Conquêtes", predecessor of the "Place Vendôme", in its design, architecture and dimensions. This research analysed the cartography and iconography of Lisbon's reconstruction. In particular the drawings of "Praça do Comércio" and "Place de nos Conquêtes" were exhaustively studied. The comparative study of the elements for both squares lead to the conclusion that the Portuguese square presents many aspects of the French illuminist ideas and in particular those presented in the "Place de nos Conquêtes". This paper concludes that the Portuguese urban design and architectural projects of the XVIII century are the result of previous knowledge where it was always possible to articulate the vernacular and erudite and where many different influences left their mark in the culture of the period. The downtown plans of Lisbon evidence a mixture of records that originate in the architectonic-urbanistic tradition of the Portuguese military engineering and the contemporary French urban realisations.



MANIPULATIONS OF TOTALITARIAN NAZI ARCHITECTURE

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ABSTRACT

There's no doubt that any kind of art might be an excellent way to influence people. For centuries, architecture acted such a role in order to highlight the position of each sovereign in the structures of power. To rise a building featuring explicit, aesthetic, material and localization values is an issue possible to manage only with prominent social position of the investor. In the most cases known from the history, the founders of such buildings had already long - established position in the social structures. They possessed sufficient economical, material and causative capabilities to raise any kind of building. They hadn't been pressed to persuade any social ideas to anybody; erecting a building was rather means to emphasize their public uniqueness. But after the collapse of three main Central European Empires in the beginning of the XX-th century it had changed. Political structures emerging on the debris of the Russian, Austro - Hungarian and German Empires needed convincing instruments to assure their societies that ideas preached by them were the only ones to recreate the greatness of their countries. The presentation is about to set out to prove that architecture could be an important means of political fight to dominate the society on an example of Germany during totalitarian Nazi State. It undertakes the task to point out main architectural instruments extensively used to achieve political aims of Nazis. In his youth, Hitler dreamed to become famous artist, architect or philosopher. He couldn't matriculate for Vien Academy of Architecture which was one of main factors to create his frustration in the future. But he had memorized the power of imperial architecture he experienced as a pauper. On his route to gain the political authority over the masses of German impoverished people in 20-ties and 30-ties of the XXth century he still believed that architecture could materialize his ideas to create the better future of his nation. This certitude led him and his architects to impose several sophisticated manipulations into the architecture styles they consequently provided not only to the German public but also the Free World. The word "manipulations" is used here in terms of false activity, set to influence the society for entirely other, hidden unwanted ideas. Today pluralism of European culture appears to be in danger. Our experience teaches us that the history often repeats. Also this unwanted history. If we don't recognize that we are manipulated, it might be too late. This seems to be a reason good enough to remind the architectural instruments set by Nazis in prewar Germany that ultimately helped them to manipulate society of great culture and led it to disastrous war. Such architecture still might be used once again for modern manipulations. Let it be our premonition.



ONE PROJECT FROM ROMANIAN STYLE TO A FASCIST ARTDECO STYLE, MARAȘEȘTI MONUMENT

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ABSTRACT

Marasti, Marasesti si Oituz is The Maginot Line of The Romanians in the First world war, were was the clash between Romanian Army and German Army. With the lost of 800.000 people on all militars in the First World War, Romania is the second in line after the French people, for the number of military which have died on the battlefields. From this, 80.000 lifes were lost in almost one month, July of 1916...in the area of Marasesti. For the remembering of the men and womens fallen in the days, a big monument was build, caled „The Church of the Nation”, like a big ancient tomb for the heroes that fought and fallen in the days. From a national architectural contest in 1920 up to the inauguration in 1938, the project past from a project made in the National Style, with an budget that was imposible to build for the Romanian government, the arhitect, George Cristinel developed a second project inspired by the new fascist times in the beginig of the 30”s and finished the third and final version with something more classic and calm, a well tempered art-deco monument with a touch of „ancient Rome” ideas Perspective, anfilade, proportion and rigourosity... things that were closed to the heart of the fascist regime of Carol the second, the king of Romania who was supportive for Mussolini and Franko. Is the architecture, a container for the views and ideas of political system? Can the discourse of the build environment sustain and represent the discourse of the politicians, adding argumets for the rise of new figures, always with dictatorial attitude...



MANIPULATIONS OF TOTALITARIAN NAZI ARCHITECTURE

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ABSTRACT

There's no doubt that any kind of art might be an excellent way to influence people. For centuries, architecture acted such a role in order to highlight the position of each sovereign in the structures of power. To rise a building featuring explicit, aesthetic, material and localization values is an issue possible to manage only with prominent social position of the investor. In the most cases known from the history, the founders of such buildings had already long – established position in the social structures. They possessed sufficient economical, material and causative capabilities to raise any kind of building. They hadn't been pressed to persuade any social ideas to anybody; erecting a building was rather means to emphasize their public uniqueness. But after the collapse of three main Central European Empires in the beginning of the XX-th century it had changed. Political structures emerging on the debris of the Russian, Austro – Hungarian and German Empires needed convincing instruments to assure their societies that ideas preached by them were the only ones to recreate the greatness of their countries. The presentation is about to set out to prove that architecture could be an important means of political fight to dominate the society on an example of Germany during totalitarian Nazi State. It undertakes the task to point out main architectural instruments extensively used to achieve political aims of Nazis. In his youth, Hitler dreamed to become famous artist, architect or philosopher. He couldn't matriculate for Vien Academy of Architecture which was one of main factors to create his frustration in the future. But he had memorized the power of imperial architecture he experienced as a pauper. On his route to gain the political authority over the masses of German impoverished people in 20-ties and 30-ties of the XXth century he still believed that architecture could materialize his ideas to create the better future of his nation. This certitude led him and his architects to impose several sophisticated manipulations into the architecture styles they consequently provided not only to the German public but also the Free World. The word "manipulations" is used here in terms of false activity, set to influence the society for entirely other, hidden unwanted ideas. Today pluralism of European culture appears to be in danger. Our experience teaches us that the history often repeats. Also this unwanted history. If we don't recognize that we are manipulated, it might be too late. This seems to be a reason good enough to remind the architectural instruments set by Nazis in prewar Germany that ultimately helped them to manipulate society of great culture and led it to disastrous war. Such architecture still might be used once again for modern manipulations. Let it be our premonition.



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Session Title:

Architectural Heritage and Conservation of Historical Structures



INTRODUCTION OF “THE BASTARD” IN THE URBAN FABRIC OF THE TETUAN MEDINA: DAR ODDI HOUSE

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ABSTRACT

The medina of Tetuan has suffered a steady growing since its founding at the end of xv century by Sidi al-Mandary. It has always followed the Islamic city rules and included those works carried away by the sultan. This process had two breaking moments, that of the occupation of the city by the Spanish army in 1860 and the establishment of the Spanish protectorate. The first inside widening of the Luneta Street of the medina took place when the Rif War had already finished (provoked by the establishment of the Spanish Protectorate). The Widening was being built and the “modernity” could astonish anyone. The motives for Hadj Ahmed El Oddi to build his own house in the heart of the medina should be searched in the “kaida”, that is the tradition so close to the muslim character of Tetuan. Building inside the medina meant not only keeping the familiar tradition but following the way of life their family, neighbours, friends kept. .It was considered improper to do it in a different place. They could own properties in the new quarters, but only to be rented, not to be first residence Dar Oddi was built in 1920 in the city centre al- Blal, the oldest quarter of the medina of Tetuan. Built on the foundation of a demolished house would be built as the new houses already built inside the medina by neighbours and relatives. That ‘current fashion’ was similar to a muslin house of the beginning of the xx century: based on the tradition but contaminated by the social changes taking place outside he medina and in short inside.



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REINFORCED CONCRETE, STEEL, TIMBER, BRICK AND GLASS - MATERIALS AND STRUCTURES USED FOR ARCHITECTURE OF PORT OF GDYNIA (1920-1939)

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ABSTRACT

Just as the development of metal frame constructions revolutionized the architecture of the second half of the 19th century, the architecture of the 20th century was influenced by the invention of reinforced concrete constructions and its development. The article presents the results of the research on the aspects of different materials and structures for which they had been used during the construction of the Port of Gdynia, erected in Poland in just a dozen years in the 1920s and 1930s. Throughout the process of construction of the Port of Gdynia and implementation of new facilities designed individually for the specific needs, the designers developed a number of interesting solutions: technical, spatial, functional and architectural. All of them, regardless of the form, the shape and the materials are combined by a common aspect - the desire to obtain an open space, easily operated plan. The fact that the construction of the port of Gdynia began during the epoch of Modernism with its radically avant-garde variations, commonly labelled as Functionalism and Constructivism is also crucial throughout analysis. Widely used cubic solutions, where the construction and rhythmic arrangement of structure elements played a leading role, modern materials were particularly important. The discussed issues aim at a better recognition of the specifics of cultural heritage of port of Gdynia and the presentation of the values associated with it.



**RESEARCH ON EVALUATION OF CONSERVATION PLANNING IMPLEMENTATION OF NANSHE
HISTORIC VILLAGE IN DONGGUAN CITY (CHINA)**

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ABSTRACT

Conservation planning plays an important role in the protection and development of historic villages. The evaluation of conservation planning is helpful to find out the problems existing in the village protection work which helps to improve the conservation planning system. The paper briefly summarizes the conservation planning background of Nanshe historic village in Dongguan city, Guangdong province, China. The conservation planning guided the protection work of Nanshe village since 2002. It evaluates four aspects of the conservation planning implementation and effect such as protection and utilization of the ancient buildings, roadway repair, landscape and basic sanitation facilities improvement by ways of field research and questionnaire survey. There are only nineteen ancient buildings repaired and the rest of them are part of repaired or not repaired. Most of the roadways are well preserved. Only four of them are partly repaired or not repaired. Most of the villagers like to chat under the ancient banyan trees. Conservation Planning pays not much attention to the needs of the residents. Although conservation planning of Nanshe village developed the near, middle and long term target it actually took 14 years to carry out the near target. It enhances the social awareness of Nanshe village and the sense of belongings of the villagers. Most of the villagers are satisfied with the implementation of the conservation planning. Meanwhile, the paper exposes the conservation planning is too idealistic. It lack of implementation details and the three phases of the investment funds and pays not much attention to the needs of residents.



World Multidisciplinary

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DESTROYING CITY, ALEPPO: CRITICAL THINKING ABOUT THE CULTURAL AND ARCHITECTURAL HERITAGE

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ABSTRACT

Aleppo is an ancient city which has historical past. In that city, there are many spatial structures and buildings especially on city centre. For example, the suq as market includes mosques, bazaars and so on. At 16th century, the city's development was taken placed by trade routes such as Silk Road and interrelationships between different communities. Until the in war begins that the city development continued but as we know that Aleppo city in Syria has being destroyed by in war since 2011. Many historical important buildings and spaces have been face to face thread from war and this condition led to collapse of spatial structure of city centre. In this case, what should be make and take previsions for conservation of spatial units. In this article, we will plan to discuss on conservation politics on cities as like as Aleppo effecting by war in terms of ICOMOS agreements.



**AN OPPORTUNITY TO SAVE HISTORICAL RAILWAY INFRASTRUCTURE – ADAPTATION AND
FUNCTIONAL CONVERSION OF FACILITIES**

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ABSTRACT

After years of neglect and underinvestment, the Polish railways are now witnessing a rapid modernization of both their constructions and rolling stock. This, however, is only true of the main railway lines connecting major urban areas. It is worth pointing out that a great number of secondary lines, railway stations and stops still have not been included in the transformation process. Railway facilities, warehouses and service features are in a process of decay. Rapid developments in technology have caused numerous historical architectural structures and service features to fall out of use. There are historical railway facilities dating back to the late 19th or early 20th centuries, whose condition is constantly deteriorating. The only way to save these structures is to change the manner, in which they are being used, attract new investors and operators. The adaptation of buildings may be carried out in a number of ways by following different strategies. The process depends on the structure's current condition and significance for the railway infrastructure system. The facilities which are disused as a result of technological changes in the rolling stock and infrastructure include workshops, steam locomotive bays, turntables and warehouses. Their size and location within a city make them a perfect place for commercial services, exhibitions, heritage sites, concerts and other events attracting great numbers of people. Other strategies may be used for constructions located next to railways lines, whose role has declined. Such constructions include small railway stations, warehouses, reloading and forwarding facilities, railway ramps, railway staff buildings as well as residences for railway employees. Railway stations located at large junctions used to serve as passenger or cargo service points. As well as being the only window to the world, railway stations in small towns housed all the services available in the place. At the same time, they served as meeting spots, community centres and places of particular social importance. Therefore, successful revitalization requires adaptation and functional conversion in order to cater to the needs of the inhabitants and visiting travellers. Such activities involve architectural, social and economic spaces. This paper presents small railway stations of historical value with a view to their adaptive potential, as well as examples of completed adaptation projects.



AUTHENTICITY OF ARCHITECTURAL HERITAGE IN A REBUILT CITY: COMMENTS TO VACLAV HAVEL'S IMPRESSIONS AFTER HIS VISIT IN GDAŃSK (2005)

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ABSTRACT

There is no doubt that authenticity is a cardinal feature of architectural heritage and shall be protected as same as historical and cultural value of monuments or their integrity. Sometimes one decides to reconstruct a destroyed historic building because of important emotional, scientific, artistic or political reasons (e.g. Zwinger Palace in Dresden or Royal Castle in Warsaw). However, the solution which should be an unusual exception, too frequently becomes a common and unnecessary practice standing in contradiction to the sense of architectural conservation. Moreover, a significant part of society accepts this kind of action and mistakes copies of historic buildings for original ones. Vaclav Havel, the former Czech president and Nobel prize-winner gave some consideration to this issue during his last journey to Gdansk in 2005. With a dilettante casualness, contrary to the modern principles of conservation, Havel concluded that not the authenticity but beauty/aesthetic value of monuments would matter for common people (see: Vaclav Havel, "To the castle and back", New York - Toronto: Alfred A. Knopf, 2007). In this paper we try to confront his remarks with the main issues of the rebuilding of Gdańsk after the Second World War, especially the partial protection of historical plan of the city and the socialist transformation of allegedly reconstructed burgher-houses. We also outline the sad circumstances which led to the post-war annihilation of many survived historic houses in Gdańsk and show, how they were ultimately replaced with neo-historical facades. Besides, we try to provoke the reflection of people (including some architects) living in the era of "liquid modernity".



ARCHITECTURAL ACCESSIBILITY OF HISTORIC LEGACY: THE SOCIAL ASPECT AND DESIGN PROSPECTS

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ABSTRACT

Due to the necessity of eliminating civilizational backwardness, the contemporary discourse concerning the tradition and post-modernity is based on the assumption that the cultural environment is a part of an integrated system, and its function and form undergo changes in the course of a constant and complex process determined by the current economic, political as well as cultural circumstances. The recognition of the value of architectural monuments is an obvious fact, however, the idea of democratizing the legacy in the context of universal spatial design is a relatively new phenomenon. Adjusting the historic monuments to the needs of people with various limitations affecting their mobility and perception is less and less frequently considered in terms of oppression or arduousness. It has started to be perceived as a potential catalyser of positive changes. Architectural accessibility might contribute to popularizing the knowledge regarding the significance of historical legacy and provide the conditions for its sustainable development and stable subsistence. It is necessary to answer the question: can the cultural space along with the preserved throughout the history tradition of the absence of the excluded groups have a universal character, so that the conditions of using and experiencing this space by people with disabilities would not exceed their capacities? Owing to the fact that the application of universal design principles is practically more complex than the intuitive understanding of the concept itself, there is a need to continue multidirectional research taking into account methods for the real application of the assumptions underlying the ideas of social egalitarianism. The aim of the paper is adding new concepts to the debate on the roots of spatial discrimination and possibilities of counteracting this phenomenon by modifying the monuments, building complexes and historic places. The conclusions have been based on the analyses of international law regulations and available literature data, but, first of all, on the experience resulting from the cooperation with the people whose exploitation of the space environments is affected by various limitations and with the institutions through which they are organized. The dynamic and competent social and scientific dialogue concerning the issue of universality cannot be possible without the involvement of persons with disabilities. The article is a voice in the discussion on the common accessibility standards and it attempts to answer a question whether, due to the risk of degrading the original buildings tissue, the introduction of physical changes implied by the ongoing socio-cultural transformation should be limited or rather supported. The paper includes suggestions concerning harmless modifications and supplementing the existing building tissue with those elements which could play a role in creating optimal conditions for the inhabitants' wellbeing and further socio-cultural development. The Author presents arguments supporting the statement that a proper understanding of the physical and mental needs of the users, professional experience as well as a proper level of awareness and empathy might open new possibilities to the designers, thus contributing to the effective reduction of the barriers existing in the space or even to their complete elimination.



MASS HOUSING NEIGHBOURHOODS IN MEDIUM-SIZED ANDALUSIAN CITIES. BETWEEN HISTORIC CITY CENTRES AND NEW PERIPHERAL DEVELOPMENTS

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ABSTRACT

This communication aims to analyse the evolution experienced by the neighbourhoods that comprise the so-called first periphery. These residential promotions emerge across Europe in response to the urgent quantitative needs of homes existing in Europe at the end of the mid-century wars. Sharing many of the morphological and typological characteristics with their European counterparts, Spanish neighbourhoods that were promoted by the National Housing Institute are paradigmatic cases that have significantly marked the urban development of our country. Most of them have been thoroughly studied, has led to recognize their values and to be included in the catalogues of heritage protection of their respective cities. However, this research shows that is pending an in-depth analysis in cities of intermediate scale. Even though they have a lower number of these public housing promotions, these are not inferior examples and its strategic position within the territorial structure of its region also placed them as recipients of transfer of rural-urban population. These are the so-called medium-sized cities, which are recognized as indispensable for the development of a more sustainable territorial model. Above all, the communication focuses on neighborhoods of social housing which were carried out in medium-sized cities of the Andalusian Coast, mainly under the guidance of the National Housing Plan of 1961-1976. Cases such as the neighbourhood "Jesus Nazareno" in Sanlucar de Barrameda (Cádiz), or "La Paz" in Barbate (Cádiz), are excellent representative examples of this residential architecture in this other scale. Its significance lies not only in the fact that they are the most significant operations of architecture of the modern movement in their respective cities, but are especially noteworthy the values derived from its strategic location within the urban structure of these intermediate scale cities. Being near to city centre, they have been constituted as transition pieces between historic sites, new peripheral developments, and even, their nearest territory. As method, this research proposes a comparative analysis of traceability among different study cases. In this context, it means recording the evolution that these promotions have been experienced since their first designs until their current situation. It attempts to find the characteristics that have resulted in the urban configuration of this periphery and to recognize the sum of all the cultural, economic, social and technological aspects that conditions the ways of life that today are detected in them. As final goal, it is intended to demonstrate that these study cases present a suitable state of conservation, in comparison to the neighborhoods that have been built in large cities. This fact allows us to introduce the concept of resilience capacity, understood as the intrinsic ability of a community to maintain appropriately their spaces and buildings. Definitely, the knowledge generated by this research allow to extract architectural and urban values of these examples, which justify its necessary dissemination as part of our legacy.



AUSTRO-HUNGARIAN PUBLIC BUILDING REFURBISHMENT AND ENERGY EFFICIENCY MEASURES: A CASE STUDY OF ADMINISTRATIVE BUILDING IN SARAJEVO

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ABSTRACT

Among other architectural historical heritage in Sarajevo, and Bosnia and Herzegovina in general, Austro-Hungarian architecture keeps its original architectural, artistic and engineering characteristics. Both residential and public representative urban blocks, streets and squares are distinguishable ambience in architectural and urban image of a city, and are testifying about our architectural past. A number of buildings, are valorized and protected by law in terms of architectural, artistic and historical value. Namely, these buildings have distinct functional, ambiental, historical, and even aesthetical value. To make them last longer, refurbishment of these buildings is challenging and presents potential and multiple benefits for city, and beyond. Refurbishing built environment through functional reorganizing, redesign and energy efficiency measures application could result in prolonged longevity, architectural identity preservation and interior comfort improvement. Besides that, implemented measures for energy efficiency, through refurbishment process, should optimize needs for energy consumption in treated buildings. This paper defines options in comfort improvements and redesign, without implying risks to building longevity, analyses interventions and energy efficiency measures which would enable potential energy saving assessment in refurbishment process of masonry buildings. This paper also discusses the different techniques that can be adopted for conservation and preservation of historical masonry buildings from Austro-Hungarian period dealing with energy efficiency. The works were preceded by historical research and on-site investigations. This paper describes a methodology to quantify their vulnerability and then based on this a scheme of structural retrofitting is suggested. Revitalization of the object consisted in the reconstruction of the old building structure, creating the inner courtyard and covering it with a glass roof.



A REVIEW OF PORTUGUESE CISTERCIAN MONASTIC HERITAGE.

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ABSTRACT

This paper aims to present a contribution to the history of the reform and renewal in the Portuguese Cistercian monasteries throughout almost nine centuries of cultural and architectural history in this Country but focusing on the Beira's Region. The Cistercian Order played a remarkable role in the affirmation of Portugal (1143) and had unquestionable position, since the medieval period, in the construction of a significant part of the Portuguese culture. The reform of many Monasteries came with the Autonomous Congregation of Alcobaça (1567). In fact, the Portuguese Cistercian Monasteries absorbed the regional ways of construction with masonry (granite in the north and limestone in the south) but it is without a doubt in its architecture that change and renewal can be found as a strength and a tool for achieving a status of cultural landmarks. The renewal and reform in the Portuguese Cistercian Monasteries was not restricted to the styles in vogue but also was related to the physical expansion of the monasteries. This could be achieved by adding new aisles and cloisters like in Alcobaça or Salzedas Monasteries. Though there are cases of unconventional renewals and reformations such as the existence of two churches in the Monastery of Salzedas and the example of the open air Museum of the Monastery of S. João de Tarouca were can be found the former medieval monastery, as a result of new archaeological research and a prospective hypothesis of its volumetric layout, in between the walls of the 17th century dormitories and the Church. This continuous architectonic renewal is still being carried out in the 21st century either by the Portuguese Government through several heritage institutes since the 20th century or a few individuals on their one. The history of the Portuguese Cistercian Monasteries blends itself with the history of Portugal as the continuous architectonic renewals and reforms were also a result of nine centuries of events and changes in this Country.



PORTUGUESE CISTERCIAN CHURCHES - AN ACOUSTIC LEGACY

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ABSTRACT

The Cistercian Order (12th century) stands out as an apologist of the simplicity and austerity of the space. According to the Order of Cîteaux, only with an austere space, without any distractions, the true spiritual contemplation is achieved. This Order was an aggregator and consolidator pole during the Christian Reconquest. Thus, as it happens with other Religious Orders, Cîteaux has a vast heritage legacy. This heritage is witness, not only of the historical, but also social, political, and spiritual evolution. This legacy resumes the key principles to an austere liturgy, which requirements, in the beginning, are based on the simplicity of worship and of the connection between man and God. Later, these requirements allowed the development of the liturgy itself and its relation with the believers. Consequently, it can be concisely established an empirical approach between the Cistercian churches and the acoustics conditioning of these spaces. This outcome is fundamental in order to understand the connection between liturgy and the conception of the Cistercian churches as well as the constructed space and its history. So, an analysis of these principles is essential to establish the relation between acoustic and religious buildings design throughout history. It is also a mean of understanding the knowledge of acoustics principles that the Cistercian Order bequeathed to Portugal. This paper presents an empirical approach on Cistercian monastic churches acoustics. These spaces are the place where the greatest acoustic efforts are concentrated and it is also the space where the liturgy reaches greater importance. On the other hand, Portugal is a country which has an important Cistercian legacy over several periods of history. Consequently, the portuguese Cistercian monastic churches are representative of the development of the liturgy, the design of spaces and of the acoustic requirements of their churches since the 12th century until the 21st century and it is of great importance to implement this study.



**THE ESSENCE OF DAYLIGHT IN THE CISTERCIAN MONASTIC CHURCH OF S. BENTO DE CÁSTRIS
(ÉVORA, PORTUGAL)**

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ABSTRACT

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 architecture, in its beginnings (12th century forward) is characterized by austerity, simplicity and the play of light and shadow that gives value to the monastic architectural space itself, making it perfect for a contemplative experience. In the Cistercian Monastery the church is the central piece of the monastic building. Nave, transept and apse are the main architectural components to which is added the choir. This paper contextualizes the importance and close connections of natural light, within the Cistercian Monasteries architecture. Thus the essence of daylight is analyzed within the Church of the Monastery of S. Bento de Cástris, in Évora, Portugal. This former Monastery (13th - 19th centuries) includes the church, at the southeastern corner which has not only a high choir, but also a low lateral choir (within the presbytery). Its unchanged exterior walls are made of solid masonry. Although the function of the walls is primarily structural, the windows allow the daylight to penetrate the space of the church. The church has two external façades facing northeast and southeast. The combined orientation effect of the church's main axis and the sun trajectory determines how the sunlight reaches the interior of this architectural structure. This study presents the qualitative and quantitative analysis of the luminous environment in the church of S. Bento de Cástris, being the first based on the authors' perception of the effect of the daylight within the different areas of the enclosed space. The appreciation of the spatial experiences was supported by quantitative daylight simulations that were conducted in selected areas within the space. With this paper is intended to contribute to the debate about the specificity of daylight, in the context of Cistercian architecture.



DIAGNOSIS OF TRANSFORMATION IN ARCHITECTURE AND CONSTRUCTION OF THE HOUSING STOCK IN THE YEARS 1848-2013 IN SELECTED CITIES OF UPPER SILESIA

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ABSTRACT

In literature, most commonly taken into consideration are: environmental built issues, the issue of new trends and design forms, often in the context of sustainable development. Increasingly, there is also the development of prospects describing and analysing the residential sociological issues reside. Against the background of years of publishing and research, national and foreign, there are also scattered and often interdisciplinary compact works and articles, concerning social phenomena in the context of the architecture and its environment. Despite numerous and valuable literature and a series of activities over the past several years of scientific studies, there's lack of work presenting a comprehensive inventory of housing, shaped over the centuries, in terms of the assessment of users, needs based on suitability and real modernisation. Such coverage of the subject, based largely on test methods using statistical reports of changes carried out in the test substance to the closest possible realities of stock assessment and potential associated with their continued use. The subject of the work is the state of residential architecture resources of the period 1848-2013 selected cities of Upper Silesia, changes carried out in the architecture and construction. Changes to the architecture and construction carried out in the test is an important evaluation measure of housing resources these resources by their users. The changes are contained in three aspects: technical, functional and aesthetic. The main objective of the work is the presentation of a detailed assessment and comprehensive picture of the state of the housing stock of selected cities in Upper Silesia, based on statistical tests, numerous spatial solutions in terms of the evolutionary development of forms of residential architecture in Upper Silesia. The premise of the work is on one hand, the expansion of knowledge of housing resources in Silesian cities. On the other hand, it is an attempt to formulate a comprehensive assessment methods of the housing stock in general, using the elements of statistics, analysis of spatial solutions and macrosocial determinants that contribute to human residence space. For increased readability and precision of the information received, the assessment is linked to a direct private space and to a limited extent only moves and upgrades to transform neighbourhood space or so-called backyard area. Time covers the period 1848-2013. Such a broad framework allows to recognize the vast majority of the existing housing stock and give a larger spectrum of evaluation of these transformations. Opening date is the year 1848. In the mid-19th century the awareness of the need for a comprehensive resolution of the growing housing problems began to shape. It was initiated many years earlier by the industrial revolution and the rapidly changing socio-economics in Europe. The territorial scope of area-defined today includes seven Silesian cities: Gliwice, Zabrze, Bytom, RacibÅ³rz, Ruda ÅšlÅ...ska, Katowice and Tychy. The choice has been dictated by the need to analyse the factors that contribute to the various urban centres. We are dealing with cities with the medieval genesis (Gliwice, Bytom, RacibÅ³rz), agglomerate sediment and industrial colony (Ruda ÅšlÅ...ska, Zabrze, Katowice), and finally processing centres under planning decision (the so-called. New Tychy). The work attempts to answer the question: what were the changes in the substance of the housing stock? In which periods were these changes most intense or largest (both in historical terms and in terms of the use)? Are the recorded changes consistent with the ones developed by other authors subject to the values of sustainability and time (and so: equipment, interior partitions, installations, the faÅšade, the design)? Potential differences in the results in different urban centres of chosen research areas, will also be relevant, as they can demonstrate specific circumstances of the housing site or specifics and priorities of selected users.



A PRAMETRIC ARCHITECTURE IN URBAN SPACE

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ABSTRACT

The paper deals with the modernization and adaptation to the new features of existing objects in the urban fabric. In the twenty-first century the digital design tools, which are interfaced with the production of computer technology, have opened the new opportunities that not only are shaping the architectural objects, but also interfering in the buildings' structures. The selected objects are examined, which have been implemented in the European cities centers, and the new design approaches, which are taken to induce the new strong interactive effects, are indicated. The analyzed objects are: the Extension of German Historical Museum (1997-2004) in Berlin, the Weltstadthaus (2003-2005) in Cologne, the King Cross Station (2005-2012) in London, the Palazzo Unione Militare (2010-2013) in Rome, the headquarters of the Patha Foundation (2006-2014) in Paris. Each of the enumerated examples shows a diverse approach to designing, and what combines them is the use of the digital tools especially the topological ones in the constructing the parametric forms, which reflect the age of digital technologies and the information society. The parametric architecture with its submissiveness to the context, may be perceived as a new way to rehabilitate urban fabric, rich in various layers created in the past. Especially European medieval cities have zones requiring the introduction of new utility functions for their social reactivation. The new architecture involves and invokes a plethora of arguments on the performance (understood both as a task and as staging) of poetics in digital architecture. Under these circumstances, what is at hand is an alternative to the understanding and the production of truly contemporary, innovative and progressive digital architecture.



UPPER LUSATIAN ARCHITECTURE IN THE AREAS OF SETTLEMENT "GŁUCHONIEMCY"

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ABSTRACT

Centuries-old history of Poland, complicated fate and variable over the centuries state borders, caused that cultural heritage is reflection of the fate of residents, interpenetration of ethnic groups and shared creation of regional culture. Particularly full of accumulations is cultural space of Southern Poland, where variable historical and geographical influences are inosculating. That is why presence of mutual for wooden objects type of construction on two different ends of Southern Poland, in two different geographic lands, is so interesting evidence of polish heritage. Fundamental area of occurrence of upper Lusatian architecture is borderline of Germany, Czech Republic and Poland. Houses of this type began to form for the first time in Middleages in upper Lusatia, then this type of construction spread to Northern Czech Republic and to west part of Lower Silesia. There are two fundamental centers of occurrence of Upper Lusatian construction in Poland: in Lower Silesia and Podkarpackie province, where type of building took root together with german settlers, called in this area "Głuchoniemcy"("Waldddeutsche"). Colonisation was accompanied by taken from West model of village settlement systems, land management, and this specific type of building. Interesting, although very poor, compare to Sudeten houses, form is architecture of Doły Sanocko-Jesielskie area and of Pogórze Dynowski, where as a result of connecting cultures was created unique architecture uncommon to other regions of Poland. Houses and economic objects created with Upper Lusatian construction in this area was made generally for farmers and were not sumptuous, therefore inhabitants were not noticing how exceptional this buildings were. Recently these objects are disappearing one after the other due to deficiency of preservation and change of old substance to objects created in newer technology. Saved buildings should remain special protection, because - due to small number of this kind of objects and deficiency of natural continuation this building forms by representatives of ethnic group- are relic of polish history.



CONSTRUCTION OF ARCHITECTURAL STRUCTURES IN CULTURAL HERITAGE PROTECTION ZONES

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ABSTRACT

The article raises issues of constructing contemporary architectural structures in cultural heritage protection zones, using the case study of a building located within the campus of the University of Warmia and Mazury in Olsztyn, Poland. Questions revolving around the construction of this building arise from the need to preserve the surrounding historic heritage, and deal with landscaping, architectural and construction solutions as well as interior design. All these problems grow in importance when dealing with such unique buildings like the discussed example of a laboratory building for the Civil Engineering Department, built on a site within a conservation zone of the university campus. The specific character of the building and the specialist equipment with which it was to be furnished (a resistance testing machine, a 17-meter-long wave flume) necessitated a series of analyses. In turn, the fact that the new building was to be erected in the conservation zone meant that collaboration with the Heritage Conservation Office had to be undertaken at the stage of making the plan and continued during the construction works. The Heritage Officer's recommendations concerning the building's shape, divisions, dimensions, materials used, etc., created a situation where the team of designers and architects had to become engaged in the process of landscape and spatial management. The above requirements concerned the functions of the building and its siting on a land parcel that was difficult to handle, also because of the protected trees growing there. Other constraints included the small size of this site, the developed surroundings, and the pre-defined programme of functions and use of the new building. All the above circumstances made the task difficult and demanded good coordination between individual teams of engineers and architects, both at the stage of making the plan and during the construction works. Many of the heritage protection zones are spoilt with inappropriate buildings and structures. The historic part of the university campus in Olsztyn, in the town's suburb called Kortowo, is an example. Some of the architecture in this area present features characteristics for socialist realism, which causes disharmony with the remaining late-19th century buildings. This paper is dedicated to the question of how to harmonise new buildings with historic ones, and how to strive towards maintaining spatial order. The case discussed in this article proves that such efforts, even when drastic solutions like demolition are needed, can be successful.



TECHNICAL PROBLEMS OF RESIDENTIAL CONSTRUCTION

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ABSTRACT

Beauty, utility, durability - these are the features of good architecture and should also be the distinguishing qualities of every residential building. But do beauty and utility remain along with the passing of time? Performance characteristics are an indicator of both, the technical as well as aesthetic state of buildings. Aesthetic needs are in disagreement with the merciless aging process. The beauty of a city is formed not only by the original forms of new residential buildings, but also by existing tenement housing; thus preserving their aesthetics becomes a necessity. Time is continuously passing and along with it, aging intensifies. The aging process is a natural phenomenon for every material. The life expectancy of building materials is also limited. Along with the passing of time, the technical state of residential buildings continuously deteriorates. With the passing of time, the aesthetic values and preferences of users of flats change and the usability of the building decreases. All buildings demand attention, especially those closest to people - residential buildings. Aesthetic requirements, which stem from the passing of time, are most focused on these buildings. Residential buildings are constructed with different building materials, which vary in terms of quality. Along with the passing of time, they age, lose their performance characteristics, and undergo natural wear and tear. Materials in the buildings are different and characterized by various, each their own, defined life expectancy periods. The processes of aging, wear and loss of performance characteristics do not take the same course in each fragment of the building. The roof cover is not as durable as the structure of the roof trusses. The life expectancy of a wooden roof truss structure is shorter than that of load-bearing walls. Passing, however, is not inevitable. The permanence of buildings, including residential buildings, is shaped not only by the forces of nature but also by activities of humans. A long lifespan is ensured by carrying out ongoing, systematic renovation-repair works. It is thanks to them that buildings derived from past centuries are still being used, and their market attractiveness is not decreasing.



SMALL HYDRO POWER PLANTS IN POMORZE - THE EXAMPLE OF THE EVOLUTION OF THE MODERN INDUSTRIAL BRICK ARCHITECTURE.

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ABSTRACT

Modernism is usually recognized and associated with aesthetics of the International Style represented by white-plastered, horizontally articulated architecture with skimpy decoration, where function was the main imperative of the architects' ambitions. In the Northern Europe though, Modernism, instead of the white-plastered face, had also its brick one, representing different manners, styles and appearances. The brick face of Modernism reflected in fact the complexity of the modern change, breaking ties of the historic styles of the 19th century and being still present in the beginning of the 20th century. Regardless of the cosmopolitan character of the International Style and its unified aesthetics, architects tried to find and keep the shades of individuality. This was especially visible in the references to either regional or even local traditions. This diversity of the modernistic architecture is intensified by different functions. The language of the industrial architecture derives its forms directly from its nature of pure functional idiom, devoted to the economical and functional optimization. The industrial form usually seems to be subordinate to the technical nature of the objects. But regardless of that, in the 19th century and the first half of the 20th century we can observe interesting evolution of the styles and tendencies visible in the industrial architecture, even in such a narrow and specific field like the architecture of small hydro power plants. The purpose of the research was to recognize the evolution of the architectural form of hydro power plant as a developing branch of industry in the first half of the 20th century. In Pomorze, during this period, the dynamic growth of the investments took place, which was concerned with the use of the potential of Pomeranian rivers to produce electric energy. At the end of the 19th century, electricity had its strong symbolic meaning of the radical civilization change, which was influencing also the aesthetic aspects of architecture. This could suggest that the architecture of the hydro power plants should be one of the carriers of the new progressive architecture. In fact, in the case of the Pomeranian hydro power plants their technical solutions were representing the most advanced and progressive solutions of the times, sometimes even being a kind of the experimental approach, accustomed to the diversity of the local geographical conditions. Regardless of that, the architecture of the Pomeranian power plants was rather reflecting the diversity and dynamism of the aesthetic discourse of the time (sometimes even representing and adopting traditional or historical forms). The cascade of power plants Podgaje (1928), Jastrowie (1930) and Ptusza (1930), all built as the elements of the same investment on river Gwda, can be the example of absorption and development of new aesthetic trends within the same stream of clinker architecture. The paper describes selection of the examples of Pomeranian power plants as a comparative study which could illustrate the evolution of the brick architecture of the beginning of the 20th century.



SAN MIGUEL'S WICKET: A LOST STRETCH OF THE ALMOHAD WALL OF THE WORLD HERITAGE CITY OF CACERES.

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ABSTRACT

Thanks to our research of the City of Caceres and chance we discover an anomaly in the urban planning that makes us suspect that some popular houses in the northeast hide a fragment of the ancient Almohad wall. After the analysis of this singularity we discover the existence of a "lost piece" of the city: a hidden denatured military structure preserved along the centuries by several houses that reused it within "economy of means". This paper analyzes this lost fragment from a holistic perspective: constructive, urbanistic and planimetric; verifying that this is a stretch with a wicket of the ancient Almohad wall and submits several hypotheses about its possible functions for further research. The aim of the paper is to contribute not only to the knowledge of "Caceres" Almohad wall, but also to the historic city itself, through a better understanding of the buildings and spaces from the perspective of how they are constructed. We hope that this knowledge will help to preserve them.



STUDY OF THE MURAL PAINTINGS OF THE CENADOR DEL LEON IN THE REAL ALCAZAR OF SEVILLE

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ABSTRACT

The Cenador del Leon is located in the gardens of the Real Alcazar of Seville, next to the Pabellon de Carlos V, in the limit with the Jard n Ingles. Designed in the 17th century, it is dominated by a pond and sculpture of a lion from which its name comes. The simple volumes recall the old typology of the Muslim "qubba" although interpreted as a transition to the baroque language. The building is one of the most interesting examples of Sevillian Mannerism, where we also observe the influence of the "retablistica" of the time. In 1644, the building was decorated with paintings by the painter Juan de Medina. A visual, architectural and landscape study of murals in the gardens of the Real Alc zar has been carried out. The mural paintings represent - with their iconographic compositions - a dialogue with the architectural space and transmit a message in their images and contribute monumental character. In the Cenador del Leon, the fresco paintings contain a series of mythological subjects, grotesques and imitations of false marbles; in its decoration can be deduced that it is dedicated to love (Albardonado, 2016). Also, a scientific study has been carried out to analyze samples in laboratory to characterize wall paintings using optical microscopy, infrared (IR), X-ray diffraction (XRD) and scanning electron microscopy with energy dispersive microanalysis X-ray (EDX). Using these methods, the fresco technique was demonstrated and the types of pigments found in the Cenador del Leon were identified; they were probably used in all the constructions of that time in the gardens. Emphasise the scientific study the detection of pigments such as blue, reddish salmon, dark red or garnet, golden yellow, green and dark brown. Some pigments have detected glass with cobalt (blue), chlorine and copper (green) and iron oxide (reddish salmon and garnet). In addition, the support of the paintings is made with calcium carbonate and, silicon oxide and feldspar, we assume that it was made with lime and arid based silica sand, formerly used support for this type of techniques. Research the materiality and the compositional form of the mural paintings of the Cenador del Leon is a tool for the restoration work that will be carried out soon. This knowledge brings us closer to the authenticity of the monument and is translated into the restoration of local patrimonial identity. In this unique environment, the mural paintings of the Cenador del Leon highlight the architectural landscape of the gardens thanks to the use of color, and also, at an architectural, historical and cultural legacy level, enrich the image of the gardens of the Real Alcazar.



HYBRID TECHNOLOGY FOR THE PROCESSING OF LASER SCANNER SURVEY DATA FOR BUILDING INFORMATION MODELLING OF ARCHITECTURAL HERITAGE

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ABSTRACT

Traditional methods of reconstruction of architectural heritage are often time-consuming and barely efficient, because they are related to the exchange of two-dimensional and paper-based support information. Modern building information modeling (BIM) technologies are an effective instrument for development of reconstruction projects of architectural monuments, allowing users to model the three-dimensional compounds of the building and to link a variety of information to it. BIM is an emerging technology used for documentation and management of existing historic buildings. The objective of the paper is to develop of a unified hybrid technology for the processing, storage and visualization of remote sensing data including laser scanning data about historical buildings, based on decoding and vectorization algorithms as an information framework for BIM of heritage resources. Civil-engineering surveying for historical buildings is a regulated activity, which is increasingly used modern high-tech devices and equipment. Thus, laser scanning is an advanced geodetic survey method for any surrounding objects. There are terrestrial, mobile (used car, train, etc.) and airborne (carrier - airplane, helicopter, UAV) laser scanning. Appropriate methods are used for filming various objects, ranging from historic buildings to uninhabited territories for road construction. Filming and data processing is currently performed individually on specific objects and territories, according to the technological requirements. Features of laser scanning are the high accuracy and density of the shooting, and the subsequent production of large amounts of data. the task of creating the hierarchical processing algorithm of large amount of data that provide a hybrid processing and data compression without loss of accuracy, the possibility of integration with the scan results obtained by various means, seamless linking of data processing in real time, providing the possibility of forming orthoimage based both on a single scan, and combined with a series of scans produced by different scanning means (it provides a reduction in the area of "dead zones" in the ortho) are not currently addressed. The author's method propose a comprehensive solution to the problem by creating a software-based technology for the algorithmic support for the hybrid system, which will provide the data processing received from all types of laser scanning - mobile, land and air, as well as photography. The first result of the technology application to historical building shows the robustness of the technology proposed.



THE IMPORTANCE OF LASER SCANNING RESOLUTION IN THE PROCESS OF RECREATING THE ARCHITECTURAL DETAILS OF HISTORICAL BUILDINGS

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ABSTRACT

The TLS method (Terrestrial Laser Scanning) may replace the traditional building survey methods, e.g. those requiring the use measuring tapes or range finders. This technology allows for collecting digital data in the form of a point cloud, which can be used to create a 3D model of a building. In addition, it allows for collecting data with an incredible precision, which translates into the possibility to reproduce all architectural features of a building. This data is applied in reverse engineering to create a 3D model of an object existing in a physical space. This study presents the results of a research carried out using a point cloud to recreate the architectural features of a historical building with the application of reverse engineering. The research was conducted on a two-storey residential building with a basement and an attic. Out of the building's facade sticks a veranda featuring a complicated, wooden structure. The measurements were taken at the medium and the highest resolution using a ScanStation C10 laser scanner by Leica. The data obtained was processed using specialist software, which allowed for the application of reverse engineering, especially for reproducing the sculpted details of the veranda. Following digitization, all redundant data was removed from the point cloud and the cloud was subjected to modelling. For testing purposes, a selected part of the veranda was modelled by means of two methods: surface matching and Triangulated Irregular Network. Both modelling methods were applied in the case of data collected at medium and the highest resolution. Creating a model based on data obtained at medium resolution, both by means of the surface matching and the TIN method, does not allow for a precise recreation of architectural details. The study presents certain sculpted elements recreated based on the highest resolution data with superimposed TIN juxtaposed against a digital image. The resulting model is very precise. Creating good models requires highly accurate field data. It is important to properly chose the distance between the measuring station and the measured object in order to ensure that the angles of incidence (horizontal and vertical) of the laser beam are as straight as possible. The model created based on medium resolution offers very poor quality of details, i.e. only the bigger, basic elements of each detail are clearly visible, while the smaller ones are blurred. This is why in order to obtain data sufficient to reproduce architectural details laser scanning should be performed at the highest resolution. In addition, modelling by means of the surface matching method should be avoided - a better idea is to use the TIN method. In addition to providing a realistically-looking visualization, the method has one more important advantage - it is 4 times faster than the surface matching method.



PALACE OF THE EARL OF PADUL, GRANADA, SPAIN: A MILESTONE IN A CROSSROAD

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ABSTRACT

The Palace of the Counts of Padul is the most emblematic building of Padul, Province of Granada in Spain, being one of the most remarkable of the region of the Valley of Lecr n. It is a building of undoubted historical value, declared of Cultural Interest, maximum level of protection of the Spanish legislation in historical heritage. In spite of this and being a symbol of Padul, it does not enjoy that importance and their citizens ignorance is generalized. It is a building of the first part of the XVII century. D. Antonio de Ar stegui y Zazo (knight of the Santiago order and a secretary of Felipe III) was its developer. He gives the building a noble character with an unusual design for this shire. It has a L shape floor, two floors and two squared towers standing out a third floor covered by a pitched roof. Load-baering walls of masonry not carved stones, with carved stones corners. Deck built with logs, and bricks, and wooden roof truss. Looking like a solid simple house. Civil architecture at the beginning of the Baroque style. Analyzing the urban morphology of Padul, the uniqueness and large area of the plot that it occupies with respect to the rest of the urban plot is verified. It is also remarkable its relative position with respect to the historical roads that crossed here: The real road that came from Granada heading to the Alpujarras, and leading to Motril and the road that starting in Malaga crossed through Alhama and arrived at Padul. It is clear then, the function that had as a control post, having been a necessary passage towards the Lecrin Valley, the Alpujarras and the Mediterranean coast Immediately after his declaration in 1981 as a National Monument, and despite this, it suffered an unfortunate intervention which has been maintained until today and that the City of Padul wants to revert with its acquisition. It is in this situation in which the invitation of the council government to the University of Granada is produced so that the students of Project of End of Degree of the School of Building have it as an object of work. By focusing our attention on this building, it is intended to preserve its valuable heritage, showing its history, proposing technical solutions that help to preserve its values, and finally, to make the Casa Grande popular for the residents of Padul and all visitors.



POSTMILITARY URBAN STRUCTURE IN CONTEMPORARY TOWNSCAPE OF POLISH CITIES

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ABSTRACT

The paper presents contemporary revitalizations of historical postmilitary complexes to housing functions. Chosen examples from Polish cities (Poznan, Olsztyn, Gdansk Wrzeszcz, Legionowo, Warszawa, Suwalki...) are presented in the context of analogous European solutions (Germany, Hungary, Spain, Slovakia, ...). The purpose of the science work is to present spatial features, which should be kept in the process of revitalization of historical barracks. The idea is to keep legibility of historic complexes in contemporary townscape. Ancient military ansambles which were built at the turn of the 19th and 20th centuries were located out of citie's border. They were swallowed up by those cities after the passage of years. Characteristic spatial layout of historical complexes, remained legible in the urban planning structure which absorbed it. Important value is keeping their legibility as tightly-knit urban planning compositions in the contemporary landscape of the city. The regular spatial structure and kept postmilitary buildings constitute warp in our times (urban grid) urban structure for new dwelling settlements (Poznan, Olsztyn, Gdansk Wrzeszcz, Legionowo, Warszawa, Suwalki...). Housing estates with assisting functions apart of dwelling, constitute the attractive offer for future residents. New flats proposed in postmilitary monuments have character similar to flats in postindustrial buildings. Results of researches let the realization for two groups: 1) of complexes honouring historical values of objects and ansambles, 2) degrading them. Conclusions from conducted analyses will allow to show conditions which should be realized as part of the revitalization process. The process should honour individual, historical features of the ansambl of former barracks, not to loose them.



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Civil Engineering-Architecture-Urban Planning Symposium - WMCAUS

THE PALACE OF STANISLAW REY IN SIECIECHOWICE - THE CULTURAL HERITAGE ON THE POLISH TERRITORIES

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ABSTRACT

The historic palace complex with a park is situated in the center Sieciechowice, away from the Wawel Hill about 30 km. It is one of the most interesting architectural and urban planning assumptions resulting in the present commune Iwanowice and district of Krakow. The development of the compositional and spatial foundation has been closely linked with the urban layout of the village. It characterized by great diversity: the historic mansions, supporting facilities and plant forms. More than a dozen buildings and engineering structures formed the original band, which formed an integral part of the landscape Sieciechowice, and it remains a living history of the history of architecture manor palace, which then lands in the possession of the county family Rey. Unfortunately, acts of war, immediate repairs, lack of proper concepts and ideas for development and long-term shortage of funds led to the destruction of the impressive foundation and continue to lead to further degradation.



CAST IRON ELEMENTS OF INTERIOR EQUIPMENT OF THE BUILDINGS

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ABSTRACT

Cast Iron is a material, characteristics of which enable to receive extremely artistic elements. It maintains good strength properties at the same time. That combination of these seemingly contrary traits makes it a commodity that was widely used in the history of architecture. That usage was not only as decorative elements, but also as technical and structural ones. Moreover even these have ornaments, which significantly affect aesthetic qualities. The aim of the article is to characterise elements of interior equipment of the architectural objects that are made of cast iron. As it appears from performed bibliography, archival and field studies, the ways of exploitation are very broad. Cast iron was used to produce the minor elements, which were only parts of the bigger wooden or stone items. Notwithstanding, there were also bigger ones casted as a whole, and frequently ones that were assembled from many elements. Some were mounted into the building, the others were a mobile equipment. They were most commonly used as decorative elements, but it was rare that in addition to this function did not serve any useful function. They can be found in the residential, farm and industrial objects, but also in public facilities, such as market halls, department stores, churches and railway stations. It can be noted, that some of these are potentially buildings of high rank. They are richly equipped. Some are the objects with no representative role, but despite that also comprise that elements. The period of greatest popularity of cast iron products is the 19th century. Methods of producing influenced the mass production and the World's exhibitions influenced the popularization of aesthetic designs. Nowadays, elements of interior feature are one of the subject of study during the restoration work of the buildings. They can provide important information and are considered as the essential part of the architecture of historical objects. Cast iron elements are also increasingly appreciated and restored to their original values.



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TWENTIETH-CENTURY REDEVELOPMENT THE CAUSE OF DISASTER TECHNICAL CONDITION OF THE WOODEN SACRAL BUILDING

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ABSTRACT

Greek-Catholic church in Wielkie Oczy, located in Podkarpacie Region in Poland, was built at the beginning of the twentieth century, in timber frame construction, an unusual for the Region. The reconstruction of the object carried out in 1937, caused adverse changes in the structure system of building. Expansion of the nave, the change the roof significantly contributed to the progressive deformation of the walls, loss of stability of the dome and the loosening of carpentry connections, used to join pieces of wood. The paper describes the impact of redevelopment in sacral object, the impact of architectural changes on the stability and strength of the building elements. It is presented the assumptions and results of structural analysis the building to the state before the redevelopment, to the reconstructed object and to the construction of the designed reinforcements. The article presents the solutions implemented in object, as a result of a compromise requirements of different fields: architecture, construction, conservation and technology of work.



TIE BARS IN ARCHITECTURE

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ABSTRACT

The use of specific material in architecture arises from its characteristics. Some of these used in the past withstand compression stresses, but are susceptible to destruction by the tensile stresses. That kind of destructive internal forces appear also as a result of the action of horizontal forces. The aim of the article is to characterize the tie bars that are used in the building objects. These elements play the essential structural role, especially in parts of the building that are exposed to the lateral forces. They were used as the component mounted into the building during its creation, both in parallel and orthogonal layout. Wood and iron were used as a raw material to make them. In the history of architecture tie bars are commonly found as structural elements that ensure the stability of vaults and arches. This refers mainly to those cases, which are based on a relatively slender support. They take the lateral force and prevent the destruction of stone or brick construction. Sometimes they get extremely rich and decorative form based mostly on floral motifs. Tie bars can be used also as horizontal elements that allow to mount on some equipment of the building. Nowadays tie bars are also commonly used in completely new buildings, mostly of metal construction which is much more slender than it would be if using brick or stone. As the practice of conservation of historic building shows, using metal tie bars is one of the most popular and effective method of reinforcement of damaged historic buildings.



**THE USE LIDAR DATA (DTM, DSM) IN THE ANALYSIS OF 3D / 4D OF OBJECTS FORTRESS KRAKOW
(POLAND)**

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ABSTRACT

The article presents the partial results of studies in the framework of the international project "Cultural Heritage through The Time" CHT2. Subject of the study were forts of Krakow Fortress built between 1849-1914 by the Austrians in order defense against the Russians. The research work were aimed to identifying architectural changes occurring in different time periods for selected objects Krakow Fortress. For the analysis was used LiDAR data: Digital Terrain Models (DTM), Digital Surface Model (DSM), and the cartographic data: maps, orthophotomaps. All the spatial data were obtained from Poland the Main Office of Geodesy and Cartography (Główny Urząd Geodezji i Kartografii GUGIK). Most of the cartographic data is available in the form of Web Map Services (WMS) on Geoportal (www.geoportal.gov.pl). Archival data were made available by the Museum of the City of Krakow or from private collections. In order to conduct a thorough analysis of objects fortress Krakow, DTM and DSM data were obtained either in ASCII format, as well as in the source format *.las (LiDAR). On the basis of DTM and the DSM were made determining the degree of destruction of selected objects fortress, occurred as a result of actions demolitions of objects in the interwar period (1920-1939) and in the 50s of the twentieth century. The research has been done on the basis of all available cartographic materials, both archival (plans, maps, photos) and actual (topographic map, orthophotomap, etc.). Verification of archival maps and plans were carried out by comparing the current digital image of the existing forms of fortifications to the projects made by Austrian's. As a result, it was possible to identify the differences between the original project and the current state. Conducted analyzes also allowed to check the legitimacy of locating the forts for: visibility of an object from the enemy (foreground), presence and amount of "dead fields" on the foreground, the effectiveness of blurring characteristic forms of military masks formed from tree rows and shrubs. Furthermore, they analyzed the impact of erosion as resulting from the natural process of silting drains of forts' ground forms, the blurring of the slopes, landslides of the scarps, flooding of moats and Kaponier.



ASSESSING OF THE “MONUMENT” STATUS IN THE VIEW OF POLISH ACTUAL STATUTORY DEFINITION

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ABSTRACT

In the presentation some aspects of the most actual amendment to the text of Polish Parliament Act from 23 July 2003 about the Conservation and the Care of Monuments (Dz. U. z 2014 r. poz. 1446, z 2015 r. poz. 397, 774, 1505, z 2016 r. poz. 1330) are set out to be discussed. It is a common dictum that any edifice can't exist without good foundations. In this particular case of mentioned above Act about the Conservation and the Care of Monuments, definition of “monument” as well as assessment set out to provide the object a status of a “monument” appear to be such a basis. These aspects are evaluated with use of analytical method supported by comparison method in the comment included in the presentation. The Act in question, in its Art. 3 p.1 defines a “monument” as cit.: “a real estate or a chattel, its part or units, appearing to be an effect of human work as well as associated with human activity and in the meantime constituting the evidence of a bygone era or past events which preservation is in the public interest according to its historical, artistic or scientific values.” This definition exists in the objective Act since its ratification by the Polish Sejm Parliament on 23th July 2003 without single change and it derives from the similar Act ratified on 15th February 1962. Post war experience of the “monument” status assessment in Poland shows that all of three mentioned above factors - i.e. historical, artistic or scientific values altogether with public interest - apparently in principle logical and understandable - are subjected to considerable problems in the practical application. It appears in fact that the historical value is still being interpreted unusually freely and what's more not only by laypeople, but - wonders never cease! - also by specialists. The purpose of the presentation is to prove that the main cause of such a state of affairs is a lack of the monument assessing categorization based on parametrized analysis of historic objects values, standardized in the scale of the entire country.



ILLUMINATION OF MONUMENT BUILDINGS THE REVIEW AND CASE STUDY ON EXAMPLE: RECTOR'S OFFICE BUILDING OF SZCZECIN UNIVERSITY

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ABSTRACT

There's no doubt that every night illumination improves the view of each building. In some cases it might create a masterpiece from an object that appears to be kind of "Cinderella" by day. On the opposite, sometimes it might become a "nightmare" if the illumination is not applied properly. So this is why professional engineering as well as an artistry and psychology should be involved when it comes to design and implement an illumination system to the architecture. It is particularly important when it comes to illuminate the registered monument of architecture. When the illumination of the architectural monument issue emerges, the conservatory administration very often doesn't allow any interference to the façades for the reasons that seem to be doubtful. Author's experience shows that it is possible to confront these reasons and find a compromise basing on rational conditions supported by some sophisticated engineering solutions. The aim of the presentation is to put forward these solutions as well as to discuss some extra ideas how to specify system of criteria acceptable for the conservatory authorities that allow proper architectural monument illumination. The discussion shall be accompanied by review of famous architectural monument illuminations examples. The axis of the discussion would be the experience obtained on example of Rector's Office Building of Szczecin University.



MODERNISM IN BELGRADE: CLASSIFICATION OF MODERNIST HOUSING BUILDINGS 1919-1980

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ABSTRACT

Yugoslavian Modernist Architecture, although part of a larger cultural phenomenon, received hardly any international attention, since there are only a few internationally published studies about it. Nevertheless, Modernist Architecture of the Inter-war Yugoslavia (Kingdom of Yugoslavia), and specially Modernist Architecture of the Post-war Yugoslavia (Socialist Federal Republic of Yugoslavia under the “reign” of Tito), represents the most important architectural heritage of the 20th century in former Yugoslavian countries. Belgrade, as the capital city of both newly founded Yugoslavias, experienced an immediate economic, political and cultural expansion after the both wars, as well as a large population increase. The construction of sufficient and appropriate new housing was a major undertaking in both periods (1919-1940 and 1948-1980), however conceived and realized with deeply diverging views. The transition from villas and modest apartment buildings, as main housing typologies in the Inter-war period, to the mass housing of the Post-war period, was not only a result of the different socio-political context of the two Yugoslavias, but also the country’s industrialization, modernization and technological development. Through the categorization of Modernist housing buildings in Belgrade, this paper will investigate on relations between the transformations of the main housing typologies executed under different socio-political contexts on the one side, and development of building technologies, construction systems and materials applied on those buildings on the other side. The paper wants to shed light on the Yugoslavian Modernist Architecture in order to increase the international awareness on its architectural and heritage values. The aim is an integrated reevaluation of the buildings, presentation of their current condition and potentials for future (re)use with a specific focus on building envelopes and construction.



HIGH RESOLUTION MODEL MESH AND 3D PRINTING OF THE GAUDÍ'S PORTA DEL DRAC

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ABSTRACT

In the context of web applications for the dissemination of cultural heritage, this article advances in a methodology for the optimization of point clouds obtained through the technology of Scanner Scanner (TLS). Identifying the potential of TLS surveys as interactive models that allow the cultural heritage to be perpetuated over time. This point cloud optimization is developed with free software, focusing its exploitation on an interactive web application, which has made it possible to convert two temporary museum exhibitions in permanent exhibitions in virtual format. Developed in conjunction with the Museo de Historia de Barcelona MUHBA. The case study is centered on the Palau Reial Major, Gothic style, formed by the chapel of Santa Àgata (built in 1302, on the Roman wall) and the Saló del Tinell (built between 1359 and 1370, on the Roman remains). A building Located in the Plaza del Rey, in the historic center of Barcelona. In this application, it is very important the visual impact, it requires a realistic model of the interior of the building, from the point of view of color and lighting, avoiding the transparencies of the model, through a dense point cloud, without occlusions, requiring a great number of positions. This implies a clear methodology, using different techniques such as the photographic projection, given the complex lighting of the building, by the artificial lighting and the one coming through stained glass. In this process, there were 84 positions that provide useful density of points, which are optimized with free programs. The temporary exhibitions of the case studies, elaborated by the MUHBA in the Saló del Tinell are: "Indianas, 1736-1847. Los orígenes de la Barcelona industrial" exposed from May 19, 2012 to 3 March 2013 and "El Mán del 1714" exposed from 20 December to 28 September 2014. Both are based on a tour through showcases and exhibitors with museum objects such as looms, fabrics, dresses, books, among others; accompanied by panels with texts and images that contain the information that each exhibition shows. Virtual applications allow such temporary exposures to become an interactive model, in which information can be permanently consulted. A virtual tour where the user can interact with the information panels and observe in detail the different objects of the exhibition. The results of this work manage to generate a powerful mechanism of diffusion and approximation to the society of the cultural heritage, that otherwise, as a whole as exhibition, would disappear.



DIFFUSION OF TEMPORARY EXHIBITIONS AS PERMANENT WEB APPLICATIONS THROUGH THE TERRESTRIAL LASER SCAN SURVEY

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ABSTRACT

In the context of web applications for the dissemination of cultural heritage, this article advances in a methodology for the optimization of point clouds obtained through the technology of Scanner Scanner (TLS). Identifying the potential of TLS surveys as interactive models that allow the cultural heritage to be perpetuated over time. This point cloud optimization is developed with free software, focusing its exploitation on an interactive web application, which has made it possible to convert two temporary museum exhibitions in permanent exhibitions in virtual format. Developed in conjunction with the Museo de Historia de Barcelona MUHBA. The case study is centered on the Palau Reial Major, Gothic style, formed by the chapel of Santa Àgata (built in 1302, on the Roman wall) and the Saló del Tinell (built between 1359 and 1370, on the Roman remains). A building Located in the Plaza del Rey, in the historic center of Barcelona. In this application, it is very important the visual impact, it requires a realistic model of the interior of the building, from the point of view of color and lighting, avoiding the transparencies of the model, through a dense point cloud, without occlusions, requiring a great number of positions. This implies a clear methodology, using different techniques such as the photographic projection, given the complex lighting of the building, by the artificial lighting and the one coming through stained glass. In this process, there were 84 positions that provide useful density of points, which are optimized with free programs. The temporary exhibitions of the case studies, elaborated by the MUHBA in the Saló del Tinell are: "Indianas, 1736-1847. Los orígenes de la Barcelona industrial" exposed from May 19, 2012 to 3 March 2013 and "El Món del 1714" exposed from 20 December to 28 September 2014. Both are based on a tour through showcases and exhibitors with museum objects such as looms, fabrics, dresses, books, among others; accompanied by panels with texts and images that contain the information that each exhibition shows. Virtual applications allow such temporary exposures to become an interactive model, in which information can be permanently consulted. A virtual tour where the user can interact with the information panels and observe in detail the different objects of the exhibition. The results of this work manage to generate a powerful mechanism of diffusion and approximation to the society of the cultural heritage, that otherwise, as a whole as exhibition, would disappear.



IMPACT VERIFICATION OF AEROGEL INSULATION PAINT ON HISTORIC BRICK FACADES

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ABSTRACT

Increasing the sustainability of existing buildings is being motivated by reduction of their energy demands. It is the above all the building envelope and its refurbishment by substitution or addition of new materials that makes the opportunity for reduction of energy consumption. A special type of refurbishment is conservation of historical buildings. Preservation of historic buildings permits also application of innovative methods and materials in addition to the original materials if their effects are known and the gained experience ensures their beneficial effect. On the market, there are new materials with addition of silica aerogel in various forms of products. They are also potentially useful in conservation of monuments. However, the effects of aerogel application in these cases are not known. For refurbishment is commercially available additional transparent insulation paint - Nansulate Clear Coat which is containing aerogel and can be used for structured surfaces such as bricks. A series of experiments examined the thermo-physical manifestation of an ultra thin insulation coating of Nansulate Clear Coat containing silica aerogel on a brick facade. The experiments of active and passive thermography have observed effects of application on the small-scale samples of the brick facade of a protected historical building. Through a series of experiments were measured thermal insulation effect and influence on the aesthetic characteristics such as change in color and gloss. The treated samples were compared to a reference. Results have shown no thermal-insulating manifestation of the recommended three layers of insulation paint. The three layers recommended by the manufacturer did not significantly affect the appearance of the brick facade. Color and gloss were not significantly changed. Experiments showed the absence of thermal insulation effect of Nansulate transparent triple coating. The thermal insulation effect could likely be reached by more layers of application, which, on the other hand may be unacceptable on the heritage conservation because of number of applications, time demand and financial costs. The effects of multiple layers on heritage attributes were not researched. Extrapolating the measured results, it can be expected that application of more than three layers of paint can significantly affect the aesthetic characteristics of the monument such as gloss and colors of historic brick facades. Due to specific material consistence of historic architecture and new insulation paint materials on the market, it is recommended to provide independent laboratory testing and on-site tests on facades of historic buildings in cooperation with the Monument Protection Board.



CONVERSATION ON SAVING A HISTORICAL COMMUNITY---A PARTICIPATORY RENEWAL AND PRESERVATION PLATFORM

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ABSTRACT

What if stakeholders, architects, and developers/bureaucrats could be in a conversation about preservation? Community heritage in China is in great danger because of the lack of authority, financial support, knowledge of preservation, and requests for development. Local residents, students, and citizens want to preserve the history and living environment of the community but bureaucrats want to demolish entire communities and rebuild for economic development. Architects do not often have enough input and rarely collaborate, while preservationists try to save every piece of historical heritage. Thus, a platform is proposed, here, to bring together voices from all the relevant participants, to democratically communicate between politicians and ordinary people, to create multiple architectural proposals for development reference based on crowd sourced materials. Furthermore, to establish also an experienceable digital world, archived from the evidence uploaded by stakeholders of heritages that are marked by bureaucrats for demolition. The mechanism of this platform can, however, bring relevant people together to engage in a “conversation.” Therefore, the original, exclusive decision-making process becomes negotiable and democratic. It is possible for professionals, ordinary people, and bureaucrats to meet and discuss the issues. Furthermore, compared with a single result made by bureaucrats and developers, the degree of freedom and flexibility of this platform can generate many alternative scenarios. Good or bad, the “conversation” involves all relevant stakeholders and embeds democracy into the process of preserving the community. During the process, evidence for preservation or demolition, and architectural schemes are crowdsourced. No matter the final decision, these digital archives provide an important historical record for the community. Combining the crowdsourced data and virtual reality is a powerful and reliable method of creating an immersive experience of what is either lost or at risk. The advantage of multimedia and multi-layered information in the virtual world is that it can encompass users’ experiences of inhabiting a much more comprehensive space compared with the physical world. Thus, community heritage can be permanently preserved and experienced in the digital world. Ultimately, following a democratic conversation of a preservation process, whether a site is preserved or demolished, the community heritage remains digitally preserved. In the end, win or lose, the stakeholders will have a digital archive and exploring tool of the former building.



GOTHIC BASILICA STATIC ANALYSIS METHODOLOGY

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ABSTRACT

The paper presents static analysis and structural health monitoring of a historic, gothic basilica in the complex of the church of St. James the Apostle and St. Agnes Virgin and Martyr and bell tower. The building is located in southern Poland, and now is on the National Heritage Monuments list. The authors present a comprehensive analysis of the structural condition of the building, including: inventory of an object using 3D laser scanner, research on building foundation, destructive and non-destructive material testing, structural calculations and thermographic and moisture research. The scope of the analysis presented affect the knowledge of the state of preservation and helped in making a right decision on further work - in construction and conservation. Paper proposing also methodology for structural health monitoring in this type of historical objects.



CULTURAL IDENTITY OF THE INDUSTRIAL HERITAGE IN GDANSK (POLAND)

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ABSTRACT

Since its inception, urbanized area passes a number of changes, caused by demands of its inhabitants. Industrial heritage, including historic architecture at the brownfields, that's more and more present in the centers of our cities, is one of the most important components of the identity. The development of civilization causes the phenomenon of spatial and functional transformations. Revitalization of the areas recently occupied by the industry, provides a unique opportunity to rediscover their values. Increasingly, however, it uses the terms "wasteland" or "brownfields". Land use by industry is associated only with its "predatory" use, destruction, devastation. However, we can venture to say, that the existing industrial use of the land, "civilized" them. Current developments have restored a public access to the "new" urban space. At these areas preserved quite a lot valuable architectural objects. That can be seen, unfortunately, tend to forget the fact of complexity, multithreaded value areas and facilities. Analyzed causes of the risks, ways to prevent adverse transformations, methods of developing action plans to re-create the industrial architecture - are still discussed. Industrial heritage, particularly architecture, is one of the important components of the material culture that specify identity of the city of Gdansk. It provides with no doubt about its distinctiveness and originality in relation to other cities and regions. Revitalization projects are at the same time the most effective way to protect and preserve the cultural identity of the brownfield facilities. Examples of such transformations are most relevant to Gdansk and also beginning to be more and more visible. Areas of the main activities of revitalization in Gdansk, are the area of the former Imperial Shipyard and the Olowianka Island are still and only the beginning of the necessary changes. Old industrial plants and technical facilities should be subject of the regeneration and be activating element at the scale of the whole districts and the city.



EXPLORING THE URBAN OPEN SPACES OF HISTORIC MARKETS IN QATAR

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ABSTRACT

This paper addresses urban open spaces in the two historic Souqs (Markets) in Qatar. The aim of this study is to discuss historic markets with a focus on the assessment of the qualities of urban open spaces. The present study examines a series of urban qualities through observing behavioral mapping and impressionistic assessments. The objectives of the paper are; a) to exploit successful urban open spaces in historic markets via exploring up-to-date theories and literature, b) to examine existing urban spaces in Souq Waqif of Doha City and Souq Waqif of Al Wakra city by Behavioral Mapping analysis, and 3) to develop a set of objectives to enhance the urban spaces in order to respond efficiently toward the socio-cultural changes and recent urban interventions. A thorough literature review has been undertaken in order to understand the evolution of urban open spaces. Both Souqs of Doha and Wakra cities has been studied and analyzed with focus on the major open spaces, data and observations were collected on a wide span of time during busy hours of the Souqs. The data were collected and presented by two major methods; first by locating the activities and functions of users and the density of these performances, secondly, observations were recorded by still photographs. Based on the literature review, the urban open spaces of both Souqs were examined toward their people vitality and sense of place, by understanding the various meeting places, invitation to urban open places, attending to surrounding life and activities, and diversification of services. The study concludes with a set of recommendations to develop the existing sense of place and enhance the urban experience by new diversified methods.



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THE HERITAGE LANDMARK OF THE ROYAL TOWN OF KLANG: BALAI BOMBA KLANG SELATAN

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ABSTRACT

The arrival of the British colony in Kuala Lumpur sparked a radical change in the town in terms of infrastructure and town planning. Due to the British Empire's reign over Malaya in the advent of 20th century, the colonial architectural style has influenced a lot of important building in the royal town of Selangor. In few decades' Klang town experienced social and spatial structural change. Some of the building is abandoned disrespect, disregard and it's frightening. Many deemed historic buildings and structures disappears in exchange for modernity, which is a threat to the townscape and history. Over the years, these early buildings that define the city's unique identity have impacted the socio-cultural, economic and political climate of the Selangor and Klang as a royal town. The local council of Klang aims to preserve clusters of colonial sights, place of worships, schools, and remnants of a fort that has shaped the town enabling people to be more appreciative towards it. Located in the heart of Klang town, Klang Selatan fire station sits next to another heritage trail icon, Raja Abdullah Warehouse. Without proper documentation and curation, the building significant will remain unknown and eventually disappear. The core of this paper will showcase the building design quality and its importance, as the first attempt to document the Balai Bomba Klang Selatan to assist in conserving its tangible and intangible qualities. The study aims to collate and document the tangible qualities of the fire station to complement the measured drawing exercise.



**URBAN CONSERVATION POLICIES AND PLANS FOR A WORLD HERITAGE SITE CASE: ANTIQUE
PERGAMON CITY AND ITS MULTI-LAYERED CULTURAL LANDSCAPE (IZMIR, TURKEY)**

Mehmet Tuncer

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ABSTRACT

Izmir's Pergamon (Bergama) Antique City And Its Multi-Layered Cultural Landscape entered the UNESCO World Heritage List with the participation of 21 countries in the 38th World Heritage Committee Meeting held in Doha, Qatar's capital in between 15 - 25 June 2014. Bergama became the 999th WORLD HERITAGE. Bergama, which has been in operation since 2010, has entered the list as a Multilayered Cultural Landscape Area. The main purpose of this paper will explain and summarize of urban and archaeological conservation efforts for Pergamon since 1992 to 2014. In the paper also aimed to give the conservation policies of public administrations which mainly central /Ministry of Culture and Tourism, Ministry of Environment/ and local /Bergama Municipality, Gen. Directorate of Vakiflar. Turkey is one of the 10 original member states to establish UNESCO. 9 cities in Turkey are included in the UNESCO List of World Heritage Sites. Further, 23 sites have been nominated and are included in the tentative list. The activities aimed to include the district of Bergama in the UNESCO World Heritage List are ongoing in the years 2009-2014. All the efforts has been made carry this unique antique city to the UNESCO Heritage List at 2014. As an Urban Conservation Planner, I had a change of preparing the FIRST Conservation Aimed Plans and urban designs for Urban and Archeological Sites of Pergamon together with my team, in the years between 1992-94. We prepared conservation aimed plans for all of the areas of Acropolis, Middle City and Ottoman period urban conservation areas. Urban and archaeological sites of Pergamon the ancient city today, which is over two thousand years old, where scientists, archaeologists, architects, art historians, urban planners, sculptors and similar arts and culture, men talk about admiration, write about and write praises, face to face some deterioration and destruction. As a conservation planner working on Pergamon since 1992, I" will concentrate the following results and conclusions; 1. Urban and Archaeological Sites in Turkey are generally in danger of destruction because of lack of public awareness and lack of sufficient monetary funds and administrative organisations, 2. In the Case Pergamon; this problems mentioned above are already defeated by the local and central governmental bodies. Unfortunately this success costs time and money, as well as more losess in the urban and archaeological areas. Especially loss in old Ottoman Houses and open archaeological sites. 3. The Paper will be aim to handle the governmental policies about the conservation, the inefficiencis in planning and approval of conservation aimed plans.



REHABILITATION AND ENHANCEMENT OF THE URBAN HERITAGE OF THE NINETEENTH CENTURY

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ABSTRACT

The purpose of this article is to deal with the rehabilitation and enhancement of the urban heritage of the City of Trento that is in a state of disuse and decline. In particular, this essay will analyze the history of the Courthouse and the prison, which were built at the end of the XIX century, with the purpose of organising a recovery intervention shared with the population of the City of Trento in Italy. The adopted research methodology has been inspired by archival material study with the purpose of knowing the historical events that concerned the building, and to draft a project that takes into consideration also the space surrounding it. The restoration project plans to operate on the various parts of the artefact with a series of interventions that will have the purpose of respecting the important historical stratifications and to bring them to light. Furthermore any human tampering on the building over time, which also changed the readability of the original structure, will, if judged incongruous, be eliminated. All the interventions to be made will have to respond to recognition and reversibility criteria, and, once the building is returned to the local community, it will be important to plan a series of preventive restoration interventions, so that new deteriorations can be avoided. The results obtained from the elaboration of the project for the reuse of the prison complex shall allow its reintegration in the vital circuit of the historical architectural heritage's current urban fabric.



TEST TO EVALUATE THE RELATIONSHIP BETWEEN THE VOLUME OF WATER AND THE HEAT FLUX IN OLD BRICK MASONRY SAMPLES AND LIME MORTAR

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ABSTRACT

Many of the historic Spanish buildings have been built with bricks and mortar of lime and sand. These materials, over time, suffer degradation processes, mainly by the action of water from the ground (absorption and desorption). They are also affected by rainwater and the environment. This process of degradation is very frequent, for that reason it is very interesting to design some procedure of non destructive test, that allows to know the volume of water that can contain a wall of brick. Knowing this volume of water, it would be possible to define precisely the most appropriate interventions in the rehabilitation of buildings with these injuries. The basis of this system is based on two principles: 1) the heat flow through a wall is related to its insulation capacity; 2) water is one of the best heat transmitters, the higher the water content has a wall, the greater the heat flow for the same external conditions. Knowing the heat flow can assess the water content of a wall. In order to relate the heat flux and surface temperatures to the water content of the wall, a series of laboratory tests have been carried out with brick and mortar factory specimens in accordance with European regulations. This process, and its results, are those explained in this communication.



ACCESIBILITY FOR PEOPLE WITH DISABILITIES IN ARCHAEOLOGICAL SITES

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ABSTRACT

According to the Turkish Statistical Institute, an estimated 8.5 million disabled people live in Turkey. Nearly 13 percent of Turkey's population is disabled. As said the World Bank and the WHO, globally, there are over 1 billions, or around 15 % of the world population, living with a disability. Disability defined as "a physical or mental impairment which has substantial and long-term effect on a person's ability to carry out normal day-to-day activities" by Disability Discrimination Act. If we look a great extension, we should include them some group such as expectant mothers, parents with buggies, people with injuries and older people. Actually, the rate more than the estimated. Although we are born free and equal, they undergo alienation and social exclusion. People with disabilities encounter accessibility problems in numerous area, such as built environment, streets, public area, transportation, health, sports and tourism... Accessibility, which is one of the human rights, can be evaluate two different meaning ; to area and access to knowledge. People with disabilities should be able to access to a place and benefit its facilities like non-disabled people.. As stated by UNESCO's World Heritage Convention, "World Heritage sites belong to all the peoples of the world, irrespective of the territory on which. Turkey, where the tourism is continuously growing, has an enormous and very valuable archaeological heritage. Unfortunately disadvantageous people don't experience them because of the obstacles. Archaeological sites, which are an precious part of cultural heritage, has an remarkable role in conservation. The aim of this study is to provide a concrete example conservation area, and to demonstrate accessibilities importance for cultural heritage conservation and management processes. And to develop a guideline for inaccessible archaeological sites via creating a route that can be used by all people, regardless of their disability or ability.



**SEARCHING FOR INNOVATIONS AND METHODS OF USING THE CULTURAL HERITAGE ON THE
EXAMPLE OF UPPER SILESIA**

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ABSTRACT

The basic subject of this paper is historical and cultural heritage of some parts of Upper Silesia, bind by common history and similar problems at present days. The paper presents some selected historical phenomena that have influenced contemporary space, mentioned above, and contemporary issues of heritage protection in Upper Silesia. The phenomena are presented in four groups. First: preindustrial period, with many historical influences, that for many years was marginalized when we think about postindustrial cities. Second: the industrial era. Third: so called confrontation period - with strong political interpretations of cultural heritage. And finally fourth: transformation period. Agreed on these time periods that raised from the state affiliation and/or the systems of social-economical organization we can think about them as some ground points of history that causes severance of tradition and structures of new forms of organization. Each of these periods left some imprints on regional space and architecture. The Silesian architecture interpretation, since 1989, is strongly covered with some ideological and national ideas. The last 25 years are the next level of development which contains rapidly transformation of the space in the turf and what is caused by another economical transformations. In this period, we can observe landscape transformations, liquidation of objects and historical structures, loos of regional features, spontaneous adaptation processes of objects and many methods of implementation forms of protection, and using of cultural resources. Some upheaval linked to the state borders changes, system, economy and ethnic transformation caused that former Upper Silesia border area focuses phenomena that exists in some other similar European areas which are abutments of cultures and traditions. The latest period in the history of Upper Silesia gives us time to reflect the character of changes in architecture and city planning of the area and appraisal of efficiency these practices which are connected to cultural heritage perseverance. The phenomena of the last decades are: decrement of regional features, elimination of objects, which were a key feature of the regional cultural heritage, deformation of these forms that were shaped in the history and some trials of using these elements of cultural heritage, which are widely recognized as cultural values. The most important phenomena of temporary space is search of innovative fields and methods and use of cultural resources. An important part of the article is the role of the "network community" in the protection of cultural heritage As an effects of mass culture development two phenomena have collide: -legally and historically developed tools of heritage perseverance - permanent monitoring led by the individuals, groups, social medias, NGOs and institutions. Cultural heritage is becoming more and more well recognized value, contemporary language of common communication and a level in which we all look for common values that are comprehended, not as a tool to lead some politics, but as an alphabet, from which we all can take and build some complex notation of the creative diversity.



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ILLUMINATION OF MONUMENT BUILDINGS THE REVIEW AND CASE STUDY ON EXAMPLE: RECTOR'S OFFICE BUILDING OF SZCZECIN UNIVERSITY

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ABSTRACT

There's no doubt that every night illumination improves the view of each building. In some cases it might create a masterpiece from an object that appears to be kind of "Cinderella" by day. On the opposite, sometimes it might become a "nightmare" if the illumination is not applied properly. So this is why professional engineering as well as an artistry and psychology should be involved when it comes to design and implement an illumination system to the architecture. It is particularly important when it comes to illuminate the registered monument of architecture. When the illumination of the architectural monument issue emerges, the conservatory administration very often doesn't allow any interference to the façades for the reasons that seem to be doubtful. Author's experience shows that it is possible to confront these reasons and find a compromise basing on rational conditions supported by some sophisticated engineering solutions. The aim of the presentation is to put forward these solutions as well as to discuss some extra ideas how to specify system of criteria acceptable for the conservatory authorities that allow proper architectural monument illumination. The discussion shall be accompanied by review of famous architectural monument illuminations examples. The axis of the discussion would be the experience obtained on example of Rector' Office Building of Szczecin University.



ASSESSING OF THE “MONUMENT” STATUS IN THE VIEW OF POLISH ACTUAL STATUTORY DEFINITION

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ABSTRACT

In the presentation some aspects of the most actual amendment to the text of Polish Parliament Act from 23 July 2003 about the Conservation and the Care of Monuments (Dz. U. z 2014 r. poz. 1446, z 2015 r. poz. 397, 774, 1505, z 2016 r. poz. 1330) are set out to be discussed. It is a common dictum that any edifice can't exist without good foundations. In this particular case of mentioned above Act about the Conservation and the Care of Monuments, definition of “monument” as well as assessment set out to provide the object a status of a “monument” appear to be such a basis. These aspects are evaluated with use of analytical method supported by comparison method in the comment included in the presentation. The Act in question, in its Art. 3 p.1 defines a “monument” as cit.: “a real estate or a chattel, its part or units, appearing to be an effect of human work as well as associated with human activity and in the meantime constituting the evidence of a bygone era or past events which preservation is in the public interest according to its historical, artistic or scientific values.” This definition exists in the objective Act since its ratification by the Polish Sejm Parliament on 23th July 2003 without single change and it derives from the similar Act ratified on 15th February 1962. Post war experience of the “monument” status assessment in Poland shows that all of three mentioned above factors – i.e. historical, artistic or scientific values altogether with public interest – apparently in principle logical and understandable - are subjected to considerable problems in the practical application. It appears in fact that the historical value is still being interpreted unusually freely and what's more not only by laypeople, but - wonders never cease! - also by specialists. The purpose of the presentation is to prove that the main cause of such a state of affairs is a lack of the monument assessing categorization based on parametrized analysis of historic objects values, standardized in the scale of the entire country.



SUSTAINABLE FOLK ENVIRONMENTS

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ABSTRACT

Due to the increasing demand of ecological assets and growing impacts of humans on folk environments, it is found that cultural and natural diversity settings are facing global challenges for their quality survival. Diversity, cultural landscapes and ecological sanctuaries in the Arabian deserts are currently under threat and heavy pressure from the growing new development demands in Dubai and in many other vast growing cities of the world on account of large-scale economic changes. The necessary recourses for sustainable modernity and valuable folk landscapes and ecological environments are currently in a conflict with each other. The increase in modernity with fast economic and social change in the area has put heavy stresses on cultural landscape diversity and is producing rapidly a new face of natural and built environments. Some folk environmental properties are considered, particularly the lots of demand for space, water, energy and ecological services in the desert atmosphere as well as their effects on the desert ecosystem of land and sea. In such circumstance, sustainable environment in the Middle East has become a significant challenge to planners and policy-makers. However, the paper addresses modernity and cultural landscapes and ecological sanctuaries issues and focuses mainly on human interaction with cultural and natural diversity settings. The objective of this paper is also to describe, review and assess modernity, human and ecosystems diversity in Dubai in terms of architectural terms, urban design, management history and cultural and natural environment.



**MODERN METHODS OF RECONSTRUCTION OF THE SACRAL OBJECTS: THE EXAMPLE OF THE
JASNA GÓRA MONASTERY IN CZESTOCHOWA (POLAND)**

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ABSTRACT

This publication is devoted to the problem of preservation and restoration of the architectural monument as an element of the historical environment. The notion of "immovable monument of history and culture" is specified. Modern methods of restoration and repair-conservatory works are analyzed. The main principles of complex studies of monument buildings are considered taking into account their interactions with the environment. The necessity of assessing the physical state of structures and materials of the architectural monument for selecting the optimal technology for repair work, preserving the historical and cultural landscape is shown. A brief history of the construction and repair of the monastery at Jasna Góra in Czestochowa (Poland) is presented. The restoration of the Jasna Góra ensemble was a complex kind of construction work: repair, conservation, consolidation and renovation of architectural monuments. The ground and underground structures of the main buildings and structures have been restored and strengthened. The program of restoration work on the task "Complex restoration of the building of the monastery of the Paulin Fathers on Jasna Góra" (2004-2013) included three stages: 1. "Reconstruction and restoration of the buildings of the monastery of the Paulin Fathers on Jasna Góra" (2007-2010), 2. "Conservation and renovation of the building of the Basilica of the Holy Cross and the Nativity of the Virgin" (2007-2012), 3. "Renovation of the North curtain - the entrance to the territory of the monastery of the Paulin Fathers on Jasna Góra"(2013). Restoration was based on a thorough examination of the monument and aimed to maximally preserve the historical, constructive and artistic features of the monastery complex, ensure its long existence. In addition to preserving the historical, technical and artistic qualities of the ensemble of the monastery, the tasks of organizing the environmental monument were resolved. Completed comprehensive repair and restoration works contribute to strengthening the structures of the restored buildings, provide harmonization of the historic and new landscapes of Jasna Góra.



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Session Title:

Sustainability in the Built Environment



ON THE CUSP OF NEW SPATIAL CHALLENGES - THE THERMAL WASTE PROCESSING PLANT AS AN ELEMENT OF URBAN SPACE

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ABSTRACT

The goal of this paper is to answer the question about the current importance of structures associated with the thermal processing of waste within the space of Polish cities and what status can they have in the functional and spatial structure of Polish cities in the future. The construction of thermal waste processing plants in Poland is currently a new and important problem, with numerous structures of this type being built due to increasing care for the natural environment, with the introduction of legal regulations, as well as due to the possibility of obtaining large external funding for the purposes of undertaking pro-environmental spatial initiatives, etc. For this reason, the paper contains research on the increase in the number of thermal waste processing plants in Poland in recent years. The abovementioned data was compared with similar information from other European Union member states. In the group containing Polish thermal waste processing plants, research was performed regarding the stage of the construction of a plant (operating plant, plant under construction, design in a construction phase, etc.). The paper also contains a listing of the functions other than the basic form of use, which is the incineration of waste - similarly to numerous foreign examples - that the environmentally friendly waste incineration plants fulfil in Poland, dividing the additional forms of use into "hard" elements (at the design level, requiring the expansion of a building featuring new elements that are not directly associated with the basic purpose of waste processing) and soft (social, educational, promotional actions, as well as other endeavours that require human involvement, but that do not entail significant design work on the buildings itself, expanding its form of use, etc.) as well as mixed activity, which required design work, but on a relatively small scale. Research was also conducted regarding the placement of thermal waste processing plants within the spatial structures of cities (a city's outer zone, central zone, etc.) and their placement in relation to the more important urban units, in addition to specifying what type of urban structure they are located in. On the basis of the research, we can observe that the construction of environmentally friendly thermal waste processing plants is a valid and new problem in Poland, and the potential that lies in the construction of a new environmentally friendly structure and the possibility of using it to improve the quality of an urban space is often left untapped, bringing the construction of such a structure down to nothing but its technological function. The research can serve as a comparative study for similar experiences in other countries, or for studies related to urban structures and their elements.



STRENGTH AND NUMERICAL ANALYSIS IN THE DESIGN OF PERMEABLE REACTIVE BARRIERS

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ABSTRACT

Permeable reactive barriers are one of the most important in situ technologies in groundwater remediation. Most of the installed PRBs have tended to use singular reactive media, but there is an increasing number of applications using combined or sequenced media to treat mixtures of contaminants within a groundwater plume. The concept of a multi-layered permeable reactive barrier (MPRB) to prevent and protect groundwater along traffic routes, especially in ecologically and naturally valuable areas, was developed following several field and laboratory investigations conducted in the Department of Geotechnical Engineering of the Warsaw University of Life Sciences. In accordance with the guidelines of the Interstate Technology & Regulatory Council for the selection of reactive materials, numerous laboratory and field investigations should be performed to determine the environmental conditions, type and concentrations of the contaminants, and the physical-chemical and permeability properties of the reactive materials. However, the deformation and strength properties of the reactive materials should be also considered in the design and evaluation of the safety conditions. In this paper, strength and deformation properties of silica spongolite, zeolite, and activated carbon were investigated using direct shear and oedometer tests. The laboratory test results were used in numerical calculations with the application of the finite element method. The aim of this study was to define the impact of the installation stages of a multi-layered permeable reactive barrier on the stability of a road embankment. Numerical analysis may prevent, reduce or eliminate the risk in the case of a breakdown during the construction or/and exploitation of a PRB.



**PARTICULATE MATTER MULTIFRACTALITY AND CROSS-CORRELATION BEHAVIOR OVER
FOOTBRIDGES ALONG AN ARTERIAL ROAD**

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ABSTRACT

Particulate matter (PM) originated by road transport constitutes an urgent task for megacities due to thousands of vehicles shuttle back and forth along every street in it, and pedestrians are supposed to be the first batch of innocent victims that exposed to and inhaled the polluted air. Since, footbridges or even elevated walkway networks have become a promising resolution to urban space utilization, the location and design of them should be more considered in order to providing Particulate matter (PM) originated by road transport constitutes an urgent task for megacities due to thousands of vehicles shuttle back and forth along every street in it, and pedestrians are supposed to be the first batch of innocent victims that exposed to and inhaled the polluted air. Since, footbridges or even elevated walkway networks have become a promising resolution to urban space utilization, the location and design of them should be more considered in order to providing a more desirable walking system to pedestrians. In this study, three groups of PM (i.e., 0.3-0.9 μm (sub-fine), 0.9-2.5 μm (fine) and 2.5-10 μm (coarse)) were measured at three different traffic scenario related footbridges (i.e., upstream of the on-ramp, downstream of the on-ramp, and signalized intersection) along an urban artery in Hong Kong, and their traffic volume composition, multifractality and cross-correlation behavior were investigated thereafter. Multifractal detrended fluctuation analysis (MF-DFA) and Multifractal detrended fluctuation cross-correlation analysis (MF-DCCA) were used simultaneously to quantify the persistency of different PM groups and interaction between them. Results fully indicate that the multifractality and cross-correlation behavior of particulate matters were much highly dependent on the traffic scenario in spatial scale, while finer particles played a more active part in aerosol dynamics related activities in size scale. It is suggest that the nature ventilation style of footbridges should avoid to be built above signalized intersection due to the long persistency of particles and between different particle groups, especially the finer ones. Besides, an enclosed footbridges with particle filter HAVC system installed could be one of the alternative reformations for the existing ones. The work was supported by Strategic Research Grants, City University of Hong Kong (CityU-SRG 7004176, 7004637).



THE IMPACT OF SMOKE VENTILATION ON GENERAL VENTILATION IN THE BUILDING

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ABSTRACT

The fire of building is a threat to its users. The biggest threat is generation, during lifetime of fire, hot gases and smoke. The purpose of quick and efficient evacuation from the area covered by the fire, at first step the escape routes have to be secured from smokiness. The smoke ventilation systems are used for this purpose. The proper design and execution of smoke ventilation is important not only because of the safety, but also of the maintenance of comfort in the building at a time when there is no fire. The manuscript presents the effect of incorrectly realized smoke ventilation in the stairwell of the medium building. The analysis shows that the flaps of smoke ventilation located in the stairwell may have a significant impact on the proper functioning of mechanical ventilation in the period when there is no fire. The improperly installed or incorrect insulated components cause perturbation of air flow and they change pressure distribution in the building. The conclusion of the analysis is the need to include the entire technical equipment of the building during the design and realization of its individual elements. The impact of various installations at each other is very important, and the omission of any of them can cause disturbances in the proper work of another.



MEASURING AIR QUALITY IN AN CONSTRUCTION SITE BIOTOPE USING THE AQM-65 ANALYSER

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ABSTRACT

Activities related to the execution of construction works often exert pressure on the quality of environmental factors in adjacent habitat. In various stages of realization of the works if is the opening of the building site and access roads, borrow pits and the storage, or the construction itself, all the related activities will cause harm in various degrees of vegetation on the construction site and its surroundings. Large areas are rendered non-productive and, although they should be restored for use in the same place or elsewhere, sometimes they can lose their natural habitat baseline. The paper is presenting a case study of air quality monitoring using the AQM 65 analyser for a construction site located near Timisoara locality, Timis County, Romania.



ASSESSMENT OF THERMAL COMFORT IN A BUILDING HEATED WITH A TILED FIREPLACE WITH THE FUNCTION OF HEAT ACCUMULATION

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ABSTRACT

Thermal comfort determines the state of satisfaction of a person or group of people with thermal conditions of the environment in which the person or group of persons is staying. This state of satisfaction depends on the balance between the amount of heat generated by the body's metabolism, and the dissipation of heat from the body to the surrounding environment. Due to differences in body build, metabolism, clothing etc. individuals may feel the parameters of the environment in which they are staying differently. Therefore, it is impossible to ensure the thermal comfort of all users of the room. However, properly designed building systems (heating, ventilation, air conditioning) allow for creating optimal thermal conditions that will be evaluated positively by the vast majority of users. Due to the fact that currently we spend even 100% of the day indoors, the subject becomes extremely important. The article presents the evaluation of thermal comfort in rooms heated with a tiled fireplace with the function of accumulation of heat using the indicators PMV and PPD. It also presents the results of studies, on the quality of the micro-climate in such spaces. The system of heating premises described in the article is not a standard solution, but is now more and more commonly used as a supplement to the heating system, or even as a primary heating system in small objects, e.g. single-family houses, seasonal homes, etc. The studies comprised the measurements and analysis of typical internal microclimate parameters: temperature, relative humidity and CO₂ concentration. The results obtained did not raise any major reservations. In order to fully assess the conditions of use, the evaluation of thermal comfort of the analyzed rooms was made. Therefore, additionally the temperature of radiation of the surrounding areas, and the insulation of the users' clothing was determined. On the basis of the data received, the indicators PPD and PMV were determined according to EN ISO 7730: 2005 Ergonomics of the thermal environment - Analytical determination and interpretation of thermal comfort using calculation of the PMV and PPD indices and local thermal comfort criteria. The obtained PMV values did not fit within the limits of thermal comfort, and the percentage of people dissatisfied reached even 20%.



**SOCIAL HOUSING POLICIES AND BEST PRACTICE REVIEW FOR RETROFIT ACTION. CASE STUDIES
IN PARMA (IT)**

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ABSTRACT

The paper aims at investigating the most suitable activities for the retrofitting of Social Housing Stock - SHS- in Europe. A global awareness has been increasing, as well as education and training among architects and building sectors employees, in order to identify tailored financing schemes and advanced integrated retrofitting solutions. Several European financed programmes have been tested so far and the results are here summarized and deeply investigated in order to increase the energy performance of social housing buildings, to improve knowledge of problems associated with the retrofitting of these households, in order to provide the most appropriate solutions to be applied. Afterward, the best practices selected have been applied to a study case in Italy, to demonstrate that the large variety of SH programmes in Europe can seriously be used, promoting the best practises" application. A lot of theoretical and analytical work has being carried out by many European projects in the last decade, defining different approaches according to typologies of social housing buildings, focusing on national or regional regulation, on existing typologies and building techniques, on retrofitting solutions, on energy saving strategies and other managing approaches and energy saving devices. Due to the high participation of social housing organisations -SHO- and related European financed programmes, this academic research is focused on the most popular ones and on those which include at least 5 country profiles, including Italy in order to encompass a large variety of needs and related solutions, even though some of them are still on course and other ones have already been completed. This research clearly demonstrate the valuable contribution these kind of programme have in exchanging and sharing of knowledge and experience in the field of retrofit of Social Housing building across Europe, in order to primary improve the energy performance of the existing building stock and the quality of life of their inhabitants.



THE CONCEPT OF "GOOD URBAN GOVERNANCE" AND ITS APPLICATION IN SUSTAINABLE URBAN PLANNING

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ABSTRACT

Contemporary urban theory and practice in the post-industrial era is increasingly often turning towards an approach based on sustainable development. That concept bearing the traits of a paradigm has grown on the ground of broad quest for an alternative to the existing development model of the industrial civilisation. It has gained wide social acceptance and is the basis for many development and environmental programmes at the level of national and local government. It puts in a new light the socio-cultural, ecological and energy-related aspects of space as well as its value and aesthetics. A model of governing the city called "good urban governance" is in a very close relation with the concept of sustainable development. It is based on the principles of inclusiveness, citizenship, accountability, processuality and effectiveness. Although this approach is not entirely novel, it stays valid and open to new challenges connected with satisfying human needs in the urban built environment on the basis of new contemporary conceptualisations such as "smart governance", "governing the smart city", "network governance" and "governance networks". The advantages of this approach based on the assumption of multidimensionality and subjectivity, matching the various and seemingly contradicting interests with a sense of responsibility for the quality of life in the urban environment are often underlined both in literature and academic debate. The aim of this article is an attempt to present selected practices in spatial planning which employ the principles of the idea of co-governance. It will include various methodological assumptions and criteria applied in "good urban governance". The intention will be to show its new research and application possibilities in countries like Poland where the idea of governance and sustainable development remains a matter of theory.



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A CLIMATE CHANGE ADOPTED BUILDING ENVELOPE AS A PROTECTOR OF HUMAN HEALTH IN THE URBAN ENVIRONMENT

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ABSTRACT

Recently, an expanded understanding of building performance acknowledges that all forces acting on buildings (climate, energies, information, human agents) are not static and fixed, but rather mutable and transient. With the use of parametric and multi-criteria optimization digital tools, buildings envelopes can be designed to respond to various requirements. This paper explores the possibilities of architectural design to benefit human condition, which encompasses mental well-being, environmental quality of life during the Climate Change era. The first part of the paper defines the main factors (such as: lack of green nature and sunlight, noise and pollution) which are influencing the formation of psychological disorder in big cities. The negative impact of these factors is constantly increasing in the time of Climate Change progressing. The second part presents results of the research program undertaken at West Pomeranian University of Technology in Szczecin by author. The program goes on to attempt to solve the problem through architectural design. This study highlights a social problem, such as mental well-being, resulting from urbanization or effects of the climate change, and serves as a useful background for further research on the possibilities of redefining sustainable and human friendly design.



A NOVEL NUMERICAL SIMULATION MODEL FOR TRANSIENT AVAILABILITY OF REPAIRABLE HEATING NETWORKS

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ABSTRACT

Traditionally, the steady-state availability is widely used to evaluate the availability of systems under the equilibrium state. Recently, with applications of high reliable and long-lifetime components, it becomes critically necessary to study the transient reliability indices of systems within the operation time. However, the steady-state availability which assumes the operation time of the system is infinite can't reveal the reliability instantaneously. While the transient availability, a kind of time-dependent reliability index, can reflect the availability of systems at different time, which has a big difference from the steady-state availability. As the rapid development of district heating, the heating scales, heating capacities and the complexity of heating networks also have a great growth. In order to evaluate the availability of heating networks more accurately and instantaneously, in this paper, we originally present a numerical simulation model based on the failure data to simulate the transient availability of repairable heating networks during the heating period. Compared with the traditional mathematically intensive method in reliability analysis, this numerical simulation model is less time-consuming and more powerful to simulate the transient availability of complex heating systems with the help of MATLAB. The numerical simulation model firstly divides the heating time T into small time intervals Δt . Then according to the failure rate and repair rate of components, the failure vector $g=\{g_i\}$ and repair vector $w=\{w_i\}$ ($i=1,2,\dots,n$), where n is the total number of small time intervals, can be calculated. Finally, the frequency failure vector $gw=\{gwi\}$ is able to be simulated with MATLAB. Therefore, the transient availability can be obtained based on the frequency of failures occurring at each small time interval. Initially, the proposed numerical simulation model is illustrated by a simple branched heating network with four components, and it takes a very short time to get the desired results. By analysis the simulation results, it has been found that for constant failure and repair rates, the availability of the studied heating network reaches its steady state at about 0.5 months during the heating period and the failure probabilities of the network have a linear relationship with the ratio of the failure rate to the repair rate. Furthermore, the results of the numerical simulation method are compared with that obtained by the classical mathematically intensive method for validation. It has shown that the numerical simulation model is a good alternative to mathematically intensive method for complex heating systems.



HOW TO DESIGN BUILDINGS, HOUSING ESTATES AND TOWNS SO THAT THEIR IMPACT ON THE ENVIRONMENT WILL BE ACCEPTABLE?

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ABSTRACT

Currently, there is a tendency in architecture to search for solutions implementing the assumptions of the sustainable development paradigm. A number of them are components of architecture, which in the future will certainly affect urban planning and architecture to a much greater extent. On the one hand, an issue of great significance is the need to integrate sustainable system elements with the spatial structure of environmentally friendly architectural facilities and complexes and to determine their influence on design solutions as well as the implementation, operation and recycling, while on the other hand, it is very important to solve the problem of how to design buildings, housing estates and towns so that their impact on the environment will be acceptable, i.e. will not exceed the possibilities of natural environment regeneration and, how to cooperate in interdisciplinary design teams to reach an agreement and acceptance so as to achieve harmony between the built and natural environment, which is a basis of sustainable development. In this broad interdisciplinary context an increasing importance is being attached to design strategies, systems of evaluating designs and buildings as well as tools to support integrated activities in the field of architectural design. The above topics are the subject of research presented in this paper. The basic research aim of the paper is: to develop a current method of solving design tasks within the framework of Integrated Design Process (IDP) using modern design tools and technical possibilities, in the context of sustainable development imperative, including, the optimisation of IDP design strategies regarding the assumptions of conscious creation of sustainable built environment, adjusted to Polish conditions.



INFLUENCE OF SHADING ON COOLING ENERGY DEMAND

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ABSTRACT

The article presents an analysis of the building cooling load taking into account the variability of the factors affecting the size of the heat gains. In order to minimize the demand for cooling, the effect of shading elements installed on the outside on the windows and its effect on size of the cooling capacity of air conditioning system for the building has been estimated. Multivariate building cooling load calculations to determine the size of the reduction in cooling demand has derived. Determination of heat gain from the sun is laborious, but gives a result which reflects the influence of the surface transparent partitions, devices used as sunscreen and its location on the building envelope in relation to the world, as well as to the internal heat gains has great attention in obtained calculation. In this study, included in the balance sheet of solar heat gains are defined in three different shading of windows. Calculating the total demand cooling is made for variants assuming 0% shading baffles transparent, 50% shading baffles transparent external shutters at an angle of 45 °, 100% shading baffles transparent hours 12 from the N and E and from 12 from the S and W of the outer slat blinds. The calculation of the average hourly cooling load was taken into account the option assuming the hypothetical possibility of default by up to 10% of the time assumed the cooling season temperatures in the rooms. To reduce the consumption of electricity energy in the cooling system of the smallest variant identified the need for the power supply for the operation of the cooling system. Also assessed the financial benefits of the temporary default of comfort.



ASTRONOMICAL AND METEOROLOGICAL CONDITIONS OF A SOLAR SYSTEM OPERATION

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ABSTRACT

Acquisition and processing of as much solar energy for heating and electricity generation in Poland and in the world is a very important objective in the policy of alternative energy sources. The main problem with the reception of solar energy by solar collectors is vary energy supply at different times of day and year and low flux density of radiation. The term of solar radiation one mean transmission or emission of energy in the form of electromagnetic waves. The radiation emitted from the surface of the sun spreads out in all directions in space, reaches the Earth's surface in only partly, especially the solar collectors. The most important parameters characterizing solar radiation are daily, monthly and annual sum of solar radiation. Its express the amount of solar energy which falls on a unit area at a given time. Number of hours of sunshine during the day are dependent on two key factors. The first one is the time from the sunrise to sunset, which strongly depends on the date and latitude. The second factor is the weather (clouds), influences solar radiation, radiation in touch with clouds is absorbed and dissipated. This publication shows the impact on the energy yield of the flat collector installation and astronomical conditions (angle of inclination and declination of solar), and climate. The calculations of determining the astronomical conditions of the place where the installation is located ware analysed. The solar installation is located in Rzeszow (Poland) and the plate collector placed on the roof of building. Based on specific methodology for selected days the calculation of the elevation angle of the Sun, hourly angle, the sun azimuth and angle of incidence of the radiation on any plane were set. The results are shown in diagrams. The effect of cloud cover on the acquisition of solar energy by the collector is also shown.



EMISSION OF AIR POLLUTANTS IN THE HOT WATER PRODUCTION

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ABSTRACT

The result of the deteriorating condition of the environment and climate change is to increase the efficient use of fuel and energy and the rational use of energy resources. Great potential for reducing consumption of fossil fuels are stuck in heating systems ranging from generation, transmission and distribution and ending with the recipients rationalize their consumption of heat. Efficient production of heat is Obtained during optimal boiler load. The boiler type WR operates with the highest efficiency of 80-85%, the rate of fuel consumption is the lowest, and the process is close to complete combustion. In such conditions to the atmosphere are emitted mainly: SO₂, CO₂ and NO_x. Pollutants such as CO, CH₄, HF, HCl, NH₃, etc., are the result of incomplete and imperfect combustion, that is, when the boiler is working inefficiently. Measurements of pollutant concentrations were performed using an analyzer FTIR Gasmet DX4000. Fourier Transform Infrared Spectroscopy is a technique of measuring that allows a very precise identification of qualitative and quantitative range of compounds, including gaseous pollutants. Device used to measure the concentrations of gaseous pollutants allow determining the amount of carbon, sulfur and nitrogen compounds, which measurement is not defined any rules, including chlorine compounds, hydrogen, methane, ammonia and volatile organic compounds. In this publication presents part of the literature the use of heat for domestic hot water production in summer and heating demand in winter. Described the characteristics of the water boilers WR type used for heating. Presents the results study of the emissions in the production of hot water for the summer and winter seasons.



SUSTAINABLE TRANSPORTATION IN ESKISEHIR CITY

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ABSTRACT

Eskisehir city, which is located in the center of the railway line connecting Ankara, the capital of Turkey and Istanbul, is one of the important cities in Anatolia. The adverse effects created by the rapid urbanization, that affected the entire Turkey since 1950, were also experienced in Eskisehir city. Having a separate position in terms of location, the most important problem that develops due to rapid urbanization is a problem of urban transportation in the city. Environmental pollution, traffic accidents, economic and environmental damage, negative psychological impact on human and disadvantage in tourism are the negative reasons that are caused numerous problems for the urban transportation in the Eskisehir city. The municipality has developed various solutions, in order to solve the intra-city transportation problems in Eskisehir city. These are aimed at reducing environmental pollution, caused by motor vehicles, as well as, measures to increase the importance of the railway systems, especially bicycles and pedestrian roads in urban transportation. Solutions to the transportation problems in the city Eskisehir cannot be successful on a single system. Besides various measures that can be taken in road, rail and river transport, today the new transport proposals are also brought on the agenda. These applications are made by the Eskisehir metropolitan municipality are aimed to be a model of sustainable transportation. In this study, while the problems of urban transportation were mentioned in general, as a result, the developments made by the municipality in the field of urban transportation, were evaluated by a survey work, asking the users with the questionnaire, to show the satisfaction of the people from the output of the municipality in the mentioned field.



MECHANICAL PARAMETERS OF RUBBER-SAND MIXTURES FOR NUMERICAL ANALYSIS OF A ROAD EMBANKMENT

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ABSTRACT

Waste production consists one of the greatest problems of the modern world. It is inevitably related to the increase of industrialization. One of the most difficult, and growing in amounts, waste is scrap tyres. The most common method of utilization of End-Of-Life tyres by their incineration raises much concern in terms of air pollution. More sustainable seems to reuse the tyre derived products - rubber in particular - in civil engineering, where the interesting properties of this material may be utilized. This paper presents results of direct shear strength tests on sand-rubber mixtures, which were next applied to a numerical FEM (finite element method) model of a road embankment built on soft ground. The laboratory tests, conducted for two types of scrap tyre rubber granulates (0.5 - 2 mm and 1 - 5 mm in size) mixed with medium fluvial sand in various proportions (5, 10, 30 and 50% by weight), proved that the unit weight of the mixtures is distinctly smaller than the unit weight of sand alone and at 50% rubber content it drops by half. The internal angle of friction stays almost unchanged for the mixtures with up to 10% of rubber (33 - 37°), but decreases by about 10° when the rubber content increases to 50%. In most of the cases analysed, the cohesion intercept is higher in case of sand-rubber mixtures when compared to sand alone. The numerical model simulated a 4.5 m high embankment with a 3 m thick layer made of sand-rubber mixtures, containing 0%, 10% or 30% of the waste product, founded on a weak subsoil (with a 3 m layer of organic soil). The results showed that stability factor of the structure built with the layer containing 30% of the coarser rubber granulate has increased from 1.55 - for sand only, to 1.95. The embankment was also able to carry load doubled from 23 kPa to 57 kPa and its base showed much smaller settlement. The results prove that the use of tyre derived aggregates in embankment construction is not only an effective way of utilization of this problematic waste, but can also improve behaviour of such a structure.



THE SUSTAINABLE IMPACT OF LANDFILL SITING TOWARDS URBAN PLANNING IN MALAYSIA

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ABSTRACT

Landfill is one of the most common, widely used waste management technique in Malaysia. The ever increasing of solid wastes has made the role of landfill become prominent despite the negative impacts that caused by the landfill is unavoidable. The public and government regulators are getting more aware with the negative impacts that could be brought by the landfill towards the community. It led to the cultural shift to integrate the concept of sustainability into the planning of siting a landfill in an urban area. However, current urban planning tends to emphasize more on the environmental aspect instead of social and economic aspects. This is due to the existing planning guidelines and stakeholder's understandings are more on the environmental aspect. This led to the needs of incorporating the concept of sustainability into the urban planning. Thus, this paper focuses on the industry stakeholders view on the negative impacts that will cause by the landfill towards the urban planning and the propose idea on the landfill siting in an urban area. The industry stakeholders are those who are related to the decision-making in the selection of a landfill site in the government department. The scope of the study is within the country of Malaysia. This study was conducted through the semi-structured interviews with a total of fifteen industry stakeholders to obtain their perspective on the issues of impacts of siting a landfill in the urban area. The data obtained was analysed using the software, QSR NVivo version 10. Results indicate that landfill brought significant sustainability-related impacts towards landfill siting in urban planning. The negative impacts stated by the respondents are categorized under all three sustainable aspects such as environmental, social and economic. Among the results are such as the pollution such as the generation of leachate, objection in siting a landfill site against by public, and the negotiating and getting money contribution from local authorities. The results produced can be served as a guideline for the industry stakeholders to have a holistic overview of the impacts that could lead by the landfill in siting into the urban area in terms of sustainability aspects. Moreover, it serves as a platform for the developing a holistic guideline for urban planning in the consideration of sustainability aspect of the selection for a landfill site.



INDUSTRY 4.0 CONCEPT INTRODUCTION INTO CONSTRUCTION SME'S

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ABSTRACT

The article presents the general idea of Industry 4.0 concept with the introduction presenting descriptions of the most important aspects in terms of production and construction industry development. The importance of the SME sector is stressed showing that this group of companies plays significant role in the European economy. The main objective of the article is to define and show possible research areas connected with the introduction of Industry 4.0 concept into SME's with the main focus on the construction sector. For this purpose analysis was made, based on the most recent literature, to point out actual needs in the SMEs sector in terms of its evolution into 4.0 level. What is more, analysis was performed based on the most popular articles published in Journals available in Thomson Reuters Web of Science Core Collection database regarding Industry 4.0 concept popularity in the last decade showing actual change of interest in this filed, taking into account possibility of usage of this concept in the construction and production sector. Authors tried to describe state-of-the-art on the Industry4.0 introduction for SME's. Performed analysis showed that there is a wide spectrum of disciplines that are affected by the Industry 4.0 that needs to be examined considering introduction into SME field. It also showed that multidiscipline approach was not investigated so far to create special rules, procedures and methods and know-how designed for introduction of main principles of Industry 4.0 in the SME sector. Authors came to the conclusions that there should be more stress put into research in this field especially taking into account the fact huge potential which lies SME sector in terms of global economic strength.



NATURAL VENTILATION OF BUILDINGS THROUGH LIGHT SHAFTS. DESIGN-BASED SOLUTION PROPOSALS.

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ABSTRACT

This work analyses how the built environment affects the quality of the air to be introduced into buildings from light shafts. Several factors such as urban environment and building design intervene in the ability of the light shaft to produce its air change process. Urban areas continuously pollute the air in cities what affects the human health and the environment sustainability. Poor air quality outside buildings supposes a big energy waste to promote an acceptable air quality inside buildings. That requires a larger flow rate to maintain the indoor air quality what is translated to an energy efficiency term. The main objective focuses on the impact of standardized architecture design in the quality of the indoor air dependent on the air change in the light shaft. The air change capacity of the outdoor space is numbered analyzed using the concept of air change efficiency (ACE). ACE is determined by the built environment, the wind conditions and the design of the building containing light shafts. This concept is comparatively evaluated inside a control domain virtually defined to obtain the mean age of the air for a known air volume. The longer the light shaft in the wind direction is, the better the ACE is compared with other options. Light shafts up to 12 meters high are the best to obtain acceptable efficiency results. Other studied cases verify that assumption. Different simplified tools for the technicians to evaluate the design of buildings containing light shafts are proposed. Some strategies of architectural design of buildings with light shafts to be used for ventilation are presented.



AN ENERGY-OPTIMISED PRE-DESIGN OF TRANSITIONAL RURAL HOUSING FOR SYRIA WITH RECYCLED RUBBLE FROM DESTROYED BUILDINGS

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ABSTRACT

Abstract. The scale of destruction caused by six years of on-going war in Syria has caused mass migration of the population within and outside its borders. More than half the population are in need of humanitarian aid and also have a pressing need for housing. The situation calls for a means to provide humane post-war affordable housing for the internally displaced persons (IDPs) within Syria that can be quickly and easily built with few resources. Due to the war, fossil fuel resources are not only scarce, but are also being used as a valuable commodity to finance war efforts. At the same time the housing should minimize consumption of energy used for heating and cooling due to the scarcity of fossil fuel resources while providing thermal comfort to the inhabitants. Evidence is showing that exiled Syrians are already returning to the Aleppo region as Operation Euphrates Shield is securing the area. The housing parameters for the proposed solution are to integrate as much of the local building materials in the Aleppo region as possible using existing regional building traditions. Imported products such as building materials, machinery, equipment, as well as foreign manpower and know-how are to be kept to a minimum. Recycled rubble from destroyed buildings is to be incorporated in the design concept. A comparative study of current disaster relief housing is conducted to illustrate the appropriateness of each design solution in relation to the above-proposed housing parameters. A detailed analysis of the physical properties of an existing case study building in Dabiq, a town 40 km northeast of Aleppo, outlines the strengths and weaknesses of the building tradition to determine which aspects of the construction may be improved for better thermal comfort and resistance against earthquakes. This paper offers a concept for transitional single-family housing for IDPs based upon the adobe tradition in the rural areas of Aleppo. Improvements to the analysed weaknesses to meet the lowest-energy standard are proposed with minimal intervention from mechanical building systems. At the same time, possibilities to strengthen the structure against earthquakes are given with minimal construction costs and low embodied energy of the construction materials for quicker housing construction for the displaced families. Reducing the heating and cooling loads can also drastically reduce fossil fuel requirements during the construction and operation phases of the single-family homes while maintaining a high level of indoor thermal comfort. Traditional construction techniques can potentially employ more craftspeople combined with manual labour instead of using automated systems. The relative safety of the rural areas can thus be increased, as storage and use of fossil fuels in the villages will be decreased allowing for quicker resettlement with less disruption from war.



ADVANCES IN THE RATIONAL USE OF WATER IN BUILDINGS IN THE BRAZILIAN CONTEXT

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ABSTRACT

This article presents a reflection on the advances made in the rational use of water in buildings in the Brazilian context. It addresses a historical perspective beginning in the 1970s with the initiatives of the World Water Decade, proposed by the 16th UN Plenary Meeting (UN, 1977), through Agenda 21 (UN 1992) and Millennium Declaration (UN 2000) Until the present day, showing an evolution of the specific consumption of water of the sanitary appliances used in the buildings. Detail the results of the Program of Rational Use - PURA (SABESP, 2012) in the state of São Paulo - Brazil, where saving water appliances were used and presents the correlation of these results with the consumption per capita in the last two decades, in which a marked increase of the population was observed in the period of implantation of several actions of rational use and against the losses in the network of distribution. The population jumped from 9.4 million to 10.5 million in six years. While per capita consumption decreased from 220 to 160 liters / day, pointing to a 27% reduction, meaning a large and proven progress in the rational use of water in buildings as a good way to keep the city sustainability. In the very near future, due to scarcity or more extreme rational use, several measures will be explored to enhance the use of water in buildings. There are already options for the use of rainwater, to replace that used in the discharges of the sanitary basins, or for irrigation and washing. There is also the possibility of reuse of gray water, or even the separation of urine and black waters in sanitary basins.



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ENVISIONING ACTIVE SHELTERS IN SAFETY PLACES TO LIVE DURING THE CLIMATE CHANGE ERA

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ABSTRACT

Global climate change has already had observable effects on the environment. Glaciers have shrunk, ice on rivers and lakes is breaking up earlier, plant and animal ranges have shifted and trees are flowering sooner. Effects that scientists had predicted in the past would result from global climate change are now occurring: loss of sea ice, accelerated sea level rise and longer, more intense heat waves. This paper explores the possibilities of architectural design to benefit human condition, which encompasses physical environment of safe life during the Climate Change era and predicted disasters. The first part deal with the evolution of the building envelopes and structures as a focus of design innovation in the twenty first century parallels advancements in envelope engineering and building science, as well as developments in computer engineering, cybernetics and artificial intelligence. The second part presents, among others, results of the research program undertaken at West Pomeranian University of Technology in Szczecin by authors. The program goes on to attempt to solve the problem through architectural design of active shelters in a safety place to live. Presented project designs envision new typologies for buildings which are embedded among others in mountain structure. Main objective of this place is to create base of future district inhabited by survivors. In conclusion, this design task can only be tackled by means of an integrated approach to design, i.e. interdisciplinary collaboration between architects, structure and environmental engineers.



A SIMPLIFIED RELIABILITY BASED DESIGN FOR FLEXIBLE PAVEMENTS

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ABSTRACT

The traditional method of pavement design has been based on empiricism. However, the current pavement design procedure adopted as per the Indian guidelines is based on mechanistic-empirical principles. Regardless of the type of design procedure adopted, inherent variability associated with the design input parameters, will produce variable pavement performance in terms of fatigue and rutting lives. So, it becomes important to consider the variability of pavement performance into the pavement design process and for this reason the estimation of structural reliability has become an important consideration in the structural design of asphalt pavements. This paper discusses about a simplified approach for the estimation of the reliability of asphalt pavements and presents a procedure for designing an asphalt pavement at any design reliability level considering the variability in both fatigue and rutting life of the pavement structure. Finally, the adopted procedure has been illustrated through examples of pavements designed as per Indian design guidelines using IRC:37-2012.



**SIMPLIFIED METHOD FOR THE CHARACTERIZATION OF RECTANGULAR STRAW BALES (RSB)
THERMAL CONDUCTIVITY**

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ABSTRACT

This research aims to design and implement tools and methods focused at the determination of the thermal properties of full size Rectangular Straw Bales (RSB) of various nature and origin, because their thermal behavior is one of the key topics in market development of sustainable building materials. As a first approach a method based on a Hot-Box in agreement with the ASTM C1363 - 11 standard was developed. This method was found to be difficult for the accurate measurement of energy flows. Instead, a method based on a constant energy input was developed. With this approach the thermal conductivity of a Rectangular Straw-Bale (RSB $\hat{\lambda}$) can be determined, using the difference between the internal and the external temperature of the samples and of the metering chamber and by knowing the thermal conductivity of the materials used to build the metering chamber. A measurement apparatus consisting of a metering chamber was realized. The metering chamber was placed inside a climate chamber, maintained at constant temperature. A known quantity of energy is introduced inside the metering chamber. A series of thermopiles detects the temperature of the internal and external surfaces of the metering chamber and of the specimens. Because the energy input is in each case constant, the right-hand side members of the Fourier's equations relative to the various cases can be equaled, obtaining equations in which there is only one unknown quantity, namely the value of the RSB $\hat{\lambda}$. The method was used to calculate thermal conductivity of RSB of different cereal samples and has provided representative values. These values are consistent with those obtained with methods that are more precise and with those found in the scientific literature.



COMPARATIVE STUDY OF THE VOLUMETRIC METHODS CALCULATION USING GNSS MEASUREMENTS

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ABSTRACT

This paper aims to achieve volumetric calculations for different mineral aggregates using different methods of analysis and also comparison of results. To achieve these comparative studies and presentation were chosen two software licensed, namely TopoLT 11.2 and Surfer 13. TopoLT program is a program dedicated to the development of topographic and cadastral plans, 3D terrain model, level curves and calculation of cut and fill volumes, including georeferencing of images. The program Surfer 13 is produced by Golden Software, in 1983 and is active mainly used in various fields such as agriculture, construction, geophysical, geotechnical engineering, GIS, water resources and others. It is also able to achieve GRID terrain model, to achieve the density maps using the method of isolines, volumetric calculations, 3D maps. Also, it can read different file types, including SHP, DXF and XLSX. In these paper we presented a comparisons in terms of achieving volumetric calculations using TopoLT program by two methods: a method where we choose a 3D model both for surface as well as below the top surface and a 3D model in which we choose a 3D terrain model for the bottom surface and another 3D model for the top surface. The comparison of the two variants will be made with data obtained from the realization of volumetric calculations with the program Surfer 13 generating GRID terrain model. The topographical measurements were performed with equipment from Leica GPS 1200 Series. Measurements were made using Romanian position determination system - ROMPOS which ensures accurate positioning of reference and coordinates ETRS through the National Network of GNSS Permanent Stations. GPS data processing was performed with the program Leica Geo Combined Office. For the volumetric calculating the GPS used point are in 1970 stereographic projection system and for the altitude the reference is 1975 the Black Sea projection system.



LAND USE CHANGES MONITORING WITH CORINE LAND COVER DATA

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ABSTRACT

The Corine Land Cover (CLC) data is a collection of information about land cover, which was created during the program that was implemented by the EU. In this article authors proposes new index of space fragmentation, which is based on the analysis of the length of the boundaries of the various forms of land use - Ex. This papers contains the procedure of designation the new index and two examples of its use for the two regions in the north - eastern part of Poland. These regions are characterized by a particularly high environmental values. Therefore, especially for these areas it is extremely important to study the fragmentation of landscapes as monitoring the increase of anthropopression. For visualization and spatial analysis authors used GIS technology.



MICROINSTALLATIONS FOR RENEWABLE ENERGY SOURCES IN THE CONSTRUCTION INDUSTRY

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ABSTRACT

The concept of microinstallations in the renewable energy sector and the related definition of a prosumer have become the focus of the discussion among the producers and consumers in the European Union and in Poland, particularly in the recent years. The range of technological solutions present in the market causes that there is no household, agricultural farm or small service-providing enterprise which would be unable to utilize at least one type of microinstallations for renewable energy sources. Development of microinstallations and prosumer energy sector are incessantly connected with the construction sector. Especially in the new model of distributed energy sector, construction might be the sector of building not only green heat plants but also combined heat and power plants or green power plants. Microinstallations of renewable energy sources represent the initial point and the foundation for development of microgrids, intelligent grids and broadly understood prosumer energy sector. Prosumer energy sector requires a period of incubation and is implemented into the energy systems with stages. These stages, being the steps to popularize prosumer energy using intelligent energy environment, can be formulated in the following manner: 1) development of technologies that utilize renewable energy sources, 2) transformation of building owners into prosumers and transformation of buildings into micro power plants with microinstallations, 3) development of new technologies for periodical storage of energy and using them in microinstallations, 4) utilization of Internet technologies i.e. energy Internet, for exchange of energy between prosumers (buildings) and sharing the surplus energy, 5) popularization of intelligent networks of supplying power to buildings. Widespread implementation of energy technologies in the field of distributed energy sectors with other subsystems will allow for creation of local electrical power systems, which will translate into the reform in the whole electric power sector and popularization of its prosumer character. Initial analyses have demonstrated that development of distributed generation should contribute to development of local communities (increased role of local governments, new workplaces etc.). In the nearest years, prosumer energy will start playing an important role in development of Polish energy sector. The particular importance will be from supplying of electric energy and heat to detached houses located far from big networks of distribution of energy generated in conventional ways. Market barriers, institutional barriers and geographical factors will only delay, for several years, the achievement of full market competitiveness by distributed technologies.



THE CONCEPT OF HEAT RECOVERY FROM THE EXHAUST GASES

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ABSTRACT

The theme of the article is to determine the possibility of waste heat recovery and use it to prepare hot water. The scope includes a description of the existing sample of coal fired boiler plant, the analysis of working condition and heat recovery proposals. For this purpose, a series of calculations necessary to identify the energy effect of exhaust temperature decreasing and transferring recovery heat to hot water processing. Heat recover solutions from the exhaust gases channel between boiler and chimney section were proposed. Estimation for the cost-effectiveness of such a solution was made. All calculations and analysis were performed for typical Polish conditions, for coal fired boiler plant. Typicality of this solution is manifested by the volatility of the load during the year, due to distribution of heat for heating and hot water, what determine the load variation during the day. Analyzed system of three boilers in case of load variation allows to operational flexibility and adaptation of the boilers load to the current heat demand. This adaptation requires changes in the operating conditions of boilers and in particular assurance of properly conditions for the combustion of fuel. These conditions have an impact on the existing thermal loss and the overall efficiency of the boiler plant. On the boiler plant efficiency affects particularly exhaust gas temperature and the excess air factor. Increasing the efficiency of boilers plant is possible to reach by following actions: limiting the excess air factor in coal combustion process in boilers and using an additional heat exchanger in the exhaust gas channel outside of boilers (economizer) intended to preheat the hot water.



LARGE PREFABRICATED PANELS COLLECTIVE DWELLINGS FROM THE 1970S: CONTEXT AND IMPROVEMENTS

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ABSTRACT

The period between 1960s and 1970s in Romania had a significant impact on the urban development of major cities. Because the vast expansion of the industry, the urban population has massively increased, due the large number of workers coming from the rural areas. This intense process has led to a shortage of homes on the housing market. In order to rapidly build new homes, standard residential project types were erected using large prefabricated concrete panels (LPCP). By using repetitive patterns, such buildings were built in a short amount time through the entire country. Nowadays, these buildings represent 1.8% of the built environment and house more than half of a city's population. Even though these units have reached only half their intended life span, they fail to satisfy present living standards and consume huge amounts of energy for heating, cooling, ventilation and lighting. Due to the fact that these building are based on standard projects and were built in such a large scale, the creation of a system that brings them to current standards will not only benefit the building but also it will significantly improve the quality of life within. With the transition of the existing power grids to a "smart grid" such units can become micro power plants in future electricity networks thus contributing to micro-generation and energy storage. If one is to consider the EU 20-20-20 commitments, to find ideas for alternative and innovative strategies for further improving these building through locally adapted measures can be seen as one of the most addressed issues of today. This research offers a possible retrofitting scenario of these buildings towards a sustainable future. The building envelope is upgraded using a modular insulation system with integrated solar cells. Renewable energy systems for cooling and ventilation are integrated in order to provide flexibility of the indoor climate. Due to their small floor area, the space within the apartments is redesigned for a more efficient use of space and an improved natural lighting. Active core modules are placed on top of the unused attics and a solar panel array is introduced. Furthermore accessibility issues are addressed by facilitating access for disabled people and implementing an elevator system that currently these building do not have.



ANALYSIS PARAMETERS PHYSICAL BUILDING JOINTS INSULATED FROM THE INSIDE

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ABSTRACT

The article describes the materials and technologies used in thermal insulation of external walls from the inside. Presents an physical parameters analysis of walls joints insulated from the interior. It has been carried out numerical calculations for the case of study using a software TRISCO with various location and insulation thickness. Based on the results of linear thermal transmittance $\hat{\lambda}$, temperature distribution and the temperature factor f_{Rsi} calculations, detailed analysis and identify shortcomings warming partitions from within. Based on results of calculations detailed analysis has been done and identified drawbacks of interior insulation joints. On the basis of calculations and analyzes formulated guidelines for the design and construction of bulkheads insulated from the inside, taking into account the hygrothermal requirements.



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A NEAR ZERO ENERGY BUILDING AS AN URBAN ACUPUNCTURE ALTERNATIVE FOR A VERTICAL SLUM: A CASE STUDY IN MALAGA (SPAIN)

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ABSTRACT

Vertical slum is defined as a particularly vulnerable height building, with serious problems of functionality, safety and habitability. Venezuela's Tower of David is a famous example. Vertical slums are associated with an important level of physical degradation, coupled with a precarious socioeconomic situation of its occupants. Their inability to create a community for proper and mandatory maintenance increases their physical deterioration. The abandonment of the original owners is replaced by a system of occupation and illegal activities. In many cases, with an interest in maintaining the building in a state of precariousness, which annuls any attempt to rehabilitate it. Facing this situation, the intervention is proposed through an urban acupuncture project, understood as a project of expropriation and physical rehabilitation of the building, associated to a project of social rehabilitation in a disadvantaged environment. It is about creating a hybrid building associated with four objectives 1- Create a hybrid building with a mixed offer of social and housing services: sheltered housing for seniors, residence and accommodation for young entrepreneurs. The idea of a social condenser is related to studies of the hybrid building such as the Downtown Athletic Club in New York, or the Rokade Tower and Maartenshof residence (Groningen, The Netherlands). 2- Incorporate the sustainability parameters directed to a building almost zero. 3- Incorporate a model of provision of housing services, managed by the municipality, but with the possibility of incorporating NGOs 4- Design a social rehabilitation project that facilitates the creation of a web of social-based companies or cooperatives that fosters entrepreneurship, and that can actively participate in the rehabilitation and maintenance of the neighborhood itself. This paper applies these principles to a building in Malaga as a case study and 10 strategies are developed and analysed in regards to its physical, social and sustainable transformation.



**COOPERATION OF HORIZONTAL GROUND HEAT EXCHANGER WITH THE VENTILATION UNIT DURING
SUMMER - CASE STUDY**

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ABSTRACT

Renewable energy sources are used in the modern energy-efficient buildings to improve their energy balance. One of them is used in the mechanical ventilation system ground air heat exchanger (earth-air heat exchanger - EAHX). This solution, right after heat recovery from exhaust air (recuperation), allows the reduction in the energy needed to obtain the desired temperature of supply air. The article presents the results of "in situ" measurements of pipe ground air heat exchanger cooperating with the air handling unit, supporting cooling the building in the summer season, in Polish climatic conditions. The laboratory consists of a ventilation unit intake - exhaust with rotor for which the source of fresh air is the air intake wall and two air intakes field cooperating with the tube with ground air heat exchangers. Selection of the source of fresh air is performed using sprocket with actuators. This system is part of the ventilation system of the Malopolska Laboratory of Energy-Efficient Building (MLBE) building of Cracow University of Technology. The measuring system are the, among others, sensors of parameters of air inlets and outlets of the heat exchanger channels EAHX and weather station that senses the local weather conditions. The measurement data are recorded and archived by the integrated process control system in the building of MLBE. During the study measurements of operating parameters of the ventilation unit cooperating with the selected source of fresh air were performed. Two cases of operation of the system: using EAHX heat exchanger and without it, were analyzed. Potentially the use of ground air heat exchanger in the mechanical ventilation system can reduce the energy demand for heating or cooling rooms by the pre-adjustment of the supply air temperature. Considering the results can be concluded that the continuous use of these exchangers is not optimal. This relationship is appropriate not only on an annual basis for the transitional periods (spring and autumn), but also in individual days in the potentially most favorable periods of work exchanger (summer and winter). Inappropriate operation of the heat exchanger, will lead to a temporary increase in energy consumption for the preparation of the desired air temperature, relative to the fresh air unit which is non-pretreated. For optimal energy system operation: exchanger EAHX - air handling unit, to preserve the most favorable parameters of inlet air to handling unit there is a need to dynamically adjust of source of fresh air, depending on changing external conditions and the required outlet temperature of central unit (temperature of air forced to the rooms).



**DAYLIGHT DESIGN FOR URBAN PLANNING OF MULTIFAMILY RESIDENTIAL AREAS IN POLAND: A
COMPERATIVE STUDY OF DAYLIGHT CONDITIONS OBSERVED IN THREE NEIGHBOURING
RESIDENTIAL AREAS**

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ABSTRACT

The purpose of this research is to illustrate that an incorporation of daylight design may be a useful tool in an urban design practice with regards to residential planning in Poland. The integration of sustainable daylight design into an architectural design process can help designers to create the multifamily buildings in respect to environmental issues, energy needs, solar and illuminance gains as well as residents needs and comfort. This paper report on the daylight conditions observed in three neighbouring residential areas in Poznan, Poland. The assessment of outdoor and indoor conditions was made by the in situ measurements of luminance, the questionnaires carried out among the residents and the comparison of physical properties of the chosen neighbouring areas. The objects of the research are residential areas created and erected in different time periods and under changing daylight regulations. The results of this study may help to determine more precise characterization of daylight determinants and tools necessary in architectural planning. The comparison study of daylight conditions in three chosen residential areas demonstrates the impact of daylight and building standards recommendations on design for the multi-family residential buildings. The analysis addressed the two main aspects of daylight control in urban design. The first one focused on analysis of parameters related to build form, like: location, orientation, size and position of apertures, type of glazing and ways of daylight introduction to the buildings interiors. The second aspect concentrated on parameters related to daylight quality and quantity, which were assessed by the residents, like: glare, brightness, sunlight provision, energy efficiency, quality of view. The selected findings of in situ measurements of luminance are also presented. The main conclusions of this study include: a. An importance of the daylight design as a factor contributing to better living conditions within multifamily residential dwellings was confirmed by findings from the questionnaires carried out among residents of the three selected areas, b. The perception of an individual living space depends on a provision of daylight into the interiors, c. The limitations of national building recommendations regarding daylight guidelines for urban planning effects the quality of residential architecture. The final conclusions of this research illustrate that a role of daylight in urban planning is very complex one and it depends on the implemented filters of objectives, from social, cultural, psychological to economic ones. The research confirms that daylight studies are crucial during the first stages of residential urban planning, especially while making decisions concerning urban density, buildings location, shape and height of the buildings, locations of open areas, window to wall ratio, size of apertures on a building facade or roof.



ADAPTABILITY IN HOUSING CONTEXT

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ABSTRACT

Changing conditions encourage designers to design building able to serve in long time horizon. The solution and answer to changing needs of customers is complex and still there is no ready algorithm leading to the clue. The paper starts from literature review, and try to collect, divide and compare different point of views and nomenclature. As the result authors would like to name most frequent and applicable solutions. The other part is theoretical case study based on the application of adaptability in single-family housing in polish context. The adaptability in this case has influence on affordability of the single-family house from financial point of view. Adaptability can decrease initial cost of investment but also reduce maintenance cost. Authors took into account also different types of heating especially renewable sources of energy and its costs of instalment and maintenance.



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SUSTAINABLE ARCHITECTURE IN THE CONTEXT OF REGIONAL ACTIVITIES

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ABSTRACT

Relationship between human and the surrounding cultural environment in urban and architecture design draws attention to the realm of interdisciplinary research. As a result they should create architectural and urban solutions which provide aesthetic satisfaction. They should also generate social bond, a sense of identity and maintain the specificity of the local building environment, where tradition and context of surrounding is the starting point for creating a sustainable living environment. Presented problems focuses on the analysis of formal, functional and spatial solutions, in which materials and technology were selected in an optimal way. The continuation of the subject concerns the relationship between the use of local urban, architectural, material and technological solutions and the quality of the cultural space that meets the principles of sustainable development. Adaptation and transformation of old techniques and traditional materials to create contemporary designs is one of the forms of experimentation encountered in contemporary architecture. Its economic, social and ecological aspects are realized in the form of : satisfying the needs of the local community , renewal and maintenance of modern standards of the surrounding buildings, use of local materials and available space. This means striving to design and transform the space already in use, while reducing the impact on the environment. Analised buildings and urban spaces are an attempt to answer: whether the strategies applied in the field of architectural, technological and material solutions provide the identification of the place and meet users' expectations?



GREEN WALLS AS AN APPROACH IN GREY WATER TREATMENT

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ABSTRACT

Grey water contributes significantly to waste water parameters such as biochemical oxygen demand(BOD), chemical oxygen demand (COD), total suspended solids (TSS), total phosphorus (Ptotal), total nitrogen (Ntotal), ammonium, boron, metals, salts, surfactants, synthetic chemicals, oils and greases, xenobiotic substances and microorganisms. Concentration of these pollutants and the water quality highlights the importance of treatment process in grey water systems. Treatment technologies operating under low energy and maintenance are usually preferred, since they are more cost effective for users. Treatment technologies based on natural processes represent an example of such technology including vegetated wall. Main aim of this paper is to introduce the proposal of vegetated wall managing grey water and brief characteristic of proposed system. Is expected that prepared experiment will establish the purifying ability and the potential of green wall application as an efficient treatment technology.



RELEVANCE OF THE LOCAL AND REGIONAL ENERGY POLICIES TO THE NEEDS OF AIR POLLUTION PREVENTION: CASE STUDIES OF POLISH REGIONS THREATENED WITH CRITICAL AIR POLLUTION FROM DISTRIBUTED ENERGY SOURCES

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ABSTRACT

Availability of the structural funds for the programming period 2014 - 2020 and the European Union's quantitative aims for 2020 and 2030, concerning share of renewable energy in the countries' energy balance, result in focusing the regional and local energy policies upon implementation of the distributed sustainable energy sources. The systems supporting deployment of renewable energy sources, imposed by the national energy legislation, may either prefer or limit deployment of specific sustainable energy sources. The amendment of the Energy Law, approved by Polish Parliament on 11 September 2013, liberated the conditions for the implementation and exploitation of the micro- and small-scale distributed renewable electricity installations by individual users. Earlier, within the programming period of 2007 - 2013, the European Regional Development Fund (ERDF) used to support local umbrella programmes assuming large-scale implementation of solar collectors in municipalities. Within the current programming period 2014-2020, as many local authorities prepare the like programmes for large-scale implementation of photovoltaic installations, which benefit local inhabitants. Application for the ERDF funds and financing local photovoltaic programmes is feasible only in the cases when the measure is considered as relevant for the improvement of local conditions, regarding air quality and reduction of carbon dioxide emissions. Based on the Energy Law, municipalities are obliged to prepare heat, electricity and gas supply plans, while on voluntary basis, local authorities prepare Low-carbon management programmes, which are necessary to apply for the ERDF financing. Municipalities associated within the EU Covenant of Mayors also commit to prepare the Sustainable Energy Action Plans. Recent years, within its annual reports concerning air pollution, the European Environmental Agency, has been reporting air quality parameters in Poland, as the poorest (besides Bulgaria) among all the EU countries. Insufficient support of public administration towards improvement of energy efficiency in housing as well as significant proportions of satisfying transport needs with private cars along with underdeveloped public transportation systems, especially in the peripheries of large cities result in deteriorating of air quality parameters. The article aims to answer the question regarding effectiveness of the local investment plans in the field of energy management, in comparison to major needs and problems addressed in the regional and local energy policies, paying special attention to air pollution prevention. Development and implementation of the local programmes, expected to receive ERDF financing, involve significant organizational and financial efforts both from the side of municipal authorities and local inhabitants. Additionally, the article aims to provide an answer on how to balance local activities in the field of energy efficiency and renewable energy, in order to achieve the effects relevantly addressing local problems of poor air quality and sustainability of energy management. Research methodology involves analysis of the regional and local strategic and planning documents dedicated to energy and spatial management, in terms of their major assumptions concerning energy efficiency, needs of emissions' reduction and development of renewable energy. Objectives of the documents and their most pending needs are compared with the planned ecological effectiveness of the local investment programmes.



DURABILITY OF WALLBOARDS IN INDUSTRIAL BUILDINGS

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ABSTRACT

Prefabricated wallboards used to be mounted in industrial buildings as suspended support structures, which speeded up the process of their construction. The adopted solutions and errors made in the construction of the buildings have now resulted in the occurrence of faults or disaster hazards caused by weld joint damage and unrestrained displacements of wallboards. Steel plate fittings were mounted in the connecting area of the support structure and the assembly was performed by welding. However, during the joining operations no assembly supports were used so the wallboards were held together only by means of welds. Thus, to appropriately assess the technical condition of the wallboards, it was considered essential to analyze the actual quality of the welds. For this purpose, a method assessing the actual quality of the weld joints was developed. The method, which also accounted for the technical condition of the wallboards made it possible to evaluate their usefulness in the process of repair work required. It was found out that the main cause of the disaster hazard were corrosion processes especially in the gaps left unfilled between the wallboards. As a result, rainwater penetrated the connection areas as well as inappropriately performed weldings that were carried out directly from mounting cranes. Also the connections with damaged steel fittings were identified, which effected in concrete cracks and degradation of the continuity of rib structure. The use of suspended wallboards as support structures requires rigorous adherence to the assembly regime. The solutions ignoring the required use of assembly supports should not be allowed. In the presented case, the actual state of the damage wallboards did not allow to carry out do any local repairs, which was due to, among others, the corrosion of steel rod ribs.



WATER FOOTPRINT IN RESIDENTIAL BUILDINGS MAINTENANCE

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ABSTRACT

Sewerage systems and water supply, although becoming more efficient, require a comparative analysis from a holistic perspective [1]. The Water Footprint indicator (WF) from an integral perspective assesses the impacts generated by water consumption during all stages of economic activity. Specifically, this research discusses the residential building sector, which requires deeper measurement and study. This will enable evaluation and decision-making in the incorporation of suitable systems for each building, not only analyzing the environmental impact (energy and water), but also to propose improvements to the traditional systems. The main objective of this research is to encourage the proper management of water resources during the use and maintenance of residential building by applying the WF indicator, allowing a broad and rigorous decision-making. The present research is part of an adaptive quantification model developed in the research group ARDITEC [2]; for the application to the evaluation of the Ecological and Carbon Footprint in building projects. The model has a budget structure, based on research conducted by Alba Rodriguez [3] where each activity or resource is estimated and its corresponding footprint is assessed. The present model considers both consumptions: water consumption caused by the tasks of maintenance and the dwellers water consumption. The case study is a residential complex consisting of two blocks of flats located in the province of Huelva (Andalusia). The work shows the results of WF for the use and maintenance phases of the residential building, and items of works and activities that increased water impact cause are focused, being this phase of the life cycle of the building where the largest footprint concentrates in the direct water consumption. All values are extrapolated to the built area in order to compare results. The wastewater, which is commonly considered a liability to be eliminated, can become a valuable resource. The discharged water, rainwater and sanitation, can be reuse by using separated networks, with considerable saving being achieved. Reuse satisfies part of water consumption without compromising this resource.



DETERMINING THE ENVIRONMENTAL BENEFITS OF UHPC AS A BRIDGE CONSTRUCTION MATERIAL

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ABSTRACT

Ultra high performance concrete (UHPC) is a material that is slowly gaining momentum in the construction industry due to its long-lasting properties, improved strength and bearing capacity with reduced structure size, and low maintenance requirements. While the use of UHPC in infrastructure leads to a slimmer design that lasts longer, UHPC generally has higher emissions than regular reinforced concrete due to the greater blend of cement and the greater emissions associated with this cement production. What is unknown is if the longer lifetime, slimmer construction and lower maintenance requirements lead to a net environmental benefit compared to standard concrete design. Thus this study proposes a comparative life cycle analysis between a concrete and UHPC footbridge design for crossing a 4-lane highway in Norway. The design will follow EUROCODE and Norwegian National Road Authority standards for footbridges and will provide valuable insight into designing bearing structure with UHPC. The goal of this study is to determine which bridge design should be chosen and to determine if UHPC is an effective material for reducing lifetime emissions of bearing structures.



BIOCLIMATIC POTENTIAL OF LOCATION: A STATIC OR A DYNAMIC CHARACTERISTIC?

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ABSTRACT

Bioclimatic potential analysis is one of the starting points for bioclimatic building design. In order to design buildings in a way that they are adapted to climate as much as possible, a balance between heating and cooling passive strategies must be obtained. However, as climate change is being brought into the spotlight, bioclimatic potential is being put into question as well, because traditionally used passive strategies at a specific location might no longer represent properly balanced approach. Therefore, the purpose of this paper was to systematically evaluate bioclimatic potential of five locations in Slovenia with five specific climates on the basis of BcChart software. With BcChart, bioclimatic charts were plotted and bioclimatic potential was calculated using air temperature, relative humidity and solar radiation data. In addition, bioclimatic potential at the selected locations was observed separately for every of the last five decades. A closer look at climate data showed that in the last fifty years in all of the four analysed locations (i.e. Ljubljana, Ratece, Novo mesto and Murska Sobota) the average air temperatures rose approximately by 1-3 K and the number of hot days ($T_{max} = 30^{\circ}\text{C}$) increased as well. In contrast, at the remaining fifth location - Portorož with Mediterranean climate - the average temperature remained almost the same. Nonetheless, a rise in the average maximum temperature and the number of hot days was still identified. Consequently, the results showed that yearly balance between heating (e.g. need for solar radiation) and cooling passive strategies (e.g. shading, natural ventilation, high thermal mass) changed through time as well in all the locations. In particular, the period of year with a need for shading is extending, which emphasises the increased importance of passive strategies for overheating prevention. For example, in Ljubljana, Ratece, Novo mesto and Murska Sobota the use of overheating prevention strategies is becoming more important as it was in the past. Specifically, the period of year when shading is needed to achieve thermal comfort increased by 2-7%, depending on location. In general, in all continental parts of Slovenia, the prevailing bioclimatic strategies integrated in vernacular architecture are focused on heating season (e.g. heat loss prevention, utilization of solar energy, etc.). Therefore, bioclimatic potential in such locations should be re-evaluated, because it changes through time as a consequence of change in climate conditions. Thus, bioclimatic strategies in a particular location must be reconsidered in order to design energy efficient contemporary buildings with comfortable indoor thermal conditions.



PROGRAMMING SUSTAINABLE URBAN NODES FOR SPONTANEOUS, INTENSIVE URBAN ENVIRONMENTS

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ABSTRACT

Urban development nowadays, not only in Poland but also throughout the world, is an important issue for planners, municipal authorities and residents themselves. New structures generated in spontaneous urban and suburban areas constitute randomly scattered seeds of excessive residential and little commercial functions which therein appear more often as temporary or even ephemeral installations emerging where it is temporarily needed. The more important special services are provided rarely. Correct thinking about creating cities involves simultaneous thinking on providing different basic functions required by local communities, but at the same time recognizing temporal fluctuations and distinction on what kind of amenities have to be provided in particular area permanently (such as e.g. medical care, preventive services and schools), with others retaining its mobile, non-formal character. An even greater problem is a restoration of urban structures in the areas affected by natural disasters or leftover areas being previously war zones, where similar deficits have significantly higher impact being potential cause of higher toll in human lives, if no functional nodes providing essential functions survived. The Ariadne's Thread is a research project which proposes infrastructure and nodes for such urban areas. It develops new framework for creating nodes not only aimed at fulfilling basic needs of people but achieving social integration and build stability for fragile communities. The aim of the paper is to describe the process of identification of a relationship between needs of the inhabitants and both programmatic and ideological approach to Ariadne's Thread (AT) node giving ultimately its architectural interpretation. The paper will introduce the process of recognition of local needs, the interpretive and/or participatory mechanisms of establishing the node as a response to this recognition containing conceptual programming, socio-cultural programming, and functional programming (services). Then, the aspect of permanence or temporality will be addressed to determine the choice of appropriate technologies used in order to convey programmatic assertions into physical solutions. The nodes are meant to be as lightweight installments in the area as possible, but at the same time as durable and of good quality as to support positive social effects and reinforce building social capital in the area. The author(s) believe that this emergency-based AT node scenario can be extrapolated to unbalanced housing areas being the result of urban sprawl, after being only slightly adjusted to local standards. But the main goal is to allow for efficient interventions in areas in dire needs and poor environments with limited resources or limited funds.



POST-WAR CITY: IMPORTANCE OF RECYCLING CONSTRUCTION AND DEMOLITION WASTE

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ABSTRACT

Wars and armed conflicts have heavy tolls on the built environment when they take place in cities. It is not only restricted to the actually fighting which destroys or damages buildings and infrastructure, but the damage and destruction inflicts its impacts way beyond the cessation of military actions. They can even have another impact through physical segregation of city quarters through walls and checkpoints that complicates, or even terminates, mobility of citizens, goods, and services in the post-war scenario. The accumulation of debris in the streets often impedes the processes of rescue, distribution of aid and services, and other forms of city life as well. Also, the amount of effort and energy needed to remove those residual materials to their final dumping sites divert a lot of urgently needed resources. In this paper, the components of construction and demolition waste found in post-war cities are to be discussed, relating each one to its origins and potential reuses. Then the issues related to the management of construction waste and demolition debris resulting from military actions are to be discussed. First, an outlook is to be given on the historical example of Berlin and how the city was severely damaged during World War II, and how the reconstruction of the city was aided in part by the reuse of demolition debris. Then two more recent examples will be given, the cities of Baghdad in Iraq, and Homs in Syria. In Baghdad, though major military actions have ceased but not all rubble is cleared out, some security structures in the form of concrete walls separate the cities into quarters and impede city life and lie around as poorly allocated resource needed for reconstruction. While in the case of Homs, and the wider Syrian context, major military operations are still raging, making more pressure on the resources needed for reconstruction. This recycling of demolition debris can bring economic and social stability through the conservation of resources, creation of jobs, and - eventually - the stabilization of the society in the midst of an atrocious war. Suggestions for relevant solutions will be given in both cities.



ASSESSMENT OF TEMPORARY SOLUTIONS FOR RADON MITIGATION IN DOMESTIC DWELLINGS

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ABSTRACT

Exposure to radon in homes and workplaces is recognized as the most important natural factor in causing lung cancer. Radon activity concentration is usually higher in buildings than in the outside atmosphere due to the lower air renewal rates. Indoor radon levels can vary from one to multiple orders of magnitude over time and space, as it depends on several natural and anthropogenic factors, such as the radon concentration in soil under the construction, building materials, the weather conditions, the degree of containment in the areas where individuals are exposed, outside air, tap water and even city gas, the architecture, equipment (chimney, mechanical ventilation systems, etc.) and the environmental parameters of the building (temperature, pressure, etc.) and on the occupants' lifestyle. The bedroom usually represents the space in a house, where people spend the biggest part of their time spent at home. In cases, when high concentrations of radon are detected, either sophisticated or temporary procedures can be applied to reduce the indoor radon concentration levels. The easiest and the most straight forward temporary method of reducing the levels of radon in small spaces, like bedrooms, involve periodically opening of one or more windows. The method is efficient and can be used in cases, where thermal discomfort does not appear. The discomfort can be minimized, if the time to use it is also minimized. Question to be answer is: how long we have to apply this method in order to assure, that during night, when usually the windows are kept close, the concentrations of radon would not grow back to high levels? With the rapid development of the hardware and software technologies in the last decade, the application of the advanced numerical methods, primarily developed in framework of finite element or finite difference approaches, opening the possibility to develop advanced and sophisticated numerical approaches for modelling of radon entry and transport through the soil and other porous materials as well to analyse the indoor radon concentration and distribution inside the individual houses. Such numerical simulations can reveal that the efficiency of the temporary method is influenced by initial concentrations of radon, the type of source, difference of temperature and time to be applied. The aim of the present paper is to numerically simulate the transformations of concentration contours of radon during night period depending of the different parameters mentioned above. Through the CFD simulations carried out in this study, the indoor radon level and distribution is predicted throughout a room from an individual pilot house located in Cluj-Napoca, Romania. The numerical model used for this investigation is developed in framework of the specialized software application (Ansys-Fluent) and is pre-calibrated by extensive parametrical and sensitive studies some of them available in the open international literature. The numerical simulations conducted in this work allows us to reveal a good picture concerning the radon diffusion and accumulation rate inside residential buildings and provide the framework to investigate the influence of different parameters over radon level and distribution.



IMPROVING MODULAR BUILDING CONSTRUCTION TO REDUCE THE IMPACT ON ASSOCIATED INFRASTRUCTURE SYSTEMS

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ABSTRACT

Currently, building construction is going through a significant shift, where Modular Building Construction (MBC) is gaining popularity as an alternative to conventional on-site building construction (CBC). While the appearance of modular buildings is typically identical to conventionally constructed buildings, their interaction with key infrastructural systems varies significantly. However, hardly any research has addressed the question of MBC's infrastructural impacts. Understanding these interactions and their effects are essential in identifying ways to mitigate their negative effects and improve the positive effects on different infrastructural systems due to MBC methods thereby increasing their viability as a sustainable alternative. The objective of this study was to identify the ways in which MBC methods impact key infrastructure systems and to identify opportunities to support a positive relationship between MBC's and those key infrastructure systems. To achieve this objective, a literature review was focused on the existing life cycle impact assessments (LCA) of MBC. Transportation & logistics, waste production and energy consumption were identified as key infrastructures, resulting in a series of conclusions: 1. The impact of MBC on the waste management infrastructure is less compared to CBC. 2. The impact of MBC on the transportation infrastructure is higher compared to CBC and, 3. The impact of MBC on the energy supply infrastructure less compared to CBC. However, this could vary depending on the transportation requirements of the project. The analysis yielded various opportunities to reduce the impact on each infrastructure system by improving MBC. Furthermore, the analysis of the LCA studies also revealed many connections and interdependencies among the three infrastructure systems created due to MBC. More study is warranted in each of the three identified infrastructures. Transportation and logistics stand out as being particularly crucial as it experiences increased impacts and thus is a likely lynchpin to accessing the positive impacts of MBC. The adaptive and integrative nature of infrastructural interdependencies could reduce overall impact of building construction on multiple infrastructural systems as a whole, thus making cities more sustainable. Addressing the challenges presented to each system individually is itself a roadblock to success. An integrated interdisciplinary approach appears to be necessary in order to produce viable solutions to these complex multi-scalar urban challenges.



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**ANALYSIS THERMAL COMFORT CONDITION IN COMPLEX RESIDENTIAL BUILDING, CASE STUDY:
CHIANGMAI, THAILAND**

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ABSTRACT

Due to the increasing need for complex residential buildings, it appears that people migrate into the high-density urban areas because the infrastructural facilities can be easily found in the modern metropolitan areas. Such rapid growth of urbanization creates congested residential buildings obstructing solar radiation and wind flow, whereas most urban residents spend 80-90% of their time indoor. Furthermore, the buildings were mostly built with average materials and construction detail. This causes high humidity condition for tenants that could promote mould growth. This study aims to analyse thermal comfort condition in complex residential building, Thailand for finding the passive solution to improve indoor air quality and respond to local conditions. The research methodology will be in two folds: 1) surveying on case study 2) analysis for finding the passive solution of reducing humidity indoor air. The result of the survey indicated that the building need to find passive solution for solving humidity problem, that can be divided into two ways which raising ventilation and indoor temperature including increasing wind-flow ventilation and adjusting thermal temperature, for example; improving building design and stack driven ventilation. For raising indoor temperature or increasing mean radiant temperature, daylight can be passive solution for complex residential design for reducing humidity and enhance illumination indoor space simultaneous.



IS PASSIVE OR ACTIVE HOUSE NEEDED IN FACE OF GLOBAL WARMING?

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ABSTRACT

Passive house concept was created and implemented in 1991 under the initiative of Dr. Wolfgang Feist. The idea of this concept was to maximise heat saving in a building in order to do without active building heating. To achieve such result, building envelope parameters were strictly regulated. A lot of countries worldwide were impressed by the passive house idea. Lithuania is among these countries. Up until 2017, energy saving requirements for building envelopes were the only mandatory measures in new building construction in Lithuania. As of 2017, further measures will be implemented, including mandatory energy recuperates and renewable energy resources. The practice of building modernization in Lithuania up to 2017 shows that focus on wall insulation alone has resulted in shortage of this field's specialists, increased prices of materials used for insulation and increased cost of construction works. The state was forced to reduce the support for people who started the renovation due to shortage of funds. Building modernization rate decreased. Furthermore, it is also noteworthy that some thermal-insulation materials are manufactured for the purpose of heat saving and have quite big energy input embodied in the process of material manufacture, transportation and construction. Embodied energy evaluation gives possibility to evaluate thermal-insulation layer's physical energy saving limits. Calculations show that thermal-insulation layer's physical energy saving marginal returns are not the same as economical marginal returns. The article aims to determine how effective the stricter current requirements for the building envelope insulation are from the economic energy savings perspective. The article deals with a mathematical method for economic assessment of optimal building thermal insulation. The mathematical methods used in this article are based on evaluating the break-even point between the construction expenditures and the economic profit. Recent research shows that energy savings achieved solely through stricter standards applied to the building envelopes are limited in their ability to achieve maximum results. As the ratio of building volume to building envelope increases, further energy saving measures applied to the building envelope produce lower energy saving effects. Energy savings achieved using renewable energy resources and recuperation systems are much more effective. Research shows that much greater effect can be achieved by combining existing energy efficiency measures for building envelopes with new requirements related to renewable energy sources and recuperating systems, such as solar batteries, wind turbines or heat pumps.



EVOLUTION OF GREEN AREAS OF HOUSING ESTATES IN POLAND IN 20TH CENTURY

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ABSTRACT

One of basic advantages of multi-occupied housing estates carried out in the second half of the 20th century was their green belt. Carried out as open spaces they were designed to serve recreational as well as health cells (associated with airing or purifying air). In the Pole as similarly as in other socialist countries these areas sparametryzowano and their sizes were defined in legislative appropriate documents. The location of these areas in in the structure of housing estates as well as their equipping in the discussed period underwent changes. The comparative analysis of specific implementations allows to their characteristics and the evaluation and taking back to contemporary views. In the forties and fiftieth these areas were carried out in the form of little squares and greens deposited in the neighborhood of streets. In sixties and of the seventieth small community parks (usually smaller than 1 ha). In the eighties the extensive green belt was being carried out, which (from economic reasons) stayed not-equipped functionally. Next decade (the nineties) is connected in Poland with political and economic changes. In case of areas of community green it resulted in the total refraining from their realization. However green arising on roofs of buildings was introduced. In our times a return to designing the big areas of green associated with the housing building development is taking place. Recreational and holiday functions are their basic task. The objectives associated with the accumulation of rain waters are becoming one of new tasks stood them. As a result of conducted analyses the author is pointing, which from historical implementations (of distinguished periods) are the best answer for the contemporary needs, and which are possible to adapt.



RENEWAL OF A SMALL TOWN IN POLAND BASED ON EXAMPLE OF USTKA

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ABSTRACT

Ustka is a historic seaside city, the port and spa - and therefore - the city of many possibilities. In this touristic town, there are many monuments and preserved historic urban spots. Despite this potential, the town plagued with various problems, like many small towns in the Northern Poland. Currently Ustka realizes its Revitalization Program for the years 2016-2022. The paper will present the situation in various stages of development of the city with its previously implemented revitalization programs, and prospects for its further development. Scientific method of analysis was applied to performed revitalization programs in Ustka. Its most significant results will be shown in this research. The example of Ustka will be described in context of the Development Strategy of the Gdansk Metropolitan Area. It will be presented to the specifics of a small town development in Poland.



SOCIAL MARKETING IN PROMOTION OF ENERGY-EFFICIENT BUILDING AND EMISSIONS POLLUTIONS

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ABSTRACT

This article discusses the problem of energy-efficient construction, which is generally more expensive than traditional ones, so there are psychological barriers before deciding to implement them. Despite the significant increase in investor awareness in this area, the knowledge of the need and benefits of using such solutions should be constantly disseminated. The change in building standards is due to changes in building regulations, the use of various forms of financial support, the need to reduce CO₂ emissions and other pollutants. Various types of promotional and educational activities increase public awareness of the positive effects of building energy efficient buildings. Promoting energy-efficient constructions is intended to disseminate and disseminate the idea of energy conservation and its impact on local and global scale, as well as on the benefits of energy and the protection of the atmosphere. Promotional campaigns are being launched to promote passive buildings, energy-efficient buildings and the use of renewable energy sources. These campaigns are based on the creative idea of demonstrating that energy saving and the use of renewable energy sources can reduce the operating costs that can devote to many different consumer goods. It is assumed that this way of promotion will convince many investors to build their own home with the ability to take out a loan and repay the savings by minimizing the cost of living. The proposed action involving a wide range of tools affecting the public is part of the business of social marketing.



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**THE POMERANIAN METROPOLITAN RAILWAY (POLAND) – A NEW POTENTIAL IN DEVELOPMENT OF
THE HOUSING AREAS OF AN INTEGRATING METROPOLIS**

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ABSTRACT

The Pomeranian Metropolitan Railway (PKM) is an investment of the Pomerania Province local government, put into operation in 2015, as the first in Poland entirely new rail road built after 1989. The resources involved in preparation of the city for hosting a one-time mass sporting event – the EURO 2012 football championship – synergistically supported realization of the strategy for integration of the port metropolis growing around the Gulf of Gdansk. This article presents a number of the potentials generated by this investment for development of the desired spatial qualities which serve the improvement of the quality of suburban life, against the background of the description of a linear investment planning process, under the conditions of the Polish neoliberal planning system. The Author, from the perspective of a designer and the director of the urbanist team co-responsible for determining the assumptions of the PKM spatial program, indicates the potentials of this investment for re-urbanization of the locally increasing so-called Zwieschenstadt. The text is illustrated by references to the examples of good practice, which could be an inspiration for formation of a new spatial policy for the districts operated by the PKM. The summary contains a commentary referring to the possibility of using the experience gained during the PKM planning (the Polish model project), in the context of implementing the guidelines of the National Municipal Policy 2023 (2015). The main constraints as well as the potentials conditioning fuller usage of the public infrastructural investment, and consequently a better use of the EU resources as a catalyst for sustainable development, are presented. The first phase of the PKM route realization was sort of a link that was missing since 1945 from the historically created suburban and regional rail road network. A nearly 25-kilometer-long key stretch between the two main rail roads existing in the region connects the airport and the surrounding 'airport city' district with the main centres of the metropolis and with the vast region. The 8 stops located on the line were designed as characteristic high-quality architectural objects, which are dimensional signs recognizable in the landscape – new symbols of the province's new integration axis. The high architectonical-urbanist quality obtained in this project anticipates a universal fitting of the objects into the structure of the local public space that is developing in the suburban zone. It is a unique achievement in the context of the Polish planning-implementation conditions, minimally promoting a multifaceted integration of this type of large-scale infrastructural investments.



SOFT MOBILITY AS A REQUIREMENT OF SMART CITIES: A MOUNTAIN URBAN AREA

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ABSTRACT

Nowadays soft mobility is a crucial issue towards a most sustainable urban environment. Not only because it promotes a less polluted atmosphere among the always dense and busy urban fabric, but also because it avoids several traffic problems. The use of bicycles, or mechanic mechanisms to support the pedestrian mobility is an emerging requirement of cities' quality. In this sense, this article aims to discuss the soft mobility as a requirement of smart cities having as a case study one mountain urban area. It refers to the urban area of Covilhã on the highest mountain of Portugal with nearly two thousand meters high. During the last decades, this city's transformation process has driven to an urban sprawl to the suburbs, increasing the efforts in terms of transportation required by the commuters. In fact, the number of inhabitants living in the city centre is decreasing in favour of the peripheral neighbourhoods. At the same time a set of several mechanic mechanisms such as public lifts, has been built in order to promote a soft pedestrian mobility. However, in many cases, because of the lack of connection and continuity of pedestrian paths in between these mechanisms, they are not allowing a pedestrian mobility network at the city scale. Thus, this paper aims to present a set of good practices in terms of pedestrian mobility network at the city scale, in order to promote a smarter urban environment. The principal results are that soft mobility is a key issue in order to turn cities smarter, among several other factors such as smart economy, smart people, smart governance or smart living. The major conclusions show that the concerns with mobility are key tools to achieve the smart city sustainability, providing and efficient and flexible traveling across the urban fabric, boosting the use of non-polluting ways of mobility. At the same time, there is the conclusion that the underlying areas of development for a smart city, despite its cultural or territorial environments, include several aspects such as reducing the transportation problems as congestion, traffic jams or painful accidents.



**SPATIAL AND SOCIAL COMPARISON OF NEIGHBORHOOD AND GATED COMMUNITY, ESKISEHIR
SAMPLE**

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ABSTRACT

People's expectations from the city have become different with the change of urban life. Urban space is not the only place where the structures are formed. Urban space also consists of a combination of public space, semi-public space, and private space. It is a social and cultural phenomenon that social events occur and people communicate with each other. Therefore, streets and neighborhoods consisting of housing are not only a physical space with features, it has also become important in the social and cultural dimensions. Modern life has brought most of the changes that affected the cities. Due to rapid changes in today, where the urban space forms set out in the conversion process is also designed differently. Historically, the space organization based on the streets of the semi-public life in Turkish cities has been transformed into mass housing and site style life in recent years. This transformation not only physically but also socially and culturally shows differences in urban life. The street which is regarded as a public space were a place where people communicated and social events happened in the past but today, the streets abandoned to security problems and become a concept that is bordered with buildings. Spatial separation has emerged with middle and upper classes isolating themselves from the streets and heading towards, gated communities for different reasons, especially security. This social and spatial separation has begun to lead to various problems in cities. Eskisehir is an important Anatolian city located between the capital city of Turkey, Ankara, and Istanbul. This research conducted between Eskisehir and a gated community where the middle and upper-income group lived and a residential neighborhood where the middle-income group lived was evaluated by a survey study. The reasons for the spatial preference, relation with urban and neighborhood of the people living in these two different regions are examined.



DUBAI: A PIONEER SMART CITY IN THE ARABIAN TERRITORY

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ABSTRACT

Nowadays, one of the main issues that the cities are facing is related with how they are dealing with the challenges toward smartness, including infrastructures, economic, social and environmental aspects. In this sense, some of the current challenges on the global scale, trying to find solutions regarding urban societies, are based on the concept of “smart city”. Therefore, is clear that new ideas regarding the cities improvements, which are on the top of global agenda, could be found at the concept of “smart city”. As the literature reveals, this is a topic reason among the researchers, which is in a continuous development, in particular regarding societies, countries or regions where it is emerging, such as in the Arabian territories. Dubai, a city in the United Arab Emirates, is an example where in a short period of time, after the oil discovery in the 1970s, one small and badly known urban settlement became a pioneer reference in terms of smart cities requirements. Thus, this article presents a background information about smart cities, their assets and key pillars, their smart infrastructures and features in cultural, social and environmental terms. The main goals are based on a theoretical approach, developed in order to get more details about smart cities, regarding the features of the Arabian territories. It argues around the case of Dubai, as a pioneer smart city in the Arab world. Among of the main conclusions, there is the idea that the urban transformation process in contemporary societies to secure the smartness, should apply to the use of ICT / information and communication technologies. This use will increase the efficiency concerns to the natural resources, and provide a high quality of life for citizens. The example of Dubai has shown that the decision-makers have built each sector and part of the city in a solid performance, in order to achieve the smart sustainability concept. This city is nowadays a reference on this matter, not only in the Middle East but also considering the global scale.



THE NEED FOR LINEAR REVITALIZATION. GDYNIA CASE

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ABSTRACT

The aim of the article is to discuss the need of the defining and implementation of the linear revitalization - the new approach related to revitalization processes. The results of preliminary investigations indicate that this kind of revitalization seems to be an important tool supporting city management and planning, especially in cases of cities fragmentation - causing lack of physical, social, economic and ecological cohesion. The problems which may occur in such situations could be, in author's opinion, solved with the use of linear revitalization. Linear revitalization relates to various linear city structures, which need renewal. The article presents the idea of new attitude, character of specific actions related to degraded linear structures, draft classification, as well as the potential benefits to the city structure which could be reached due to the linear revitalization implementation. The theoretical deliberations are supplemented by the description and assessment of the chosen case study from Gdynia in Poland. The Kwiatkowskiego Route in Gdynia, playing important role in the city traffic as the external connection, creates the barrier in the city structure, causing many negative effects. Author presents specific problems related to chosen example, and the ways to solve them and to connect city structure. The main conclusion of the study is that the presented approach may be, in author's opinion, the beginning of the discussion related to the linear revitalization, which may become important and effective tool of sustainable city development. It may help overcoming physical barriers, and minimise functional, economic, social, mental and environmental conflicts caused by city fragmentation.



AIRPORT CATCHMENT AREA- EXAMPLE WARSAW MODLIN AIRPORT

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ABSTRACT

The form and functions of airports change over time, just like the form and function of cities. Historically, airports are understood as places of aircraft landing, control towers operation and location of other facilities used for communication and transport. This traditional model is giving way to the concept of so-called Airport Cities, based on the assumption that, in addition to its infrastructure and air services, also non-air services are performed, constituting a source of income. At the same time, their reach and impact on the economy of the areas around the airport are expanding. Idea City Airport appeared in the United States in the late twentieth century. The author is J. D. Kasarda, he believes that it is around these big air ports that airport cities develop. In the world, there are currently 45 areas which can be classified in this category, out of which 12 are located in Europe. Main air traffic hubs in Europe are not only the most important passenger traffic junctions, but also largest centres dispatching goods (cargo). It can be said that, among the 30 largest airports, 24 are the largest in terms of both passenger and freight traffic. These airports cover up to 89.9% of the total freight transport of all European airports. At the same time, they serve 56.9% of all passengers in Europe. Based on the concept of Airport City was developed document THE INTEGRATED REGIONAL POLYCENTRIC DEVELOPMENT PLANS FOR THE WARSAW MODLIN AIRPORT CATCHMENT AREA. The plan developed takes into account the findings of the Mazovian voivodeship spatial development plan, specifying the details of its provisions where possible. The development is the first step for the implementation of the concept of the Modlin Airport City. The accomplishment of this ambitious vision will only be possible with hard work of a number of entities, as well as taking into account the former Modlin Fortress, currently under revitalisation, in concepts and plans.



INFORMATION AND COMMUNICATION TECHNOLOGIES APPLIED TO GOVERNANCE IN URBAN PLANNING

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ABSTRACT

This article discusses the use of information and communication technologies (ICT) at the local-level of governance in the field of urban planning. It is based on a literature review, in order to define a set of considerations about their use in the urban context and the main challenges related with them. As a starting point, there is the rethinking of local governance through the use of ICT in urban planning. On the one hand, there is the need of modernizing the processes associated with urban planning, in terms of spatial and territorial management. On the other hand, in many countries, the current paradigm is no longer and expansionist urban approach, but a position oriented towards urban regeneration and rehabilitation. This is the case of the Portuguese municipalities, which are focused on the coordination and integration of spatial policies with a territorial impact. However, the spatial planning system is characterized by some problems. Among these problems there is the lack or articulation in between the national and the municipal level rules, or the fragmentation of the spatial planning permission rules. Consequently, the spatial planning process turns less inefficient, weakening the communication in between the local administration and the citizens, regarding the understanding of spatial planning requirements. In this sense, this article aims to show that governance should be a support to the decision-making process towards the development of the territories, engaging the citizens and the social and economic agents. As the main result, this article shows that ICT play an important role in spatial planning management by contributing as a simplifying tool to the exchanges of information and knowledge sharing, in between spatial planning authorities and citizens, promoting the efficiency of urban processes, the development of networks, or the social and territorial cohesion. The major conclusion is that the use of ICT should be seen as a crucial tool to achieve the engagement in between local government and citizens and to promote proper policies of urban rehabilitation, improving the quality of life and encouraging local development among local communities. With the use of ICT becomes more likely to perceive the city in its multiple facets, monitoring public policies differentiated and customized to each situation. Finally, the role of local authorities in all involved sectors of spatial planning is essential to a successful use, dissemination and application of ICT towards a more democratic and transparent form of governance.



World Multidisciplinary

12-16 June, 2017 - Prague (Czech Republic)

Civil Engineering-Architecture-Urban Planning Symposium - WMCAUS

THE STATUS OF BUILDING INFORMATION MODELING (BIM) ADOPTION IN POLISH CONSTRUCTION INDUSTRY

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ABSTRACT

The advantages and opportunities offered by Building Information Modeling (BIM) in Architectural, Engineering, Construction, and Operation (AECO) industry leads to the worldwide adoption of BIM in all construction projects. BIM allows understanding the building before it starts its construction through virtual models. The benefits of BIM includes, energy efficiency, less co2 emission, health and safety, clash detection, waste reduction, control of construction cost and also the cost of maintenance throughout the life cycle of the building at the design and construction stages. All of its benefits makes the prevalence of the use of BIM models in the world is growing at a dynamic pace. BIM is becoming new paradigm in designing and building the future global standard. Most of the construction companies in Poland implementing BIM for their projects from last five years. Now it becomes mandatory for the companies to adopt this new technology to sustain the competitiveness in Polish construction industry. After the European directive 2014/24/EU Polish government agencies aimed at implementing appropriate legal solutions and recommendations enabling the use of BIM practices in public procurement. In this paper the maturity of Polish construction market to adopt BIM, current level of BIM adoption, barriers and benefits of the BIM adoption in Poland are presented. The current Polish construction sector involves the disordered, uncontrolled, uncoordinated, long term and immeasurable process of working out principles and standards for BIM implementation



THE CRITERIA OF ARCHITECTURAL COMPOSITION DESIGN IN RESIDENTIAL COURTYARDS

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ABSTRACT

In the research, courtyards of high-rise residential houses created in the second half of the 20th century are analyzed in the context of the criteria of the architectural composition. Consequently, the aim of the research is as follows: to study the planning principles of courtyards of high-rise residential houses in the urban environment in order to determine the outdoor living space of an aesthetically and functionally high quality. The research carried out so far has demonstrated the novelty of this topic, and based on the data of the previously carried out research it is necessary to evaluate the outdoor living space of courtyards of high-rise residential houses from the point of view of planning techniques and principles of creation of the architectural composition. The totalitarian times of the 50s-80s of the 20th century have brought the building of high-rise residential blocks in Latvian cities, characterized by an uninteresting solution of standard buildings and the alien scale which does not meet the regional features. During the above period, areas of the residential courtyards have not been addressed. The conclusion of the research is that today the courtyards of the high-rise residential houses have become a stagnant, functionally irrelevant area that forms a depressing nature of the outdoor living space. The uncharted area of courtyards is not being used fully which highlights a wide range of issues that applies to car parks, recreation areas, and the green areas. With the development of the urban infrastructure, the creation of high-rise parking facilities and separate car parks are insufficiently addressed. Consequently, the implementation of improvements in courtyards of high-rise residential houses is not possible if the above issue on the removal of the car load from courtyards is not solved. Many building districts are characterized by the same compositional, architectural-spatial structure which even more influences and causes discomfort in these areas to stay. In recent years, the solution to the above issue is sought by the municipal authorities of Latvia to create a new courtyard zoning. It applies to the project development and construction works. In the research, courtyards of the city of Jelgava are analyzed and evaluated which from the qualitative point of view demonstrates and is a vivid example where the issues of the research are readable. The city of Jelgava, located 45 km away from Riga, is an expressed satellite city and serves for the agglomeration of Riga as a huge high-rise residential district. Consequently, the research includes separate courtyards of high-rise residential buildings of the city of Jelgava and their study is carried out from the point of view of the architectural composition and the functional point of view of courtyards.



GEOMATICS, SUPPORT FOR AN EFFICIENT URBAN PLANNING

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ABSTRACT

Geomatics represent a natural consequence of the accelerated development of information technology; it is a combination of the basic concepts of Geodesy and Geoinformation and encompasses a wide range of fields, including tools and techniques used in surveying, mapping, remote sensing, Geographic Information Systems (GIS), global navigation systems by satellite (GPS), geography, planning and decision making in almost all areas: infrastructure, environment, demography, urbanism, health, sociology, economics, tourism, administration, transportation and many others. As a consequence of increases in population and industrialization, society has become more complex for government and other institutions, with the result that more complex and complicated tasks have to be performed. In order to solve these tasks properly, more and more information is required. Having passed through the stages of agricultural and industrial societies, we now live in an information society. Town planning cadastre defines itself as a particular cadastre, part of the general one, which involves inventory and systematic evidence of the buildings, fields, networks and utilities inside towns. All these problems regard both technical and economical aspects. In order to automate cadastral activity, the first important procedure is to collect all physical information from a certain territory, which will supply later on the database for town cadastre. Geodetic activity for engineering projects is able to provide accurate solutions for positioning, setting out, control, mapping in order to cover basic needs of land administrative information and decision making for the Local Authorities. The paper points out the purpose and importance of town planning cadastre for providing exact data on the situation of the urban fond in order to identify its needs; it is presented the case of Timisoara city located in the western side of Romania; it will be European Capital of Culture in 2021. As a national strategy, a key component in the policies of growth poles is promoting urban development as part of a long-term project with sustainable impact on economic, cultural and social development.



**FROM AN EXTENSIVE METROZONE TO AN INTRA-METROPOLITAN DEVELOPMENTAL AREA.
COMPARISON OF PORT-NEARBY DISTRICTS: NOWY PORT IN GDANSK AND HARBURG-
WILHLMSBURG IN HAMBURG.**

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ABSTRACT

The concept of metrozones, similarly to the term *zwischenstadt*, describes current problems related to the strive for creation of an efficient and compact European city. Restructuring of the port-nearby and post-port areas enables new development of the urbanized but never planned as urban space areas. Shaped in accordance with the technological capabilities and with the regulation standards and normatives of the second half of the 20th century, nowadays the areas form a resultative landscape burdened with the image of unfriendly and even dangerous zones. In the era of high technology, metrozones are becoming valuable intra-city developmental areas. The article attempts a comparison of two similar districts in Gdansk and in Hamburg. Hamburg in 2013 finished realization of a multiannual program IBA Wilhelmsburg, which addressed the problem of restructuring of port-nearby metropolitan zones. The strategy for preparation of the region that had been shaped by a metrozone landscape for adoption of an urban program and for creation of fully-fledged developmental areas was initiated with the concept of a "Leap over the Elbe River". It meant not only a mental and physical breakage of the border between the city and the port, but also an intellectual breakout beyond the existing practice of spatial development. A format of searching for solutions through the state of urban process change, which is the German International Building Exhibition was used. Intensification of the work on shaping innovative urban tactics that were meant to answer the key questions- the future of metropolises in the era of globalization and climate changes resulting in inevitable social changes was assumed. Innovativeness and creativity of the IBA Wilhelmsburg activities distinctively inspire a reflection on the new city planning model of the SMART age. In connection with the above, the article describes the situation of the area in the Nowy Port region in Gdansk. In the summary, collation of the examples with similar parameters of endogenous development potentials - Nowy Port and Wilhelmsburg - developed in fundamentally disparate planning cultures, provokes a reflection on the chances for effective implementation of the European Urban Agenda, Pact of Amsterdam 2016, not only in Poland, but in all the countries managed via a similar planning model.



RURAL SYSTEMATIZATION AS A POLITICAL CONTROL TOOL OF THE COMMUNIST REGIME IN ROMANIA

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ABSTRACT

This paper deals with one of the means of communist control over society in Romania: rural systematization. After the Second World War, the Romanian villages underwent radical changes. The main objective of the communist regime was to reduce the number of villages from 13,129 to 10,000 by the year 2000. To this end, feasibility studies were conducted and the villages were classified as viable and non-viable. About a quarter of Romanian's village were threatened. The classification was based on the following criteria: functionality, infrastructure, and social and cultural facilities. The community itself, with its traditional and historical values and the role of the private investors were completely ignored. Some of the villages were to be turned into agro-industrial towns, while others were to be abandoned. The first priority of the rural strategy was the shaping of the "New Man" who had to be provided with decent living and safety standards. The result of the territorial systematization process would be the "New Towns", which had to respond to the "New Man" needs. This required, among other things, setting up new buildings after typical design. The purpose of the communist authorities was to homogenize all the members of the society, so that they were easier to control. The second priority was to control migration from the rural to the urban area by optimizing the commuting system. By encouraging population growth and improving the living conditions, the communist authorities wanted to assimilate the rural environment into the urban one. The first priority of the rural strategy was the shaping of the "New Man" who had to be provided with decent living and safety standards. This required, among other things, setting up new buildings after typical design. The purpose of the communist authorities was to homogenize all the members of the society, so that they were easier to control. The second priority was to control migration from the rural to the urban area by optimizing the commuting system. By encouraging population growth and improving the living conditions, the communist authorities wanted to assimilate the rural environment into the urban one.



SOCIAL, SPATIAL AND LEGISLATIVE STRATEGY TO SHIFT URBAN MOBILITY PATTERNS

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ABSTRACT

A city's predominant transportation mode is crucial in determining its type of urban tissue. A denser and more compact urban development is generated through pedestrian, bicycle and public transit while car based developments tend to be dispersed, characterized by unsustainable low densities. However, a clear implementation strategy eludes many urban planning practitioners and public administrations, thus highlighting the need for further research. Following an international trend, Timisoara's mobility strategy over the past two decades, has been to accommodate an ever increasing number of vehicles on its underdeveloped infrastructure at the expense of green areas, pedestrian lanes and even travel-turned-parking lanes. Despite the latest, slight, shift towards inner city urban development only 11% of the proposed Urban Mobility Strategy's policies are not centred on cars. Through a 15 criteria analysis of the main means of transportation, pedestrian, bicycle, public transit and car, the authors determined the most sustainable and efficient mode based on the distance - duration relationship as being bicycles, for a city of Timisoara's size and characteristics. Yet, the city's infrastructure scored poorly on safety and comfort due to its incoherence and numerous dysfunctionalities. To better illustrate and understand Timisoara's both current state and proposed mobility strategy the authors undertook a comparative analysis of Timisoara's and Utrecht's bike lane infrastructure. Similarities in size and number of inhabitants were only secondary selection criteria compared to Utrecht's aspiring to model status. The aim of this study is to present the long term, multi-tier implementation strategy proposed to reorient Timisoara's urban development towards a more compact, sustainable typology. Comprising social-educational, spatial and legislative objectives the strategy aspires to modify local behaviour towards and perception of alternative modes of transportation by influencing human behaviour at a strategic and tactical level.



NANOIRON AS AN INNOVATIVE REAGENT FOR REMOVAL SELECTED POLLUTANT DURING THE WATER TREATMENT

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ABSTRACT

The paper deals with the possibilities of innovation in water treatment. Attention is focused on the possibilities of using nanoiron in removing selected pollutant. The partial results are presented from the research, which deals with the removal of chromium and phosphorus from water. A conventional coagulant (aluminium sulfate) was used as a comparison. To verify the effectiveness of these chemicals a series of laboratory experiments was conducted in order to determine the appropriate dosage and working procedure to remove a selected group of pollutants. During the laboratory tests the overall efficiency of removing mentioned pollutants and also turbidity were monitored using liquid aluminium sulfate and nanoiron. The process of removing mentioned compounds from water was simulated under laboratory conditions. The laboratory experiments carried out on the model water which contained increased concentrations of chromium and phosphorus showed the capability of nanoiron to remove these pollutants from water. During the research, the dependence between pollutants removal and dose was investigated to achieve the best efficiency using innovative means.



REHABILITATION PLANNING OF WATER DISTRIBUTION NETWORK - SHORT TERM PLANS

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ABSTRACT

The paper describes the methodology of short term rehabilitation planning of water distribution networks. This methodology is divided to three basic steps. At the first step, the basic elements of the network (entities) as potential candidates for the rehabilitation are determined. The second basic step of proposed methodology is ranking of estimated entities. The entities are ranked by the values of set of criteria (age of pipes, failure rate, water losses indicators, water quality, pressure condition, reliability index). The recommended rehab technologies are assigning to each entity in the third and last step of this methodology. The technical part of planning has to be consistent with the financial plan of rehabilitation, which is mentioned too.



**URBAN MOBILITY ANALYSIS ON EFFICIENCY AND SUSTAINABILITY BY MEANS OF
TRANSPORTATION**

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ABSTRACT

Patterns of urban land use are inherently linked to the predominantly used means of transportation, both generating and being generated themselves. While each mode of transportation shapes a different development typology a clear understanding of their interrelations and dependencies is needed in order to create a comprehensive mobility strategy. The study proposes a 15 criteria analysis framework developed to identify and quantify the main modes of transportation's key aspects. The analysis framework was applied to a yearlong research on Timisoara, Romania, comprising hard, quantitative data, digital simulations and mobility pattern analysis and soft data, quality assessment and perceived needs and satisfaction levels. The research was carried out in clear opposition to the national trend of official mobility strategies focusing on accommodating increased levels of car traffic on the underdeveloped existing roads infrastructure. By analysing the efficiency and sustainability of all four main modes of transportation the results offer a holistic comprehensive view. While, despite current practices, no mobility strategy can focus on a single means of transportation, the article will only present in detail the research on cycling, infrastructure and use, as it is the most underdeveloped and least discussed at the national level and proven through our study to be the most efficient for a city of Timisoara's size and characteristics. By identifying a clear link between urban land use patterns, infrastructure quality and perceptions and the most efficient means of transportation for each particular city type mobility strategies could shift the trend of urban development towards a more sustainable one.



SMART CITIES AND THE IDEA OF SMARTNESS IN URBAN DEVELOPMENT – A CRITICAL REVIEW

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ABSTRACT

The concept of smart cities is becoming another mantra for both developing and developed cities. For instance, Indian government in 2015 announced its objective to build one hundred smart cities all over the country. They clearly stated that they are choosing smart development as the underlying concept for their future growth as a way to foster economic development in smart way to avoid the paths of rapid industrialization and pollution of cities as it took place in Europe and United States. The first of these smart cities, Dholera, is already under construction and it attracts journalists and urban planners from all over the world. The aim of this paper is to critically discuss the theoretical backgrounds and the practices of smart cities and examine the ways the concept is implemented. The paper is based on thorough study of literature and examining the two case studies of Dholera (India) and Songdo (South Korea). Smart city is a contested concept without a unified definition. It stems from the idea of digital and information city promoted using information and communication technologies (ICT) to develop cities. By installation of ICT municipalities obtain large sets of data which are then transformed into effective urban policies. One of the pilot projects of this kind was Rio de Janeiro and building the Center of Operations by IBM company. City made a great investment into the smart information system before two huge events took place - FIFA World Cup in 2014 and Olympic Games in 2016. The project raised many questions including whether and how it improved the life of its citizens and in what way it made the city smart. The other definition of smart city is the idea of smartness in city development in broader sense. It focuses on smart use of resource, smart and effective management and smart social inclusion. Within this view, the ICTs are one component of the concept, by no means its bread and butter. Technologies can be used in a variety of ways. Problem occurs when smart city is viewed as means to make investments from city budgets by any price, by promoting use of smart technologies as the only way forward, as necessity. Many companies, including technological giants IBM and CISCO already participate on many smart city projects supplying technologies for smart city projects. In this study we are looking into two case studies, the city of Dholera in India and city of Songdo in South Korea, both pompous large scale projects. Smart City technologies are growing market which is projected to be annually worth 20 billion dollars by 2020 (Navigant Research, n.d. in Hollands, 2016), with IBM participating in 2000 projects accounting for 3 billion dollars (Hollands, 2016). There are many concerns about these developments, among them the issue of equity, whose purposes the projects are serving, how these initiatives are developing cities and the general idea of smartness in urban context. The research concludes that the ambiguity of smart city definition which allows multiple interpretations is frequently bent and used to promote the lobbying of strong players in cities and in private sector.



PUBLIC PARTICIPATION PROCEDURE IN INTEGRATED TRANSPORT AND GREEN INFRASTRUCTURE PLANNING

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ABSTRACT

The dialogue among the decision makers and stakeholders is a crucial part of any decision making processes, particularly in case of integrated transportation planning and planning of green infrastructure where multitude of actors are present. Although the theory of public participation is well-developed after several decades of research, there is still a lack of practical guidelines due to the specificity of public participation challenges. The paper presents a model of public participation for integrated transport and green infrastructure planning for international project TRANSGREEN covering the area of five European countries - Slovakia, Czech Republic, Austria, Hungary and Romania. The challenge of the project is to coordinate the efforts of public actors and NGOs in international environment in oftentimes precarious projects of transport infrastructure building and developing of green infrastructure. The project aims at developing and environmentally-friendly and safe international transport network. The proposed public participation procedure consists of five main steps - spread of information (passive), collection of information (consultation), intermediate discussion, engagement and partnership (empowerment). The initial spread of information is a process of communicating towards stakeholders, informing and educating them and is based on willingness to be informed. The methods used in this stage are public displays, newsletters or press releases. The second step of consultation is based on transacting the opinions of stakeholders to the decision makers. Pools, surveys, public hearings or written responses are examples of the multitude of ways to achieve this objective and the main principle of openness of stakeholders. The third step is intermediate discussion converges both sides to a dialogue using the tools such as public meetings, workshops or urban walks. The fourth step is engagement based on humility utilizing negotiations, arbitration and mediation. The collaborative skills needed here is dealing with conflicts. The final step in the procedure is partnership and empowerment employing methods as multi-actor decision making, voting or referenda. The leading principle is cooperation. In this ultimate step the stakeholders are becoming decision makers themselves and the success factor here is continuous evaluation.



ATTRACTIVENESS FOR THE YOUNGER GENERATION OF OSTRAVA-JIH HOUSING AREA DEVELOPED IN SOCIALIST ERA: THROUGH INTERVIEWS WITH THE INHABITANTS (OSTRAVA-CITY, CZECH REPUBLIC)

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ABSTRACT

Ostrava-city had developed as an industrial city in socialist era. At the same time, panel housing areas had also developed for laborers and their families. Ostrava-Jih, consists of Zábřeh, Vítkovice, Hrabůvka, Dubina and Bělský les areas, is one of the largest housing areas developed in socialist era in Ostrava city. After democratization, Ostrava city have faced deindustrialization and population decline, but the rate of population decline of Ostrava-Jih is lower than other areas. It can be thought that Ostrava-Jih has attractive points for the inhabitants. In this research, fourteen inhabitants of younger generation (include 4 parental generation) were interviewed in September 2015 in order to clarify the attractiveness of Ostrava-Jih housing area from the present viewpoint. Interviewees were asked about their daily life, impressions about their neighbourhood and activities for improve their living environment along time since they started their life in Ostrava-Jih. By the interviews with inhabitants, rich nature such as river and forest around the housing area are highly evaluated and frequently used for their recreation activities such as cycling and walking. Public facilities such as school and hospital have good accessibility from the apartments, which are also evaluated. About the accessibility to commercial facilities, there has been at least one core centre with commercial facilities in each area of Ostrava-Jih, except for in Dubina area where no commercial function had been equipped at the beginning of area development. However, new commercial facilities were built after democratization, also in Dubina area. Public transportation systems such as tram and bus have been kept since socialist era and the good connection among Ostrava city are pointed out. Relationship with neighbours differ from person to person, while an interviewee said that she and her neighbours made a children's playground equipment by themselves and they have strong relationship. Besides, the reasonable price of rent or buy an apartment unit was one of the important points to decide their present apartment by some interviewees. Furthermore, attachment places in daily life such as inhabitants' habitual pubs and restaurants, playgrounds in front of their apartment were also pointed out as the attractiveness at all areas in Ostrava-Jih. The younger inhabitants who started living in Ostrava-Jih after democratization found several attractiveness in the panel housing area, which realized both before and after democratization. The tiny story of neighbourhood cooperation for children's playground sounds significant that some shortage of function can be a seed for new attractiveness. These interviews suggest the large panel housing area should be regarded and encouraged as the living environment with gradual realizations of various attractiveness for the inhabitants.



CITIZENS' INITIATIVES FOR NEW URBAN PUBLIC SPACES: A STUDY OF PARTICIPATORY BUDGETING PROJECTS IN LODZ, POLAND

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ABSTRACT

Public spaces define the character of a city, manifest its history, tradition, and specificity. They provide platform for urban life, stimulate various activities and by doing so they co-create the city. In economic terms, utility aspect is decisive for whether a space “becomes” an asset and for how long it remains one and can be really or potentially used as such [Zimmerman, 1951]. Its important features are: limitability and differentiation. Public space understood as the common good experiences dynamic transformations resulting from how it is managed by its users and implied by their activities. Thus, the scale and scope of the use define the nature of common goods, i.e. mixed goods and club goods. In this context, the quality of public spaces, their availability, priorities in space management and use are of fundamental importance and they exert strong impact upon how public spaces operate and are perceived. Public spaces are also a resource, which determines the trajectory of urban development. Recently new problems emerged that have led to the reinterpretation of the notion of public space. On the one hand, lack of interest has been observed when it comes to public space and the organisation of “life” of this space combined with reduced importance of public space as a place for interactions and building relations caused by the development of technology and focus on the virtual world. On the other hand, social context of public space is highlighted, i.e. space is defined through its users and their activities, also those linked with entertainment and consumption. A separate although important issue deals with citizens’ involvement in space management, its planning and use. In recent years, citizens’ budget initiatives pursued in many Polish cities have clearly increased the engagement of citizens in local affairs, in particular those connected with the development and quality of the immediate environment. The design and animation of urban public spaces are the main subject of many projects proposed under the participatory budgeting. On the one hand, participatory budgeting is a valid tool that helps make the budget policy of a territorial unit more inclusive and spend public resources in line with residents’ expectations and postulates. On the other hand, it focuses citizens’ activities around the key aspects of urban policy. Social energy released by citizens’ initiatives and projects is used to improve the quality and comfort of urban life. Studies conducted in Lodz have identified the readiness of residents to get involved in the improvement of public spaces. The list of key projects includes, inter alia, initiatives to create woonerfs, pocket parks, squares, playgrounds, and revitalisation. Participatory budgeting provided an impulse to many citizens’ initiatives targeting public spaces in Lodz discussed in the paper.



URBAN PLANNING ASPECTS OF CREATION MUSEUM QUARTERS AS AN ARCHITECTURAL MEDIUM FOR CREATIVE CITIES

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ABSTRACT

Since the second half of the 20th century, urban environment has experienced significant transformation. Splash of interactivity, bottom-up initiations with development of creative sector of city economy and participatory planning, irretrievably changed the attitude to the urban environment. One of the most intensively growing field - creative industry - provided cities with numerous cultural clusters, which boosted urban economic development and social cohesion. Supported in many cases by gentrification and revitalization, these processes brought renovation of brownfield and more comprehensive approaches to urban design. Understanding of the economic benefits made city managers to start an active promotion of creative clusters and their intensive integration into urban life, involving the main museums and cultural institutions. Thus, a new type of cultural clusters - Museum Quarter - appeared. Holding the position of cultural flagman in the historical heart of the city, Museum Quarters (MQs) pretend to take on an important role as in urban planning structure, as in social life. Furthermore, such role usually has strong influence on the surrounding districts, in a positive or negative way. Although, basic principles are still applied for all types of cultural districts, the phenomena of "Museum Quarters" due to the complexity of planning, operating and maintenance issues, stepped far above basic cultural clusters, requiring substantially new attitude to the planning of such urban entities. Five clusters were chosen for this study: MQs in Vienna, Berlin, Amsterdam, Copenhagen and the currently developing project in Budapest. The main purpose of this paper is to elaborate the principles for the practical implementation of Museum Quarters by the definition and classification of their specific urban planning aspects. The complexity of target object - Museum Quarter - and its multi-level relationships with the whole city, require from the research interdisciplinary approach and methodology of systemic-structural analysis. The typology of different MQs - identifying specific and common features - is based on studies of urban grids and architectural characters. The critical observation and comparison of the socio-political background and the traditional and modern understanding of museum environment helped to define some crucial misconceptions in interpretation, such as the widespread attitude to the Museum Quarter as a museum building, not as a part of urban medium, causing documented obstacles to development. Consideration of drawbacks and advantages, as the results of this study, showed potential of Museum Quarters as new models of urban environment for smart-governed, economically and socially sustainable contemporary city life.



EVOLUTION OF A SOCIAL INTEREST HOUSING PROJECTS IN COLOMBIA

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ABSTRACT

It is recognized as a social interest housing projects to those projects aimed at covering the basic need for decent housing in the sectors of the population with low resources, through the proportion of credits by governmental entities. In the case of Colombia, the clearinghouses provide a significant percentage of their resources to build this kind of projects. Housing financing systems in Colombia have undergone several transformations since its inception. Likewise, there have been several crises that were experienced in the different implementations formulated by the state and that have forced to make transformations. One of the strongest that Colombia has suffered in terms of access to housing was between 1990 and 2000 during the implementation of the UPAC system. The consequences of this were terrible for the citizens. The government and the constitutional court had to intervene the financial system and the debtors to save the economy and the construction sector. After this, new changes were made and the UVR system was started. In the following article, the reader will be put in context in the evolution of this type of housing in Colombia in recent years, with a strong emphasis on the "unit of purchasing power" (UPAC), which was strongly used in the sector Housing in the country, since its main purpose was to preserve the purchasing power of the national currency and thus facilitate access to Colombian mortgage loans



SPATIAL METHODOLOGY TO ESTIMATE CHANGES ON POPULATION DENSITY: A CASE STUDY IN BOGOTA, COLOMBIA

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ABSTRACT

In rapidly growing cities on developing countries, urban sprawl has been the general growth pattern. The city of Bogota and its adjacent municipalities have undergone densification processes during the last decades, especially on peripheral locations where low-income informal settlements are established. This study investigated the use of ordinary least squares (OLS) and geographically weighted regression (GWR) models to identify the impact of residential land use and transportation network coverage on changes in population density in the city Bogota and its surrounding municipalities, based on the study area defined on Bogota Land Development (BoLD) model. The global regression model (OLS), is used to estimate statistically significant explanatory variables that explain the regional differences in population density, while the local regression model (GWR), estimates parameters differently depending on spatial correlations among neighboring geographical zones. The same three independent variables significantly tested in the global regression model are applied in the local model to achieve comparison among models. Estimation results show that the GWR model has better prediction accuracy and better accommodation of spatial autocorrelation. This study confirms the notion that changes in population density can be generally associated with local transport infrastructure characteristics, as differences in public transport and main roads network line density are statistically significant. This let us conclude that these variables might be major contributors on process of densification on the city of Bogota and its surrounding municipalities. Further research is needed to better understand densification processes in the context of sustainable development for the city of Bogota and its region.



A READING ATTEMPT OF THE URBAN MEMORY OF ESKISEHIR OSMANGAZI UNIVERSITY BADEMLIK CAMPUS VIA COGNITIVE MAPPING

Orkun Alptekin

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ABSTRACT

University campus have a small city view containing basic city functions such as work, accommodation, rest and transportation. They are space of social life that occupy large areas, have population density and different activities, change and grow with the cities they live in, and memorize the past accumulations. In this context, it is necessary for campuses to form and protect their own memories like cities. Campus memory is the ability of individuals to keep, maintain and - when necessary- reveal the experiences, sensations, comprehensions gathered from physical environment. This environmental information coding are of urban images, buildings, streets, statues, fountains, parks, and topographic-natural etc. data. To reveal the physical and sensational relation that individuals construct with the city, one of the methods has been developed is "creating mind mapping (cognitive mapping)" to reveal the individual-city interaction. Cognitive maps are created graphically using verbal and geometric items on paper by remembering these coded urban images. In this study, to determine the urban images belong to Eskisehir Osmangazi University Bademlik Campus, architecture students who have a short period experience of the campus were asked to note the areas they interact with the campus on the cognitive map. Campus memory items are identified by analysing the cognitive maps of the individuals who experienced the campus. In the direction of the obtained data, the campus area was re-read with five basic elements of Lynch: roads, regions, boundaries, focal points, and signposts. As a result of these analyses, it is seen that religious structure, which is a large symbolic structure, located next to the main entrance in the settlement and health care facilities defined as landmarks are located in the memory of most of the individuals. Then, paths, nodes, districts, edges and educational buildings are listed respectively in cognitive maps.



**USING SPACE SYNTAX TO ASSESS SAFETY IN PUBLIC AREAS: CASE STUDY OF TARBIAH
PEDESTRIAN AREA, TABRIZ, IRAN**

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ABSTRACT

In studying the urban complex issues, simulation and modeling of public space use considerably help in determining and measuring factors such as the urban safety. Depth map software for determining parameters of the spatial layout techniques; and Statistical Package for Social Sciences (SPSS) software for analyzing and evaluating the views of the pedestrians on public safety were used in this study. Connectivity, integration, and depth of the area in the Tarbiat city blocks were measured using the Space Syntax Method, and these parameters are presented as graphical and mathematical data. The combination of the results obtained from the questionnaire and statistical analysis with the results of spatial arrangement technique represents the appropriate and inappropriate spaces for pedestrians. This method provides a useful and effective instrument for decision makers, planners, urban designers and programmers in order to evaluate the public spaces in the city. Before any physical changes in the surface of urban public spaces, space syntax simulates the pedestrian safety for the use of city management. Finally, regarding the modeled parameters and identification of different characteristics of the case, this study represents the strategies and policies in order to increase the safety of the pedestrians of Tarbiat in Tabriz.



THE PATTERN OF HOUSING AND ENTREPRENEURSHIP IN THE SUBURBAN LANDSCAPE

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ABSTRACT

Housing is stimulating the development of SMEs (small and medium enterprises) in the suburbs. The multidisciplinary research in the urban and economic fields carried out by the authors confirms this trend. The purpose of this paper is to present the multidisciplinary results of the research on the determinants of the SME allocation in suburban areas of Gdansk, Gdynia and Sopot (Metropolitan Area Gdansk - Gdynia - Sopot - MAGGS). A lot of researchers attach great significance to the term of urban sprawl. Most authors agree this phenomena is a multidimensional. It also differs in global perspective. The research conducted showed that the urban sprawl in Poland had a positive impact on the development of entrepreneurship leading to a situation that location quotient (LQ) of SME in some suburbs is higher in comparison with the core city itself. The communities characterized by significantly higher LQ than in core city are identified by Authors as "entrepreneurship nests". Many scientists find considerable differences in entrepreneurial attitudes between the regions within one country, between the centers and the peripheries within one region or between the cities and the rural areas. The Authors' goal is to broaden the existing research in this area. In the paper they present the results of their study concerning the differences in entrepreneurial attitudes between suburban areas and the central cities within one metropolitan area. To identify the research problem, a two-pronged research in the fields of urban planning and economic research were adopted. The charter of suburban landscape was determined by site analysis and the study of architectural form. The results confirmed that in more than 80% of the parcels, which include economic activity, there is also residential function. Our study confirms that urban sprawl and its characteristic the housing patterns stimulates business activity in the suburbs. According to our results, it is not only determined by financial factors, but also by social and spatial reasons. This paper is written within the project UMO-2013/09/B/HS4/01175, financed by The National Science Centre in Poland.



SLOW REVITALIZATION IN REGIONAL SCALE: THE EXAMPLE OF AN INTEGRATED INVESTMENT PROJECT

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ABSTRACT

The study arose from question about the future of towns, as well as the possibility of their development. The paper is an attempt to look at the direction in which many towns around the world aim, connecting to a networks, and especially the network of Cittaslow. The author asked a few questions - whether the Cittaslow network actually helps towns to use their inner potential, build their brand and improve the quality of residents' lives? The starting point for the case study method adopted in the paper is a discussion of examples of urban networks as a background for a wider Cittaslow characteristic. For this purpose, there was conducted literature and in situ research on the Cittaslow towns, the query of documents related to Polish Cittaslow, own photographic documentation was collected and a series of talks were carried out in different offices and municipalities. The database constructed in this way, allowed the analysis and conclusions. An important part of the research was the synthesis of information on the integrated project which has been taken in 14 Polish Slow Cities. "The Cross-Local Programme of Revitalization of Cittaslow Town Network in the Warmian-Masurian Voivodeship" is an unique action on the scale of the entire international Cittaslow network. Each of the participating towns tried to exploit through revitalization its own unique potential for real growth and improve the quality of life of its residents. Through the joint action, even the smallest town could more easily obtain significant funding. The involvement of regional government and understanding of the idea was also crucial. Cittaslow network, although not perfect, may in the long term strengthen linkages and exchange of experience between the slow towns and not lead to their unification. Furthermore, as shown by the example of Polish "The Cross-Local Programme of Revitalization of Cittaslow Town Network in the Warmian-Masurian Voivodeship", belonging to the Cittaslow network could help to raise funds for the implementation of a comprehensive revitalization, as well as to integrate revitalization projects in the whole region. Joint venture naturally consolidated these slow towns in the Warmia-Mazury region and facilitated to operate efficiently in the network, as well as to undertake other common "hard" measures. As a result, obtained effect of revitalization is likely to be a more coherent and holistic.



**INTEGRATED APPROACH AS A MEANING OF LEADING THE DEGRADED POST-INDUSTRIAL AREAS
OUT OF CRISIS: A CASE STUDY OF LODZ (POLAND)**

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ABSTRACT

The article analyses the issue of modern development strategies in post-industrial areas. The issue concerns many regions in Europe and is one of the fundamental challenges of urban policy. The aim of the study is to define the methods of achieving lasting changes in the quality of life in the degenerated areas of post-industrial cities. If projects in the spatial, cultural, economic and social sphere are carried out simultaneously, they produce long-term effects. Projects in the spatial, cultural, economic and social sphere carried out simultaneously produce long-term effects. In this context, projects improving the accessibility of the area, making use of its cultural heritage, which naturally includes architectural elements that create the identity of the city, as well as activities aimed at an economic recovery are absolutely vital. Another key element is changing the city image, both in the eyes of the residents as well as outsiders. The study analyses approaches adopted by the urban policy of Lodz, a city which has received the largest EU funding for urban renewal in Poland. The article presents new legal mechanisms introduced by the Urban Renewal Act to the Polish legal system. The redevelopment of the city's transport network, renovation of historic urban tissue, improving civil engineering infrastructure and quality of public spaces are all part of the projects implemented in Lodz. Moreover, a proposal to locate a cultural event of international importance in the heart of the city center has been put forward. Lodz as the only European city applied to organize EXPO 2022. The exhibition area is located in the immediate vicinity of the newly built multimodal railway station, the biggest railway investment in the country in the recent years. These projects will improve city image, enhance economic recovery and raise the quality of life in the city center. A consistent implementation of the development strategy, despite the centralization of projects in the city center, will also have a positive impact on smaller urban settlements in the agglomeration, leading to sustainable development of the metropolis.



RESIDENCES AS A NEW LIVING SPACE: AN ASSESSMENT IN THE CONTEXT OF ISTANBUL

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ABSTRACT

In this study residence which has been popular for two decades, will be debated. Residences are generally multi-storey living spaces that provide services such as cleaning, security, reception, and social areas such as sports and children's playground in the same building. The number of residences in Istanbul has been increasing rapidly for the last decade. There are more than 300 residences, and 82% of them were constructed in last 3 years. When the residences are functionally examined in Istanbul, it is seen that they are designed as buildings having one or more functions. The proportion of constructed residences as an only residential is %43.57% of total residences were designed together with the other functional areas like shopping mall, office, and hotel. So, there is a growing tendency among developers and policy-makers to favour mixed-use developments, where office, shopping, hotel, and residential uses shared within one building. Mixed used development, seen in the compact-city debates comprises more than one land use which could be combined, i.e. vertically in a single building or horizontally in multiple buildings on a single site. When considered from this point of view, residences in Istanbul could be described as vertical mixed used. But they are not planned the logic of compact city. They are mostly sprawled to whole city. 15% of them are located in CBD, the rest of them have been concentrated in different areas such as Esenyurt, Küçükçekmece, Bakirköy in European Side, and Kadiköy, Ümraniye, Kartal, Atasehir in Asia Side. On the other hand, considering the characteristics of the place and the facilities, it is seen that the residences, which are called as the new living area in Istanbul, also show the characteristics of the gated communities. Within this framework, the aim of the paper is to evaluate the residence projects which have been constructed since 2000s in Istanbul, in terms of location, capacities and facilities features, and define a typological approach.



SLOVENIA'S CONSTRUCTION ACT AND IMPLEMENTATION PLANS: A CASE STUDY OF IZOLA IPA-8

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ABSTRACT

The guidelines for urban design in Izola's IPA-8 planning area, which is earmarked for hotels, apartment complexes, and sports, specify diverse forms of leisure living space required by modern society. The new tourist complex is not a large monotonous hotel complex, but rather a spatial arrangement in which guests experience an authentic local environment and city residents enjoy the new high-quality ambience. The hotel area is defined by three major communication axes from north to south, linking the countryside to the coastal area and opening up attractive sea views in the new complex. Internal east-west links connect buildings and public spaces. Because of the terraced terrain, a large number of paved ramps and internal public gardens have been designed between the structures. The extensions of the communication axes are laid out as squares, named based on the function of the public spaces. Hotel Street is the central axis and main connecting street, with public hotel services and restaurants. The west axis extends into Culture Square, where activities related to Izola's culture and history are presented; here there is an opportunity to create new galleries, a small local museum, and an exhibition room. Apartment Square is located on the east communication axis, along which only a limited number of trade, catering, and service activities are planned. The plan received first prize in a public competition, and it later developed into detailed municipal spatial plan. In this process, it became clear that Slovenia's Construction Act (ZGO 2004) does not support plans to create terraced buildings.



AN ANALYTICAL APPROACH FOR DETROIT URBAN REDEVELOPMENT AND REHABILITATION

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ABSTRACT

Detroit had been the leader city in manufacturing in the 20th century in the US. The automobile industry created and sustained the thriving economy in Detroit, MI in the early to mid-1900s. There had been a massive increase in people moving to Detroit, which led to an increase in construction industry in the city. The automobile industry sustained the flourishing economy in Detroit until the auto companies experienced union strikes and factories were relocated outside of the city. Many automobile companies moved production out of those plants and began to manufacture in more efficient ways. When outsourcing and deindustrialization impacted the industry, jobs diminished and people began to leave the city to find work elsewhere. Abandoned houses and factories remained. The economy continued to fall and many of the properties were foreclosed after the housing market crash in 2008 which turned a big economic crisis effecting all country. After such a strong economic crisis, Detroit has been desperately need of economic revival which has begun to turn around very slowly in last ten years. The professional sports and entertainment districts have set the foundation for reviving the downtown area in recent years. The revival of the downtown district will spread outward and upward by bringing new businesses to the city as well as new residents. The housing market will grow following this revitalization of the city. In this paper, while defining the nature of the problem, workable solutions for Detroit area will be discussed with certain and framed techniques. The main purpose is to understand the current case for Detroit after a decade of the economic crisis and bring solutions for urban redevelopment and rehabilitation for Detroit area with real examples and projects. A detailed Evaluation will be carried through comparison with other cities or cases in similar condition in global manner. Paper will detail the problems in Detroit area, reasons behind the complications, components/parameters, constraints/limitations, solutions, people involved and expected results.



World Multidisciplinary

12-16 June, 2017 - Prague (Czech Republic)

Civil Engineering-Architecture-Urban Planning Symposium - **WMCAUS**



Session Title:

Public Space



ANALYSING "MEANING QUALITY OF URBAN PUBLIC PLACES" IN YAZD (IRAN) CITIZEN PERCEPTION

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ABSTRACT

Meaning quality of urban public places is a big concern. Diversity of dimensions, components, criteria and indices, shape the meaning quality of urban public places. Some indexes have more roles in perception of quality. Finding these indexes could help planners and designers to improve meaning quality from the perspective of citizens. The main question of this paper is that: what are the main indexes in perception the quality of Yazd (Iran) squares in the perspective of citizens? To answer this question, this paper used descriptive-analytical method. With 376, participant to answer questioner in three-step process. Literature review used to determine meaning quality indexes and SPSS T-test and Friedman test, used to analysis data. Results indicate that among the indices for all 22 indicators, three indicators (public place, accessibility and efficiency) have the most effect on percept meaning quality. Amir Chaqmaq square has the best quality between Yazd squares. Referring to history and heritage was the main index in meaning quality of Amir Chaqmaq square.



ACTIVATING PUBLIC SPACE: HOW TO PROMOTE PHYSICAL ACTIVITY IN URBAN ENVIRONMENT

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ABSTRACT

Physical activity is an essential component of a healthy lifestyle. The quality and equipment of urban public space plays an important role in promoting physical activity and encouraging people (residents, tourists) to take it. In order that recreation and sport activities could be undertaken willingly, in safe and comprehensive manner, certain spatial conditions and requirements must be met. The distinctive feature of the contemporary big cities is the disappearance of the local, neighbourly relations, loneliness, alienation and atomization of the residents. Thus, the design of public spaces should be the expression of the values of social inclusion and integration. Properly designed urban space would encourage people to leave their homes and integrate themselves in it, also by undertaking different forms of physical activities. This, in turn, can lead to raising the quality of the space, especially in the context of its “familiarization” and “domestication.” The aim of the research was to identify the architectural and urban features of the public spaces of contemporary cities, which can contribute to the promotion of physical activity. The paper presents the research results and the case studies of such spatial solutions and examples of good practices, which invite residents to undertake different forms of physical activities in public spaces. The issue of the integrating, inclusionary and social function of physical recreation and sport is discussed as well, so are the possibilities of translating these values to the physical characteristics of urban space. The main conclusions are that taking into account the diverse needs of different social groups, participation in the design and construction process, aesthetic and interesting design, vicinity of the residence, open access for all age groups and disabled, would be the most important spatial determinants of the properly designed, physically activating public space. Strategies of should also assume their multi-functionality and variability in time to adjust it to the changing needs of the residents.



TOWARDS HYBRID URBAN MOBILITY: KICK SCOOTER AS A MEAN OF INDIVIDUAL TRANSPORT IN THE CITY

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ABSTRACT

The characteristic feature of a contemporary city is its inconvenience and oppressiveness caused by the hitherto dominant paradigm of the urban planning based on car mobility. As a result, the inhabitants experience air pollution, noise, spatial barriers, sedentary lifestyle and other factors which worsen their health and the quality of life. Regarding these conditions, ecological and physically activating urban mobility plays an increasingly important role in the process of creating friendly and healthy city. For many years, the steadily increasing share of bicycles in urban traffic can be observed. There are also other trending forms of non-motorised transport, such as in-line skates, skateboards, kick scooters etc. Each of these forms can be practised in a recreational or sport way, but can also be used as an ecological, physically activating mean of urban mobility. The paper discusses the different forms of recreational mobility in the context of the possibility of joining it with city public transport, with particular emphasis on kick scooters. Kick scooters are becoming more and more popular, not only among children and youth, but also among adults, who mainly use it as a mean of the non-motorised urban transport. Appearing numerous publications from different parts of the world show a dynamic growth of this phenomenon. The aim of the article is also to answer the question, in what extent the design of public space include the use of these new forms of transport and recreation, and, consequently, what aspects and requirements should be taken into account in the planning and design process. The paper presents the conclusions of the field study carried out with a group of students in Szczecin and Berlin. The aim of the research was the evaluation of the possibilities of using kick scooters in big cities as a mean of hybrid mobility joint with the public transport, testing the existing urban infrastructure, exploring the cities across the spectrum of public spaces (streets, squares, traffic nodes and hubs, public buildings etc.) and the perception of urban space. This experience and research results seem to confirm the vast possibilities of kick scooters in this regard.



THE PLACEMENT OF PUBLIC ART: TWO EXAMPLES ON LISBON (PORTUGAL)'S WATERFRONT

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ABSTRACT

In our contemporary cities, some public spaces seem to have a greater ability to host art interventions, which frequently appears in historical centres, urban sprawl areas, gardens and parks, new residential districts, among others. Also in port cities, its waterfronts constitute privileged spaces for the placement of public art. On Lisbon's riverfront we have a relevant number of works and, in particular, of monuments of strong symbolic nature. In turn, the placement of public art is a way to value the inherently symbolic nature of the waterfronts and to emphasise its monumentality. However, the criteria for the placement of public art on those spaces are not always clear. In some cases, there are some thematic correspondences between the works and the places, namely with the theme of the water, the Discoveries and others like that. Nevertheless, we cannot observe a profound spatial integration, or a design with the context. In some cases, the artistic elements are produced with the logic of isolated work of art and later it is acquired and placed in some public space. In other cases, we watch to an unusual situation: a work is conceived in a strict relation with a specific place, but then, without any evident justification, it is dislocated to a completely different context. Or simply they are removed, disappearing from the public space. Although it seems a strange situation, such kind of dislocations often occurs in Lisbon. With this framework, this research proposes a discussion about the processes of implementation of public art. We will analyse two cases of public art replacement: 1. The monument Primeira Travessia Aérea do Atlântico Sul [First Aerial Crossing of the South Atlantic], by Laranjeira Santos and Rodrigues Fernandes, 1972; 2. The public sculpture Ribeira das Naus, by Charters de Almeida, 1995. Both works were designed to very specific and important places on Lisbon's waterfront and both were later replaced to other locations on the inner city, quite far from the river. This kind of "(de)monumentalization" of a space originates us the following questions: why is a work removed from a public space and why it is decided to give it another destination? What are the implications of those changes? Is public art removable? Considering public art besides its purely aesthetic significance, this phenomenon seems to confirm that the physical and the social integration with the place are not always important, or, at least, they are only important in some moments. Also we can see it from another point of view: a removal or a replacement of a work always reveals specific strategies for certain places, in certain moments. We can thus conclude that the processes of implementation of public art are clearly indicators of the policies and of the dynamics of the cities.



**RECREATIONAL USE OF MINING QUARRIES THAT COMPLETED ECONOMIC VALUE: THE CASE
STUDY OF BURDUR CITY AND ITS ENVIRONS, TURKEY**

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ABSTRACT

The industrial development is directly proportionate to development in many countries as well as Turkey. In the development, the mines are the main material suppliers. For this reason, the mine resources extracted from ground by different methods need to be brought out to the service of the industry. However, during these processes, especially the acquisition of the mines, important changes occur in the topography as a result of the used methods. Large crater pits can be opened in opencast mining (marble, stone quarry, etc.) or unseen galleys can be opened for underground mining (stone, coal etc.). Although mining appears to be a threat to the sustainable use of natural resources, the mining areas can be reclaimed because they have interesting surface shapes, the underground galleries are interesting to the people and they can be used for recreational purposes after mining. In Turkey, there are many mining quarries that have been abandoned and have not been rehabilitated after completing their mining activities. These quarries need to be reclaimed by the relevant institutions of the state without wasting time. However, all phases of these studies must be aimed at reconstructing ecological, hydrological, aesthetic, production, recreational and other functions of the closed mining land in coordination with a sustainable land use development plan. These applications should be presented to the public as well as the mining industry as example. Land use planning done by manual or computer after the opencast mining will provide numerous benefits to the country's economy, local people, environmental values and the operator who will carry out land improvement work. In addition, the recovery of these areas is a multiple and interdisciplinary situation which should be taken into account before mining activities, which is conducted in parallel with mining activities, and which are resulted to reclaim a new use after mining activity. In the study, proposals about recreational use possibilities are made for opencast mining that have completed its industrial life in the Burdur City and its environs depends on its topographical structure.



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EVOLUTION OF SPACES BETWEEN BUILDINGS IN POLISH MASS HOUSING ESTATES IN THE EYES OF THE INHABITANTS

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ABSTRACT

The author investigates into the state of public and semi-public spaces in the Polish housing estates erected in the times of mass housing projects (1960-1980). The character of these estates is special. On the one hand, the buildings were accompanied by lavishly designed open spaces with elaborate material infrastructure: urban design followed the ideas that time – and strict regulations – that, in theory, prevented creation of substandard spaces. Provision of affordable housing was given a priority in the centrally controlled economy, so vast greenfield areas were devoted to housing. Moreover, the estates often stay under one management of housing cooperatives for years. The assets are relatively modern and usually conveniently located within the city/town infrastructure. This gives the areas advantage over contemporary housing schemes affected by constraints imposed by prior development and commercial approach to the provision of housing. On the other hand, technical wear and tear, functional obsolescence, years of underinvestment, natural demographic changes in local communities, changing ownership structure, and weakening social bonds make the large housing estates with their too lavishly designed public areas an ungrateful object of management. Recent availability of European Union funds for modernization of public spaces increases the numbers of municipal projects and individual initiatives to activate communities by improving public and semi-public spaces. A question arises whether the money and effort is spent reasonably. Do people actually use the new facilities? Are they encouraged to affect the form and function of their surrounding? Does the public space change according to some passing fancies, or according to the changing needs? To juxtapose the development of technical condition of infrastructure and functions offered by the space between buildings with the expectations of users, the author repeatedly views the scene and conducts structured interviews with the inhabitants of the estates. The paper presents results of two interdisciplinary surveys, held five years apart in the same estates, and based on the same questionnaire. Its results confirm that user expectations evolve. The interest in the development of green areas, and availability of recreational facilities in the proximity of home is growing as people observe that changes are possible. More people declare some form of active participation in improvements. Preferences towards functions and accessibility of the areas reflect changes in the demographic structure. Surveys of this kind may be regularly used in defining guidelines for further improvement measures, and raising user awareness of the personal responsibility for the condition of the neighbourhood.



SEARCHING FOR CITY CENTRE OF STALOWA WOLA

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ABSTRACT

In cities that have historic urban layout, with clearly separated main representative space - market, or the main street (a pedestrian area), specify the location of the center is not difficult, either residents or people from the "outside." Interesting is the situation in which, in the structure of the city is no clearly designated main public space equipped with all the necessary services, and the period of location and development of urban system falls on the twentieth century. One example of such cities in Poland is Stalowa Wola - founded in 1938 as part of the Central Industrial District. The city was located not far away from Rozwad³w town, which, because of the development of Stalowa Wola, was absorbed by the new structure and became a district of the bigger city. Main square of Rozwad³w, with its traditional urban structure could aspire to becoming the main square of the city, however, despite "adequate" spatial structure, main square of Rozwad³w district is not mentioned or considered by the inhabitants of Stalowa Wola as a potential city center. The layout and spatial structure of Stalowa Wola is based on a modernist designs, so there is no unequivocally designed city center. In Stalowa Wola, as in functional city, there was carried out a special division into areas with different functions and purposes for different social groups. In the second half of the twentieth century the development of the city based on the immigrant population deepened the phenomenon of social and functional segregation. Changes in the economic system, in the nineties, revealed the pathology of this assumption, which is largely related to the lack of a sense of local identity and social identification of residents. The recent Municipalities actions are aimed at revitalize the city, improvement of living conditions and safety of residents by, among others, creation a high quality urban space, which would be unequivocally defined as the city center.



INTEGRATING ART INTO PLACES IN TRANSITION. ROSE KENNEDY GREENWAY IN BOSTON AS A CASE STUDY

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ABSTRACT

Among many projects of public spaces, there are the unique ones that are building the identity of a place. The aim of a paper is to examine how integrating art and cultural strategies into public space can enhance and reinforce sense of a place. Particular attention is devoted to urban spaces that are being the places in transition, where public art improves city's imaginative capacity, enlivens neighborhoods and sparks civic exchange. Methods used in the research are based on multidisciplinary literature studies and detailed case study of Rose Kennedy Greenway - contemporary urban park in Boston, USA, intended to stitch together the various neighborhoods surrounding downtown. The Greenway is also a place in transition in which the Conservancy brings innovative and contemporary art to Boston through temporary exhibitions, engaging people in experiences, interactions and dialogue with art. The five-year Public Art Strategy was supported by Fund for the Arts, a public art program of the New England Foundation for the Arts. The main vision of a project is to amplify the Greenway's unique characteristic through art that is connective, innovative and celebratory. There are the two main types of projects within Public Art Vision for RKG: short-term projects called PLATFORMS and long-term projects called MAGNETS. The particular conceptual framework is being developed to guide proposals: connection, interactivity, civic dialogue, ecology and the environment. The article examines the case and analyses the important issues related to implementing art into a public space such as re-imagining places, short-term and long-term artistic interventions, arts and cultural programming.



**THE NETWORK OF GREEN AREAS WITHIN COLLECTIVE HOUSING COMMUNITIES. CASE STUDY:
TIMISOARA, ROMANIA**

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ABSTRACT

Green areas have always been an essential feature of urban developments, improving the quality of life within a community, both from a social perspective - offering residents a place for relaxation and interaction, as well as from the point of view of disease prevention - improving the overall air quality, but also encouraging inhabitants to spend more time outside. The importance of these areas within a settlement further increases in the present-day context, in which the constant expansion of cities in their surrounding territory, phenomenon known as "urban sprawl", gradually eliminates the natural green spaces and agricultural terrains from our landscape. This trend has devastating effects on the environment, as well as on the micro-climate of our settlements, characterized, in recent years, by the formation of heat islands within the built tissue. Moreover, the disappearance of natural green areas leads to the constant estrangement of the inhabitants, and especially of young generations, from the natural values and realities. It is thus more important than ever to ensure an adequate percentage of green areas for our cities, uniformly distributed within the urban tissue. Green belts, urban forests, parks, green squares or even urban gardens - all these entities play their parts within the urban green network, having certain radiuses of influence and attraction and thus occupying a specific position within the urban hierarchy. In Romania, the terrains left un-built between the collective housing buildings - or apartment blocks, erected during the communist administration and currently constituting public property, have a huge potential regarding the matter of urban greenery, being easily transformed into active and qualitative green areas. However, the local authorities lack the resources (both financial and in terms of human resources) to efficiently develop and then administrate these areas, which are consequently either abandoned, or used as illegal parking lots. This paper therefore explores the possibilities in which the terrains between collective housing buildings can be exploited by the community and transformed into qualitative green areas, as well as their integration within the hierarchy of the existing green network.



THE PUBLIC SPACES - COEXISTENCE AND PARTICIPATION

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ABSTRACT

The paper is an attempt to answer two questions: [1] how to develop positive social relations and citizenship among residents of cities in Poland and [2] how suitable shaping of public space affects the activation and integration of local residents. The specificity of the post-war process of urbanization in Poland - a country traditionally agricultural - was its political dimension (forced 'nationalisation' of agriculture and industrialization of the country) ignoring the socio-cultural determinants and consequences of this process resulting in disappearance of traditional social bonds. According to forecasts, the number of urban dwellers is expected to grow by the year 2050 and increase up to 70 percent of the population. Such a rapid urban sprawl was not accompanied by appropriate social policies; the result was a low level of social organization and of a sense of citizenship. There are various attempts to change this situation. One of them is the development of a system of urban public spaces, according to the needs and preferences of residents (ie. promotion of physical activity in public areas, introducing elements of art to the common external space, encouraging users to contribute to their surroundings and introducing the appearance of temporary, often cyclical, attractions). Regular interactions between people in public spaces are conducive to developing positive social relationships. Quality and development of the local community is dependent on the quality of space in which it is built. For this reason, attention has been paid to the factors influencing the perception of public space, i.e. geographical and natural conditions, cultural and architectural (arrangement, the availability and condition of these spaces). In the article examples of different types of Polish public spaces are described - permanent and temporal recreational spaces (including summer activities and winter attractions). Attempt has also been made to give an answer to the question: who nowadays is a citizen and how to assist in the creation of civil society with a system of public spaces with thoughtful application program. Currently the city, through its scale, deepens the alienation of residents, therefore appears a need for treatments favouring social interaction. The aforementioned spatial actions motivate people to go out and find themselves in the public space. Coexistence is the first necessary step to produce community. This relationship and the specifics of this co-presence may encourage citizens to return to the public space.



LEARNING BY WALKING - JANE'S WALK CASE STUDY: REDISCOVER SAN LORENZO. REMAINS AND TRANSFORMATIONS IN A HISTORICAL CITY DISTRICT

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ABSTRACT

"Cities have the capability of providing something for everybody, only because, and only when, they are created by everybody". This citation from the revolutionary book of an American city activist, Jane Jacobs: *The Death and Life of great American cities* from 1961 becomes a starting point for many activities within the contemporary urban design and an impulse for Jane's Walk global festival an excursion through city spaces which involves visitors and residents living in a neighbourhood. This is an activity which confirms study of space in an alternative way: walking intended and recognized as observation. The article discusses the transformative role of those alternative activities in urban design, particularly its role in the regeneration of city spaces and the role of exploring, talking and celebrating Jane Jacobs ideas in public participation and regeneration processes. The article asks the following question: to what extent does sharing of stories and different visions of the city during the exploration and interventions in the urban structure can support and develop spatial and cultural strategies for urban redevelopment projects. The case study focuses on conversation on various topics and aspects of the neighbourhood in one of the well-known but underestimated district in Rome. The aim of this analysis is to find out if manifestation of belonging to a place and rediscovering public space by alternative activities can improve the existing state of transformation of urban landscape and spatial disorder. The data for the study was gathered during several preparation workshops, practice on location, investigation and interviews with neighbours and members of the public, concluded with a final event in an inner city area: San Lorenzo district in the very centre of Rome, Italy. The topic of Jane's Walk was realized, as district urban walk, under the title: Rediscover San Lorenzo. Remains and transformations in a historical city district. The analysis is based on the field study of Jane's Walk activity in the above mentioned location and issues of public participation in space and their consequences in practice, with a special emphasis on "social capital" idea introduced by Jane Jacobs. The urban walk is an opportunity to learn about numerous social identities of the neighbourhood. It allows to take note of the strong heterogeneity and different atmospheres of places and activities present in it. The rediscovery of the physical space, the history, the social identity of the neighbourhood means not only knowing the present status of the sites, but also imagine its unpublished future perspectives. Having in mind the above mentioned, it turns out, that local actors are a fundamental factor to the regeneration processes of cities.



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URBAN SPACE INNOVATION - 10+ PRINCIPLES THROUGH DESIGNING THE NEW IMAGE OF THE EXISTING SHOPPING MALL IN CSEPEL, HUNGARY

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ABSTRACT

The first part of the paper is about to introduce the principles of “placemaking” as an innovation and important tool of the cities in the 21st century. The process helps the designers to transform the spaces of “nobody” to a community-based space for supporting the connection among humans. The second part of the paper shows the process of the used principles by the author for designing the new image of the existing shopping mall in Csepel, Hungary, which work was selected as one of the best design ideas for renewing the existing underutilized space.



NON-STANDARD FORMS OF HUMAN RESIDENCE - THE PAST AND THE FUTURE

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ABSTRACT

Today our visions of the human habitat have been characterised by an amazing diversity. In particular, it concerns the settlement areas considered equally as attractive as unavailable (wilderness, oceans, around-Earth orbits, etc.). Among the probabilistic vision of the human habitat there were floating "human hives" (Hydrogenase, V. Callebaut and others), mobile housing units (Walking Cities, Archigram Group and others), and even orbital objects (Hyper Building, P. Soleri and others). These concepts underlie the belief in a need for movement constantly experienced by the human and simultaneously tolerated by him the fact of a crowd and scrum. It seems that the issue of human scale was missed, in particular a human capacity of adaptation. Therefore, radical proposals of apologists from Modern Movement in Architecture were already contrasted solutions for residential environment based on many-centuries tradition of developing settlement systems (Staaken and others). A similar trend has also appeared at the beginning of the XXIst century (New Romanticism). Since the dawn a man has been taking numerous settlement actions in places even useless for this purpose, for example in areas water- or permafrost-stricken. A perfect example of this in European conditions have become households built in Friesland, on the Scandinavian Peninsula (Lapland) and in the western part of Jutland Peninsula. In the area of Amsterdam, the fishermen raised one-room houses on piles with a wood covered in tar (Markeniland). In the province of Gelderland country houses were built with clay mixed with straw chaff, and in one of the poorest provinces of the Netherlands - Drenthe woodcutters and fuel diggers inhabited almost windowless houses made from peat blocks. In turn, in Lapland were raised building objects on one or more piles. They were used both for food storage as well as for housing. The scale of the building development, created within it neighborly relations, as well as used on that occasion materials, techniques and technologies seem to be particularly interesting in the case of so-called negative evolution of the human environment and the disappearance of active-citizen attitudes. For these reasons, research undertake aiming to assess the usefulness of construction and settlement solutions in the past should be regarded as reasonable.



PROBLEMS OF MILITARY CEMETERIES GREENERY: CASE STUDY OF THE MILITARY CEMETERY IN ZVOLEN

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ABSTRACT

The aim of this work is to highlight the importance of understanding military cemeteries as objects of cultural and historical heritage and also as a part of garden design history. The design and maintenance of cemeteries and graves is a manifestation of the national culture. This is even more obvious in military cemeteries, the maintenance of which is regulated by international agreements. Objects of military cemeteries are important places not only from the historical and architectural point of view, but also as green areas. The most military cemeteries in Slovakia originated from World War I and II. In Slovakia, 160,000 soldiers were buried, 75,206 of them lost their lives in World War I and 93,000 in World War II. 32,495 war graves are registered by The Ministry of the Interior of the Slovak Republic - 23,316 war graves from World War I and 9,179 from World War II. From the period of World War II, there are 22 cemeteries and graveyards in Slovakia, established for soldiers of the Soviet, German, Romanian and Czechoslovak army. Military cemeteries and memorials are mostly high quality works of architecture and art. From this point of view, cemeteries from World War I designed by the Slovak architect Dušan Jurkovic are especially important. This paper focuses on the current situation and restoration issues of military cemeteries by the example of the Military Cemetery in Zvolen. In the context of its planned reconstruction, a comprehensive tree assessment has been started in 2016. The Military Cemetery in Zvolen, being one of the largest military cemeteries in Slovakia, consists of The Cemetery of the Soviet Army with 17,628 buried soldiers and The Romanian Cemetery with 11,000 buried soldiers. The Romanian Cemetery is one of the largest cemeteries of Romanian Army in Europe. Both cemeteries were declared national cultural monuments in 1963. In the cemetery, dendrometrical parameters and the health condition of trees were evaluated. In total, there are 825 woody plants. In both cemeteries, coniferous trees prevail, mainly individuals of the genus Thuja (49.4 %). Moreover, the maintenance of greenery and the aesthetics of the landscape composition were assessed. Based on the assessment of woody plant species composition, health condition of trees and their aesthetic qualities, necessary changes in the cemetery landscape composition were designed.



**INDUSTRIAL WASTELAND AS FACED WITH CONTEMPORARY LANDSCAPE ARCHITECTS'
CHALLENGES**

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ABSTRACT

The following article describes the problem of regeneration of industrial wasteland. It is illustrated with examples selected from various design projects created by outstanding contemporary landscape architects. It also shows how a correctly planned and performed project concerning regeneration of derelict industrial sites serves multiple functions, i. e. it serves as recreational zone as well as activates people. Moreover, it significantly enhances environmental value of a given area as well as stimulates emergence of innovative landscape investments. The paper presents innovative compositional arrangements used in creating projects concerning brownfields; balanced proportions of spatial elements, the possibility of approaching the area from different levels and perspectives and, also, the possibility of engaging fully with nature by physical contact with it. It also draws attention to special concern of the authors of projects with the protection and preservation of green areas which, in consequence, results in endowing a given area with new meaning, and improving its value as a landscape. It also highlights important factors such as designing space that integrates the object and its surrounding, the protection of unique fauna and flora, levelling a contaminated area, creating a safe space, novel spatial ideas, designing based on the idea of contrastive colours, texture, shades, and flowering period. The conclusion provides the answer to the question of how uniqueness and ingenuity of landscape architecture design influence the aesthetics of public spaces and restores its usefulness in terms of society and environment as well as fulfil an educational role.



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PUBLIC SPACE IN BARCELONA (1992-2017): EVOLUTION AND CASE STUDIES

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ABSTRACT

Abstract. The construction of the public space has become in the last decades something so important and fundamental in the architecture of the cities, that requires a specific discipline and a concrete study that evaluates the characteristics and actions on it. Not already from an urbanistic perspective but from its own design and constructive perspective, with its character as a place for everyone and for everything, must gather a series of elements that are unique to this space. Barcelona is one of the densest cities in the world that, since the end of the s. XX until our days, tries to solve the public space with a design of quality and optimum. The shortage of public space, which also hosts more than eight million tourists each year, makes it necessary to propose a type of meticulous intervention in order to accommodate all types of users and activities. From the first Universal Exhibition of 1888 through 1929 to the 1992 Olympics as the most important stimulus for this renewal of urban space, Barcelona has been rethinking and evolving in the modus operandi in terms of its urban space. From our professional experience as architects both in the municipal, private and university spheres, we believe that it is our responsibility to confer the public space, that is to say, the design of the urban infrastructure with the attributes necessary to consolidate it in a space Suitable for all without exception and as a place of expression of citizenship. Through the projects of public space developed in our office we will analyze this change of procedure in the construction of squares, parks and other spaces in the city of Barcelona.



STREET AS PUBLIC SPACE: MEASURING STREET LIFE OF KUALA LUMPUR (MALAYSIA)

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ABSTRACT

Kuala Lumpur is transforming itself as quickly and envisioning in becoming World Class City by the year 2020. Urban public spaces are livelihood assets for developing city like Kuala Lumpur, and they are found near our everyday streets, spaces in front of a building and transitional spaces between stations. Essential elements of form and function of the urban environment are streets. Streets showcases the community and connects people. It's one of the most comfortable social environment that provides aesthetical and interaction pleasure for everyone. Classified as main shopping streets in the local Kuala Lumpur urban design guidelines, Jalan Masjid India has its uniqueness of shopping experience and social interaction. This local street is adjacent to Jalan Tuanku Abdul Rahman, another shopping avenue that is rich in heritage culture. Public spaces complex spatial interrelationship can be analyzed and explained by tracing its genesis. In various discipline, the application of space syntax examines the social logic of space is via its spatial configuration. This conceptual paper will study the physical and cultural characteristics of the street that will generate the street character by mapping its inherent characters. Physical aspects information and patterns of use will be studied through observations and semi-structured interviews will be carried out to evaluate the responsiveness of the street. The findings will focus on strengthening the methodology applied to promote improvements in evaluating the street as a great public space. Findings will also contribute to understanding the overall site context, the street connectivity, and urban dynamics. This paper is part of a larger study that addresses on transforming the sociability of a public space.



INFORMAL GREEN INFRASTRUCTURE ALONG THE STREET: TYPOLOGY AND URBAN DESIGN IMPLICATIONS

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ABSTRACT

Some city cores express a remarkable diversity of informal streetside horticultural activity despite, and in some ways because of, the press of built form, civic infrastructure, and vehicular traffic. This paper explores the convivial greenstreet as an emerging component of the green infrastructure of medium- to high-density urban environments. Based on case study metrics and observational data gathered in 12 European cities, this paper defines convivial greenstreets and constructs a typological framework, from formal to informal to spontaneous flora. Focusing on the informal and quasi-public, I align the notion of such streets with urban design and green infrastructure literatures, and provide insight on the relationships between greenstreet morphology and interactions between gardeners, neighbors, and passersby. In addition to spotlighting greenstreet exemplars, I cite a few cases where installations hint at social class distinction or contested space. I argue that the convivial greenstreet can make a positive contribution to the life of the city, and that it deserves recognition within the realms of urban design and infrastructural engineering. Five key attributes of robust greenstreets are suggested: i) presence of horizontal and vertical liminal growing spaces with adequate soil volumes ii) street cross-sections that privilege pedestrians over automobiles iii) interacting flora-keepers iv) a degree of intensity and variability of vegetation and related paraphernalia, and v) supportive, or at least tolerant, civic policy contexts. Overall, this particular kind of urban gardening seems to be contributing to the lingua franca of the street. At their best, convivial greenstreets are generous, expressive and welcoming, and may measurably enhance sustainability, cultural vitality, and social inclusion in the city. I conclude by urging that the emerging reality of convivial greenstreet take a firmer place in the scholarship and practice of urban design and engineering.



GREENS OF THE EUROPEAN GREEN CAPITALS

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ABSTRACT

Well established and maintained green areas have a key role on reaching the high quality of life and sustainability in urban environments. Therefore, green areas must be carefully accounted and evaluated in the urban planning affairs. In this context, the European Green Capitals, which attach a great importance to the green areas, have a great potential to act as a role model for both small and big cities in all around the world. These leading cities (chronologically, Stockholm, Hamburg, Vitoria-Gasteiz, Nantes, Copenhagen, Bristol, Ljubljana, Essen and Nijmegen) are inspiring for the other cities which seek to achieve more sustainable and environmentally friendly places through green areas. From this point of view, the aim of this paper was to investigate the green areas of the European Green Capitals. The paper covered whole European Green Capitals, and the application form of the each Green Capital was used as a primary data source. Consequently, the paper put forwarded that the European Green Capitals have considerably large amount and high proportion of green areas. Further, these cities provide an excellent access to the public green areas. As a result of abundant provision and proper distribution, the almost all citizens in most of the Green Capitals live within a distance of 300 meters to a green area. For further researches, the paper suggested that these green capitals should be investigated in terms of their efforts, measures, goals and plans, policies and implications to administer, to protect, to enhance and to expand the green areas.



**URBAN ACUPUNCTURE - A LIGHT INSTALLATION TO ACTIVATE AN UNUSED PEDESTRIAN SQUARE
IN TIMISOARA (ROMANIA)**

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ABSTRACT

A small-scale temporary lighting intervention managed to transform a neglected historical public space in which lighting failed to support the creation of urban life. For one evening, a pedestrian square in Timisoara evolved from a transit hub to a hot-spot of the city, creating a positive and stimulating experience for local community. The in situ intervention is the result of an educational process which started with a Social Lightscares workshop held in October 2016 at the Faculty of Architecture and Urbanism by two members of the Configuring Light research group from London School of Economics, in the framework of LIGHT EDU Symposium. During the three days of the workshop, the fourth year architecture students have analyzed the spatial, social and economic factors affecting the urban area. After the social users categories were identified, the students investigated what needs and issues each of this category is confronted with, concluding with a presentation of their findings about the main reasons that make the space unsuitable for social interactions and activities by day and by night. Based on their findings, three different approaches were developed into visions about what the square should become over the next five years, each of these trying to activate this deadened space. Using this social research as a guide during their seminary classes in urban planning, the students carried on their task to find and implement a solution to activate the square by proposing a light installation, an urban acupuncture intervention that will relieve the identified conflicts in the square. The ambitions were high, but we had to scale them down, based on the various constraints we faced while developing a solution, the main one being the lack of budget for lighting equipment acquisition. We decided to make a minimum investment in lighting equipment and borrow different structural material in order to make a strategic punctual light intervention that will create a new energy in the square and uplift the neighborhood life during the Christmas festive season in a light and sound celebration that invited pedestrians to interact. Conceived and produced by the 4th year architecture students, tutored by two of their teachers, the LED Neon Flex tube installation beckoned residents and passersby to sit "inside" one of its exterior rooms defined by its light edges, grab a tea or mulled wine glass, make a wish for the urban design of the square and listen to the carols sang by the students' chorus. The installation managed to soften the atmosphere of the deserted pedestrian area, making it inviting for social interaction, given the conditions of freezing temperatures. The research gathers insights on how a strategic implementation of a low budget lighting intervention creating intimate light spaces in urban environments can bring energy in neglected historical urban spaces and become a catalyst of interactions between people.



**TO DETERMINE THE POTENTIAL OF OUTDOOR RECREATION AREAS: THE CITY OF BURDUR
(TURKEY)**

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ABSTRACT

With rapid industrialization and urbanization, the green areas in the cities and their vicinities have diminished but urban people have increased desire to get over the monotony and stress of the city. In this sense, people generally need leisurely and quiet green areas of the city for the recreational activities. In this study, to determine the potential of existing and potential recreational areas of Burdur is aimed. 18 existing and 4 potential recreational areas that are larger than 0.4 ha in Burdur and its vicinity form the material of the present study. Observations on the existing and potential recreation areas are made and data are collected and then recreational potentials of these areas are determined by evaluating in terms of landscaping value, climate value, accessibility, recreational facility and adverse factors by using Kiemstedt (1967) method, which Gülez (1980) developed in accordance with the conditions of Turkey. As a result, Burdur has a high recreational potential. Public beach has the highest recreational potential value (87%). It is found that Burdur has sufficient recreational area but needs to be improved and expanded the scope of activity for better use of the areas. Especially the recreational facilities of the areas need to be improved. Furthermore, when the variety of recreational resources in the area is increased, the people of Burdur who are heading for the nearby cities will benefit from the recreational activities of their city. Total recreation potential will also be increased with the construction of the superstructures and infrastructures of potential recreation areas.



GENERATIVE DESIGN SYSTEMS - STUDY FOR ARCHITECTURAL DESIGN IN PRACTICE

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ABSTRACT

Generative Design Systems are structures that are capable of setting up changeable compositions that express design objectives. They express design intent offering a pool of possible solutions. The system is developed to support architects in designing sustainable buildings and identified the architectural form. The system carries a mechanism for generating design alternatives. The Generative Design System methodology project contain a generative system and an analysis system. The generative system is a rule-based system that provides a powerful mechanism for design alternatives while the analysis system provides the tools to estimate these proposals. The system imparts to itself well to calculation and simulation realization. The relationship between the generation and testing mechanisms would carry on to a larger set of available solutions and can aid the design team in foundation intelligent, sustainable and preferable designs. When the performance criteria such as daylight, solar heat, real state preferences established and solutions are modeled and analyzed within generative systems, architects can better understanding of the effects of the design decision on the design performance. In this paper, The Generative Design System is validated within architectural practice. The paper will describe generative systems about design methodology and its foreseen advantages. Firstly a short brief deduction on generative systems and their use in design will be provided. Next, it will be discussing analysis systems used in architectural design. The explain of the methodology phases should point at influences the methodology to the design process. The main attention of the paper is focused on the theoretical aspect of design derives from generative design methodology. Finally, some architectural experiments will be demonstrated as a case of study.



MODERN CONDITIONS AND THE IMPACTS OF THE CREATION OF ARCHITECTURAL ENVIRONMENT

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ABSTRACT

Methodological principles of the creation of architectural environment based on a comprehensive approach with the definition of interference of conditions, the impact of factors, is the subject of this study. A comprehensive review and structural analysis of different current conditions and all impact factors that lead to the sustainable architecture design are conducted in the proposal. The main groups of conditions and factors such as social-economical, natural-geographic, urban, ergonomics, ecological, typological, technical, cultural, and aesthetics are determined in accordance with their contemporary specifics. This analysis provides an opportunity to define in the proposal the appropriate hierarchical levels of the modern trends and prospects of creation an effective, attractive and friendly architectural environment. Some examples of author's projects and implementations will be presented in the proposal.



**MULTIFUNCTIONAL PUBLIC SPACE ON THE EXAMPLE OF CONCEPT DEVELOPMENT OF
COPERNICUS SQUARE IN OPOLE, POLAND**

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ABSTRACT

The city of Opole, Poland, in 2015 decided to sell part of the Copernicus Square, one of the main city squares, to a private Client. The aim was to expand the existing shopping mall and to build an underground car park as part of a public – private partnership. In order to find solutions for designing the remaining part of the square, it was decided to announce a competition for its development. The competition was organized together with the Opole branch of the Association of Polish Architects. The article is a description of research and analysis of this space, made for the purpose of developing the competition work, prepared by our office db2 architekci. The concept of shaping the square was based on the analysis of urban context in downtown Opole. The nature of the public spaces within a twenty minute walk of Copernicus Square was analyzed. In the course of work, a decision was made to differentiate – in relation to Client's intentions – the shaping of public space. In a graphical way the maximum extent of the gallery expansion was shown. It was in line with the urban layout of this part of the city, to preserve the historical viewing axes. The article presents the conceptual work done for this competition along with the justification of the design decisions taken. One of the basic assumptions of the project was to combine all the frontages with the square and to create a leisure area rich in greenery. In the project the whole square area was divided into three parts, each of a different character. The center of the square occupies a green area of a leisure nature – a space that is lacking in the downtown Opole. At the southern frontage of the square under common roof, there are restaurants, small market, parking area for bicycles and underground parking facilities. The area directly adjacent to the gallery is an open, multifunctional, partly covered square – a space for cyclic public events organization. The project, which has emerged, harmoniously combines the various functions that Copernicus Square is to fulfill. The communication solutions used, especially the entry and exit solutions from the underground car park, have a positive effect on the traffic in this part of the city. The preservation of the historic urban layout and viewpoints makes the new building part not overwhelm the square but constitutes its harmonious closure.



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Session Title:

Urban Design



COLORS CONVEY LANNA IDENTITY IN LAMPHUN AND CHIANG MAI AREA (THAILAND)

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ABSTRACT

Colour control is a specific tool to identify local environment. Especially in the historic area or conservation area, to promote colour control is very necessary. Therefore, there are many standards of colour to control such as Munsell, colour name, and $L^*a^*b^*$. This research is aimed to analyse the appropriate colour control by using a Munsell standard colour which is suitable to visual perception. The study area is scoped in northern region of Lanna culture in Thailand which nowadays used names of colours to control. Chiang Mai and Lamphun are selected to be case study because they are in a centre of Lanna Empire of Thailand and have many historic significant things such as city wall, temple, monastery, palace, and city moat. The mainly procedure conducts in this article is based on the analysis of material colour. The study chose local natural materials which are used in the historic significant things. Earthen clay tile, wooden roof tile, burnt clay brick, laterites, hard wood, bamboo, silver, and gold are evaluated. The procedure used the DIC application of android processor on smart phone. This application has a conversion data to switch a colour value from pick-up point in photo to many colour values such as RGB, CMYK which Munsell value is included. The photos were taken within the historic area of Chiang Mai and Lamphun by random. The result can scope a range of colours of Munsell standard of natural colour (N), red (R), yellow (Y), and yellow-red (YR). A natural colour (N) can be suggested a range 1.0-9.0 (N 1.0-9.0). Red can be ranged the value between 3.0-7.0 and chroma between 3.0-9.0 (R 3.0-7.0/3.0-9.0). Yellow can be ranged the value between 6.0-9.0 and chroma between 4.0-12.0 (Y 6.0-9.0/4.0-12.0). Yellow-red can be ranged the value between 2.0-8.0 and chroma between 2.0-11.0 (YR 2.0-8.0/2.0-11.0). The results can be revealed a process of colour analysis of historic colour control, and may offered to be an ordinance in further.



PROVIDING PUBLIC SPACE CONTINUITY IN POST-INDUSTRIAL AREAS THROUGH LAND/WATER CONNECTIONS

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ABSTRACT

This article concerns the problem of urban transformation strategies applied in recent decades which are based on creation of new water areas and modification of the existing ones. The research is an attempt to prove that modifications of plans of water areas and the forms of their borders may play an important role in achieving public spaces' continuity on the post-industrial areas. What is essential, this continuity is one of the most significant factors among evaluation criteria of the public space quality. The basis for demonstrating the importance of modification of the water borders including introducing new forms of the presence of water in cities are theoretical surveys, comparative studies and in-field analyses. It can be seen that the post industrial areas, that used to create voids in the urban fabric, are most of all perceived as unique but isolated places that should be integrated into structure of cities. Thus, creating continuity of public spaces that will relate converted areas with their surrounding is a well known objective of many transformation strategies. The research proves that an effective strategy toward achieving this goal could be based on modification of relationships between the land and the water. Namely, introduction of new water areas, designing new pieces of land that protrude into the water, softening the boundaries of water lines or opposite - structuring the smaller water flows into well defined canals, if consciously designed, may significantly contribute to the quality of public spaces' continuities. This influence does not only rely on providing the stronger morphological links in the pattern of public spaces, but it makes them more related to the environmental qualities of the converted territories. Moreover, it is worth emphasizing that even single steps in such operations such as establishing new outlines for green and blue grids in the cityscape, creating scenarios for social activities in relations to the character of the land-water connection - it all fosters the development of sustainable cities and contributes significantly to the emergence of high quality urban landscapes.



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12-16 June, 2017 - Prague (Czech Republic)

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Session Title:
Theories and Methods



DESCRIPTIVE AND COMPUTER AIDED DRAWING PERSPECTIVE ON AN UNFOLDED POLYHEDRAL PROJECTION SURFACE

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ABSTRACT

The aim of the hereby study is to develop of a method of direct and practical mapping of perspective on an unfolded polyhedral projection surface. The considered perspective representation is a rectilinear central projection onto a surface composed of several flat elements. In the paper two descriptive methods of drawing perspective are presented: direct and indirect. The graphical mapping of the effects of the representation is realized directly on the unfolded flat projection surface. That is due to the projective and graphical connection between points displayed on the polyhedral background and their counterparts received on the unfolded flat surface. For a significant improvement of the construction of line, analytical algorithms are formulated. They draw a perspective image of a segment of line passing through two different points determined by their coordinates in a spatial coordinate system of axis x , y , z . Compared to other perspective construction methods that use information about points, for computer vision and the CAD system, our algorithms utilize data about lines, which are applied very often in architectural forms. Possibility of drawing lines in the considered perspective enables drawing an edge perspective image of an architectural object. The application of the changeable base elements of perspective as a horizon height and a station point location enable drawing perspective image from different viewing positions. The analytical algorithms for drawing perspective images are formulated in Mathcad software, however, they can be implemented in the majority of computer graphical packages, which can make drawing perspective more efficient and easier. The representation presented in the paper and the way of its direct mapping on the flat unfolded projection surface can find application in presentation of architectural space in advertisement and art when drawings are displayed on the polyhedral surfaces.



BASIC STUDY OF DAILY WORKING SCHEDULES OF CONSTRUCTION MANAGERS

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ABSTRACT

Building projects are characterized by contingent environmental factors, unforeseen events, and their individual nature. Construction site processes fluctuate during the course of a project, and are prone to disruptions. In order to still meet a project's goals for time, cost and quality, a higher level of effort is needed to manage a project. Therefore, the results of the on-site works are highly dependent on effective management. Lean Construction methods for identifying waste and increasing efficiency offer solutions for optimization of processes and can make a significant contribution to site management. The construction manager is in control of a building site, and has a key role in executing construction projects. Multiple and complex tasks together with the changing requirements of the everyday working conditions of a construction manager mean that his or her work must be carried out in a high pressure and high stress environment. A study by Germany's Federal Institute for Occupational Safety and Health (BAuA) on the topic of psychological stress placed on construction managers completed in 1997 derived similar conclusions pointing to factors such as cost pressure, working under time pressure and disruptions to work as the most common stressors. In order to gain insight into the current situation, six construction managers were observed in their everyday working environment (for a total of 55 hours). Thereby 371 activities were evaluated. The goal of the research was to evaluate the current and real state of the daily routine of construction managers. The results of the analysis showed that task switching, long working hours and increased effort for certain tasks were particularly common characteristics of a construction manager's daily routine. The average of the value for all construction managers is 08:03 minutes. The results demonstrate that the sequencing of the daily routine does not have any structure, and the various processes are not standardized. The work of the construction manager consists more of reacting to situations and less of structured actions. A lack of standards for construction site processes are hindering the creation of more structured construction management. Too frequent task switching and disruptions to work cause an increased burden on construction managers and prevent optimized management of the construction site. Improvements to the organization of work can reduce the stress on construction managers and improve site management. A possible solution would be increased structure to the working day. This could be divided into blocks of 90 minutes. Every block of work would be allocated a particular module of work. Different methods or characteristics define the various modules. Activities that require the attention of the construction manager for a defect-free execution of works could be allocated to the module Concentration. For example, checking drawings or calculations could be allocated to this module. The specific characteristics of the various modules allow an interruption free and concentrated way of working and thereby lead to a lower level of mistakes and save time during the workday. The allocation of different modules into individual blocks can be designed flexibly according to individual requirements. This modular work day allows a structure that while being flexible, allows routine and stability.



SINGLE IMAGE-BASED MODELLING ARCHITECTURE FROM A HISTORICAL PHOTOGRAPH

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ABSTRACT

Historical photographs are proved to be very useful to provide a dimensional and geometrical analysis of buildings as well as to generate 3D reconstruction of the whole structure. The paper addresses the problem of single historical photograph analysis and modelling an architectural object from it. Especially, it focuses on reconstruction of the original look of New-Town synagogue from the single historic photograph, when camera calibration is completely unknown. Due to the fact that the photograph faithfully followed the geometric rules of perspective, it was possible to develop and apply the method to obtain a correct 3D reconstruction of the building. The modelling process consisted of a series of familiar steps: feature extraction, determination of base elements of perspective, dimensional analyses and 3D reconstruction. Simple formulas were proposed in order to estimate location of characteristic points of the building in 3D Cartesian system of axes on the base of their location in 2D Cartesian system of axes. The reconstruction process proceeded well, although slight corrections were necessary. It was possible to reconstruct the shape of the building in general, and two its facades in detail. The reconstruction of the other two facades requires some additional information or the additional picture. The success of the presented reconstruction method depends on the geometrical content of the photograph as well as quality of the picture, which ensures the legibility of building edges. The presented method of reconstruction is a combination of the descriptive method of reconstruction and computer aid, therefore it seems to be universal. It can prove useful for single-image-based modelling architecture.



A CONICAL PERSPECTIVE IMAGE OF AN ARCHITECTURAL OBJECT CLOSE TO HUMAN PERCEPTION

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ABSTRACT

The aim of the study is to develop a method of computer aided constructing conical perspective of an architectural object, which is close to human perception. The conical perspective considered in the paper is a central projection onto a projection surface being a conical rotary surface or a fragment of it. Whereas, the center of projection is a stationary point or a point moving on a circular path. The graphical mapping results of the perspective representation is realized directly on an unrolled flat projection surface. The projective relation between a range of points on a line and the perspective image of the same range of points received on a cylindrical projection surface permitted to derive formulas for drawing perspective. Next, the analytical algorithms for drawing perspective image of a straight line passing through any two points were formulated. It enabled drawing a perspective wireframe image of a given 3D object. The use of the moving view point as well as the application of the changeable base elements of perspective as the variables in the algorithms enable drawing conical perspective from different viewing positions. Due to this fact the perspective drawing method is universal. The algorithms are formulated and tested in Mathcad Professional software, but can be implemented in AutoCAD and majority of computer graphical packages, which makes drawing a perspective image more efficient and easier. The presented conical perspective representation, and the convenient method of its mapping directly on the flat unrolled surface can find application for numerous advertisement and art presentations.



**MODELING GEOINFORMATION STRUCTURES FOR CIVIL ENGINEERING AND URBAN PLANNING
ACCORDING TO STANDARDS ISO AND INSPIRE**

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ABSTRACT

Map as a basis for civil engineering and urban planning projects has to be replaced, in present state of technologies, by a sophisticated system of geographic information to comprehend specific information structures and allow the users effective management of their developments. The structures comprise, in general, categories (classes) of objects, their properties (attributes), their behavior and mutual relationships. They have to be properly, uniquely, clearly and completely described (modeled) by means of a formal, computer-interpretable, language. Such a language is nowadays the most frequently used the Unified Modeling Language (UML) and a relevant methodology of modeling geographic information is known as the Model Driven Approach and is covered by the ISO standards of 19100 series and INSPIRE Data Specifications. The paper gives a review of this methodology with respect to specific applications relevant to civil engineering and urban planning such as: land use, transport networks, buildings and cadastral parcels. A more detailed authors concepts of models are given in relation to transport networks covering road, railroad, water and air transport which have as a common origin the existing in Poland database of topographic objects (BDOT). The paper presents the concepts in a general outline. As a conclusion it is expressed the need of interoperability of spatial data infrastructure items, including data relevant to civil engineering and urban planning projects, to provide common understanding and availability of the data and services among the reach variety of users. This can be achieved through using computer neutral and independent means such as UML and MDA.



**AN INFLUENCE OF INSTALLATION ERRORS OF THE PIEZOELECTRIC VIBRATIONS TRANSDUCERS
ON THE OUTPUT DATA**

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ABSTRACT

The paper examines an influence of installation errors of the piezoelectric vibrations transducers on the output data. A PCB Piezotronics piezoelectric accelerometers were used to perform calibrations by comparison. The measurements were performed with TMS 9155 Calibration Workstation version 5.4.0 at frequency in the range of 5Hz - 2000Hz. Accelerometers were fixed on the calibration station in a so-called back-to-back configuration in accordance with the applicable international standard - ISO 16063-21: Methods for the calibration of vibration and shock transducers - Part 21: Vibration calibration by comparison to a reference transducer. The first accelerometer was calibrated by suitable methods with traceability to a primary reference transducer. Each subsequent calibration was performed when changing one setting in relation to the original calibration. The alterations were related to negligence and failures in relation to the above-mentioned standards and operating guidelines - e.g. the sensor was not tightened or appropriate substance was not placed. There was also checked the calibration in accordance with current standards but modified the method of connection. The different kind of wax, light oil or grease was used or the other assembly methods were used. The aim of the study was to verify the significance of standards requirements and to estimate of their validity. The authors also wanted to highlight the most significant calibration errors. Moreover, it was demonstrated relation between various appropriate methods of the connection.



**STRUCTURAL VIBRATION OF A FLEXIBLE COMPLEX SYSTEM UNDER A HARMONIC OSCILLATION
MOVING FORCE**

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ABSTRACT

This paper focuses on the free and forced transverse vibration of a double-string complex system with elastic interlayer under a harmonic oscillation moving force. The complex systems are very important as structural members with high strength to weight ratios. The paper includes the study of a dynamic behaviour of a finite, simply supported double-string flexible complex system subject to concentrated harmonic force moving with a constant velocity on the top string. The strings are identical, parallel one upon the other. The elastic interlayer is described by the Winkler's model consists of a Hookean resilient spring distributed in parallel. The classical solution of the response of complex systems subjected to harmonic oscillation force moving with a constant velocity has a form of an infinite series. But also it is possible to show that in the considered case part of the solution can be presented in a closed, analytical form instead of an infinite series. The presented method to search for a solution in a closed-form is based on the observation that the solution of the system of partial differential equations in the form of an infinite series is also a solution of an appropriate system of ordinary differential equations. Responses of structures to moving loadings are often complex and difficult to understand, especially because of the complex nature of vibration and moving load speed repeatedly complicated systems. A string as a simple model of a one-dimensional continuous system resistant to tension but not to bending is often used in analysis of numerous engineering structures and has been a subject of great scientific interest for a considerable time. The reason for this interest is that the vibrations of a string are described by the wave differential equation. This allows one to see the wave effect in a string, contrary to many more complex systems where it might be either not present or not clearly visible. The double string connected in parallel by linear elastic elements can be studied as a theoretical model of composite structure in which impact of layers interaction, interlayer coupling effects and transverse wave effects are taken into account.



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SUBURBAN RURAL DEVELOPMENT IN THE METROPOLITAN AREA OF GDAŃSK

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ABSTRACT

The settlement network of the Metropolitan Area of Gdańsk is very extensive. Except small and medium-sized towns there are many villages. What is the development of such small centers located in the immediate neighborhood of a large city? Doesn't extensive management areas deteriorate the existing system? The Metropolitan Area has a rather unfavorable settlement system. There we observe the intensifying urbanization process around the agglomeration. The population growth in suburban villages is very dynamic. A lot of new housing estates arise currently, in the neighborhood of Gdańsk. The largest rural settlements has even more than 1,000 residents. In the paper, the method of analysis and comparison will be presented on the basis of three selected suburban villages.



SETTLEMENT NETWORK IN POLISH SPATIAL DEVELOPMENT REGIONAL PLANS

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ABSTRACT

In 1999, ten years after great political changes in Poland, 16 self-governed regions (in Polish: voivodeships) were created. According to Polish law, spatial development plans for voivodeships (shortly: regional plans) determine basic elements of a settlement network. There are no detailed regulation what elements of the settlement network and what feature of these elements should be determined. For this reason, centres adopt different names depending on a region. The purposes of the research described in this article were the following: (1) recognition and systematization of settlement network models determined in the regional plans; (2) assessment of readability of the planning establishments and the possibility of using them in practice of regional policy. Six models (types and sub-types) of settlement network in regional plans have been identified. Names of the levels of centers indicate that they were classified according to two criteria (1) as level of services, only in 4 voivodships, (2) according to their importance in development, in other voivodships. Hierarchical model referring to the centers of development is less understandable than in case of services. In most texts of plans, the centers are treated both as centers of services and development, independently from their names. In some plans, the functional types of towns and cities are indicated. In some voivodeships, establishments in the texts of the plans are too general and seem to be weakly useful in practice of regional policy. The Author suggests, that the regional plans should determine two kind of centers: hierarchical service centers and non-hierarchical centers of development. These last centers should be distinguished according to: (1) their role for activation of their surrounding; (2) level of development and necessity of actions for their development, (3) types of the actions of regional policy.



World Multidisciplinary

12-16 June, 2017 - Prague (Czech Republic)

Civil Engineering-Architecture-Urban Planning Symposium - **WMCAUS**



Session Title:
Regional Planning



GOVERNANCE AND TERRITORY

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ABSTRACT

The Bay of Biscay is located in the heart of district known as Donostialdea (San Sebastian). Together with the towns of Donostia-San Sebastian, Lezo, Errenteria and Oiartzun, it makes up the so-called Oarsoaldea region, a supramunicipal area of common interest. A urban continuum peculiar to the region, than may be better understood as an area of shared territorially with several elements in common and as a community where individual interests intersect with common interests. The importance of the geographical location of this region is more than notable. It is on the Bay of Biscay right where Spain curves northward to meet France; it is the only natural point of passage on the west end of the Pyrenees Mountains, with La Junquera in Catalonia at the east end, thus communicating the Iberian Peninsula with the rest of Europe. This is the strategic point for each and every known means of transport. The rail system consists of three different types of track gauge; the road network includes major motorways and the national road system; the airports at Hondarribia and Biarritz and the natural port of Pasaia complements this transportation node. All of this takes place in a small space, a natural corridor at the foot of Mount Jaizkibel. What was once considered modern infrastructures sufficient to meet transportation needs is today absolutely insufficient, obsolete and in operative. A set of partial solutions lacking an overall vision cannot be considered an integrated system. Therein lies the origin of the problem. Here is the diagnosis: The Port of Pasaia is obsolete. Pressure is felt from urban growth in the surrounding cities and from the restrictions of the Hondarribia airport. The roads are completely saturated and traffic continues to increase. The railway service is inefficient owing to three different types of track gauge. And each of these infrastructures is subject to its own restrictions and management. This forces us to think about the current state of these services and to come up with a new way of organizing this "infrastructures complex" that can efficiently solve the problems of mobility, based on the different services complementing each other. The system must be understood as a "whole", a system made up of individual parts which are effective in their relationship with the rest of the parts, a single way of understanding and dealing with the problem. The complexity involved in managing this situation and in developing common interest calls for the creation of a powerful and competent administrator and management entity. Governance is a fundamental 'factor' in achieving the objectives put forward by the community through its managers, as a goal for the transformation, improvement and development of the conditions in its territory and of its inhabitants. The 'social' character that any type of initiative means in this area takes on an unusual dimension due to the effect it reaches on this territorial scale. Hence, the importance of a territory-wide vision regarding local positions, and the need for an appropriate instrument.



LEGISLATIVE FRAMEWORK FOR LANDSCAPE PLANNING IN LATVIA

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ABSTRACT

With the adoption and ratification of the European Landscape Convention a legally justified need for a clear landscape policy was grounded in the European countries. That includes elaboration of new and improvement of the existing legislative documents on landscape planning, protection and management. The aim of the particular study is to analyze the existing legislative documents in Latvia influencing landscape planning on different scales, and to make a comparison with the situation in other European countries. The study emphasizes the complex structure of the Latvian legislative framework affected by the distribution of the normative documents under the various ministries. Therefore the main problem is unclear responsibility levels and organizing system for the solving the issues regarding landscape planning, protection and management. Thus the various discussions between the involved disciplines and responsible institutions are arising. Two groups of the legislative documents influencing the implementation of the landscape policy in Latvia are detected within the study. The first group is strategic documents determining main landscape planning principles and directions at the European, national, regional and professional or sector level. The second group is action documents providing a set of actions for the landscape planning, protection and management at the local or the municipality level. The study concludes that the action documents developed by the municipalities are in high importance because of their direct influence on the landscape planning in Latvia. This often leads to the different landscape planning requirements included in the normative documents of the neighboring municipalities, although the spatial and ecological borders of the visual landscape do not fit with the formal borders of the municipalities. Thus it is essential to develop the common principles and actions that would be incumbent on municipalities all to provide the landscape integrity and to protect its values according to the main principles defined in the European Landscape Convention.



REGIONAL DEVELOPMENT PLANNING IN THE SLOVAK REPUBLIC

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ABSTRACT

Regional development is very closely related to a region and its competitive advantages which affect the competitiveness of the region. The regional development is influenced by many factors that act differently depending on the region. To ensure the effective and harmonized regional development, the systematic approach is needed. Every region is unique and differs from the other by the level of economic development, living standards of its inhabitants, unemployment rate and by employment possibilities. Regional policy is a strategic investment policy which focuses on all regions and cities in the European Union. The aim is to boost economic growth and to improve the quality of people's lives. Solidarity is the main feature of the policy, because policy focuses on support for less developed regions. A fundamental aspect of regional development is to reduce disparities between the regions and cities. The paper focuses on the analysis of regional development of Slovakia. The intention is to follow the logical continuity of the articles "parts, the correctness and the adequacy of information and data. First part is focused on the definition of the regional policy and regional development. Important task is to identify the differences between European policies - regional, structural and cohesion policy. This section is prepared by using the analytical methods - the analysis, the casual and historical analysis. This part is based on literature review. The empirical part is based on statistics and secondary analysis which were aimed to analyze the regional development and effectiveness of its planning in the Slovak Republic. The question of this article is whether it is possible to plan the regional development by application of the plan for economic and social development.



**EVALUATION AND MAPPING OF CULTURAL ECOSYSTEM SERVICE FOR CULTURAL LANDSCAPE
CORRIDOR PLANNING BY PPGIS OF RESIDENTS**

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ABSTRACT

Cultural landscape corridors connect segregated landscape patches and points, linking the sites and areas with historical, cultural, natural and recreational values, promoting cultural communication and diversity between people from religions, providing access for public transportation and recreational activity, improving residential environmental and social wellbeing. It provides multiple ecosystem services that benefit human and presents various human activities. Thus, engaging the knowledge and value of local residents is important for the further landscape scenario planning and decision making of cultural landscape corridors. Unfortunately, as a systematical function, cultural ecosystem services have been rarely considered neither in assessments resulting in ecosystem management for landscape planning process, despite some isolated cases of cultural ecosystem services(heritage conservation etc.) are considered. In this paper, we perform a spatially mapping and evaluation of cultural ecosystem services through PPGIS by residents who are living in an area along a part of the cultural route of Silk Road in Western China. The case study is used to explore future options and public involvement on a cultural landscape corridor plan along the cultural route. The study includes several workshops with stakeholders and representatives from planning and administration along with the cultural route. Interviews and group discussions are carried out with the stakeholders. And public participatory (PPGIS) provides a participatory approach for local residents to investigate spatial cognition for ecosystem services evaluation and landscape decision-making process. The outcome is based on a mapping practice and survey with 80 stakeholders in 3 towns along the cultural route by PPGIS. The results highlight the diversity of cultural ecosystem service which is closely related to their local daily life in the local multifunctional area. Cultural tourism value and aesthetic values of landscape and landmarks are those receive most attentions among cultural ecosystem services mentioned in surveys. The study emphasized the particular pattern of perception and cognition of local residents grouped in different background, resulting in the hotspots pattern of various cultural ecosystem services which is closely related to local landscape characteristics through correlation analysis. This paper illustrates that evaluation and mapping of cultural ecosystem service should become a vital process inspiring cultural landscape corridor planning, management, and conservation, impacting scenario planning and strategy making for local landscape conservation and sustainable development.



URBANIZATION AS A THREAT TO THE NATURA 2000 PROTECTED AREAS: HOW ACCURATELY IS IT ASSESSED?

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ABSTRACT

Promoting efficient management measures in Natura 2000 protected areas in order to achieve the EU Biodiversity Strategy 2020 targets has become one of the most important challenges of the European biodiversity policies. In this regard, it is very important to assess the conservation status of each species and habitat and to deliver an accurate understanding of the current threats to protected areas. Urbanization, considered as a result of built-up area expansion, is a common threat to many Natura 2000 protected areas. This paper aims to report a lack of scientific and field-oriented approach for accurately identifying and establishing the urbanization level and intensity in protected areas. We consider the Eurostat database to evaluate the presence of urbanisation as a threat in Romania's Natura 2000 protected areas. We update the Eurostat database with information from the protected areas' management plans. Our results show that urbanization is considered as a threat in 32% of Natura 2000 protected areas, while in 46% it achieves high intensity. For representative case studies of Natura 2000 protected areas we assess the changes in built-up land between 2005-2016 both within and outside protected areas boundaries. We found that in many cases the urbanization is not really a threat. In order to solve this issue a clear methodology has to be developed to accurately assess the urbanization as a threat to protected areas. Such a methodology is important to be considered not only for urbanization, but also for the other threats faced by protected areas.



TYOLOGY AS A TOOL FOR LOOKING BRAND NEW REGION IDENTITY

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ABSTRACT

Vistula delta region is specific due to historical settlement. The area is very interesting example of the hydraulic heritage of civilization. A special role in shaping the structure of the polder area played XVII century Dutch settlement. This lanscape physiognomy of Vistula delta is specific and very difficult for building. Space for water, as in similar dutch delta, is mainly located below sea level. Unfortunately the identity of the region has been braked by the destruction of 1945 warfare. Post-war radical farming and settlement increased this process. Today, there are indications, the need and conditions to create a new identity of the region, based on exogenious spatial values strongly associated with water. Aim of the research is to find brand new typology of projected water-related spatial solutions in the region. Creating a typology can aid in the formulation of water settlement system, which will influence brand new identity of the region. It can be a helpful tool for coordnation of flood protection and spatial planning in river delta. Reinterpretation of the main advantages of spatial solutions, strongly water-related, could become a new social process of settlement. It is important, that typology takes into account values of the landscape, but also its potential danger. Nowadays, creating space for water requires different solutions below sea level and above. Formulation of typology, as result of interdisciplinary studies, will help in determining the optimal design solutions in order to create a new identity of the region.



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Session Title:

Sustainable Urban Development



**OFF THE SCALE – EXPANSION OR DEVELOPMENT? A SMALL TOWN WITHIN A METROPOLITAN ZONE
AS AN ALTERNATIVE PLACE OF RESIDENCE**

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ABSTRACT

The goal of this paper is to point out the types of spatial changes that the small towns located in Krakow's range of influence are currently undergoing, as well as what are the consequences of the various types of changes in these towns. The author asks the question whether the current changes seen in small towns that are under the influence of Krakow can be described as sustainable development – at the basis of which is the increasing of the quality of the functional and spatial structure of a town while preserving its qualities and character – or, on the contrary, that it is more appropriate to describe the changes in the spatial structure of towns as an expansion, which is related only to an increase in their surface area or an increase in the density of their built environment? An attempt has also been made to determine the cause of these changes. An analysis of a set of towns in terms of their accessibility in relation to Krakow, as well as the demographic changes in towns in recent years, has been carried out. This research was useful in determining the dynamic of urban changes or their stagnation. Afterwards, groups of towns with varying degrees of transformation (towns that have been intensively transformed, towns with a balanced degree of spatial changes and towns which remain on the sidelines) were established. In addition, various forms of changes were defined – ranging from cities which register an increase in attractiveness and the changes that it brings while preserving their qualities in accordance with the principles of sustainable development, to settlements which are losing their small-town character as a result of intensive change, at the same time undergoing unification both in terms of space and form of use. From among the groups of towns, examples which most fully illustrate the varying degrees and character of the changes of small towns in the area of Krakow have been selected. Based on the research that has been conducted, we can state that small towns in the vicinity of Krakow are undergoing intensive changes and are an attractive alternative in terms of serving as a place of residence, for instance in comparison to the suburban zone of Krakow. However, it is necessary to channel the changes in small towns in a manner that would take advantage of the opportunities for spatial, social and economic development on the one hand, while at the same time causing the intensive changes in those areas to not lead to the loss of their uniqueness, identity and small-town character, as well as the qualities of both a given town and its surroundings on the other. The research that had been performed and the conclusions that were drawn from it can serve as comparative material for other types of small towns and for metropolitan areas.



BALANCING HERITAGE CONSERVATION AND SUSTAINABLE DEVELOPMENT: THE CASE OF BORDEAUX (FRANCE)

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ABSTRACT

Over the past few decades sustainability concerns has gained central importance in the contemporary debate on the future development of cities, due to the fast urbanization, the increasing pollution, the intensity of climate change and resources consumption. In this worldwide context a particular category of city is suffering from pressures never seen before: the historic urban landscape where urban conservation strategies have to be integrated within the large goals of sustainable development, as affirmed by the recent UNESCO's Recommendation on the Historic Urban Landscape adopted in 2011. The Recommendation reflects the actual international attention given in order to find a holistic approach which integrates urban conservation and development in a social, environmental, economic and cultural sustainable balance. In this framing certain questions emerge: how urban conservation can open up to sustainability, while keeping intact tangible and intangible values and heritage? What are the strategies and policies implemented? Recognizing sustainability as a primary challenge that urban conservation faces, the current paper aims to present, starting from an international perspective, the case study of Bordeaux, a port city in south-western France. Bordeaux since 2007 is inscribed as an inhabited historic city on the World Heritage List on the basis of an outstanding urban and architectural ensemble, but at the same time has developed a series of interesting policies in order to avoid the "museification" of the inner city, with the aim of ensuring a "historic living city", able to evolve and develop itself in a sustainable way over time, in accordance with its heritage. For these reasons the case of Bordeaux is emblematic to demonstrate the possible adaptation of urban conservation tools in order to take into account sustainability aims and shows a great step forward in wedding heritage preservation and sustainable development, currently still far from being a common practice.



HOUSING AGGLOMERATION IN THE VULNERABLE ZONE: ANALYSIS ON LAND GOVERNANCE AND STAKEHOLDERS' DYNAMICS IN THE NORTHERN BANDUNG AREA

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ABSTRACT

The physical development of Northern Bandung Area is characterized by the formation of a peri-urban area; reflecting a growing mega-urban region marked by a mixture of rural and urban activities. This process is continuing, and even grew faster after 1980s to mid 2000. Northern Bandung is experiencing land transformation from agriculture and forest to housing cluster and commercial area. Northern Bandung also faces problems of uncontrolled land conversion that lead the area to become more vulnerable and high risk. There is high demand for living space in Northern Bandung, which causes land conversion related to land market and weak land governance. Land market process in Northern Bandung tends to do as capital gain by the private developers and lack of development inspection related to spatial plan by the governmental agencies. For the indigenous people, many lands are fragmented to be inherited by the children or grandchildren, or to be sold. Since the land becomes smaller and the agriculture is no longer profitable, this leads to land selling and encourages land use change. Land conversion from agricultural into non-agricultural is uncontrolled. A lot of housing clusters have reinforced spatial segregation by life style and status. The indigenous people turn into minority within the neighbourhood. There is a tendency of municipal government in Bandung Metropolitan Area to exploit land resources excessively by issuing development permits to private developers. The area of Northern Bandung should be managed through an integrated land use planning and spatial development plan at all governmental level. Institutional development is now critical to ensure the sustainability of Northern Bandung.



TOWARD COMPREHENSIVE DEVELOPMENT AND SUSTAINABLE MOBILITY - BUENOS AIRES CASE

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ABSTRACT

This paper is introducing Buenos Aires' achievements and challenges in implementing comprehensive development and integrating efficient and sustainable transport system within its urban structure. There are several important steps in these process starting from urban regeneration of Puerto Madero, the introduction and then implementation of a strategic plan "Modelo territorial (2010)" and of "Buenos Aires' Plan de Movilidad Sustentable (2013)". The last one - Sustainable Mobility Plan helped Buenos Aires win several prestigious rewards for innovative approach to mobility and sustainable transport and leadership in combating climate change. Buenos Aires City government demonstrates strong leadership by implementing well-planned BRT solutions, stressing the importance of political will and support, flexibility and an open mind in listening to the points of view of all stakeholders involved. Unceasing effort of the city, to listen to the points of view of all stakeholders involved, is the most demanding but also most vital part of this process. Buenos Aires has made a very important step toward sustainability by supporting development of more sustainable modes of transport, increasing share of voyages done by bicycles and improving walkability of the city centre. The last initiative combined with strong focus on public spaces is adding to tourist attractiveness based on diversity of capital of Argentina. Also large scale development project of Puerto Madero has much stronger impact, both positive and negative on the city in which it is situated, then urban regeneration projects in Europe or Northern America. By building the new mixed-use centre Buenos Aires used opportunity to consolidate its position as competitive knowledge centre with diverse morphology based on port heritage.



HYDROGRAPHIC BASINS ANALYSIS USING DIGITAL TERRAIN MODELING

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ABSTRACT

The paper, emphasis the link between digital terrain modelling and studies of hydrographic basins, concerning the hydrological processes analysis. Given the evolution of computing techniques but also of the software digital terrain modelling made its presence felt increasingly, and established itself as a basic concept in many areas, due to many advantages. At present, most digital terrain modelling are derived from three alternative sources such as ground surveys, photogrammetric data capture or from digitized cartographic sources. A wide range of features may be extracted from digital terrain models, such as surface, specific points and landmarks, linear features but also areal features like drainage basins, hills or hydrological basins. This wealth of information may be used in applications such as hydrological runoff simulation, geomorphological modelling, and support of interpolation procedures or in cartographic generalization digital terrain models. The paper, highlights how the use an appropriate software for the preparation of a digital terrain model, a model which is subsequently used to study hydrographic basins according to various geomorphological parameters. As a final goal, it shows the link between digital terrain modelling and hydrographic basins study that can be used to optimize the correlation between digital model terrain and hydrological processes in order to obtain results as close to the real field processes.



NURSING HOMES AND THEIR SPATIAL CONTEXTS - FINDINGS FROM AUSTRIA

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ABSTRACT

Against the background of aging and the increasing number of persons in need of care on one hand and the decreasing potential of family support on the other hand, nursery homes both in rural areas as well as urban areas of Austria receive importance as final residence. The brochure "Residential and Nursing Homes in Austria", edited by the Federal Ministry of Labour, Social Affairs and Consumer Protection, is the only "printed" database in Austria that provides information on each residential and nursing home for elderly people in order to provide decision support for persons concerned or rather interested. Each description covers information on the number of beds and nursing services as well as on spatial related aspects such as location, accessibility, and leisure activities. Information related to the latter are all optional. The reliability has not been checked. Basing on data from the year 2014, this contribution aims at analyzing relevant spatial related information on 875 residential and nursing homes in different urban (cities, towns/suburbs) and rural contexts in order to 1. demonstrate how spatial related aspects are considered in the facilities' presentations (kinds of spatial related aspects, detailed information, missing values), 1. illustrate the level of community integration of these in-patient offers (involvement of volunteers, dialogue with the municipality), 2. understand facility-specific future plans (necessities to act, requirements for improvement), 3. reveal important questions and define urgent research demand (planning in general at its different spatial levels) 4. stimulate the interdisciplinary and cross-cutting dialogue (e.g. spatial planning meets architecture, spatial planning meets social sciences and humanities)



THE SELF MADE CITY –ALTERNATIVE LIVING AND URBAN DEVELOPMENT MODELS

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ABSTRACT

With more and more people moving to urban centers worldwide, new solutions for growth are needed; strategies for densification that actually improve and bring benefits to the surrounding neighborhood. The "Self Made City" is about how people not only take over unused spaces with temporary interventions, but have been developing long-term solutions for their own living environments. The self-determined design of space, building, living and working, be it in the form of the baugruppe or co-housing, co-op"s, co-working spaces, or other project forms, has produced an architectural diversity and quality in Berlin over the last fifteen years that is exemplary. New co-op associations are increasingly building community-determined, socially oriented and highly ecological urban projects throughout Europe. These projects are helping to redefine participative processes and offer alternatives for development that greatly cut costs but bring high building quality at the same time. Key are the spaces and public places where people not only come together, but also have the feeling that they belong and can have a hand in the way things are—that they can do something there. This is the "Self Made City" where people are finding ways on every level to create their own niches and oases, together with others. The growth of the sharing society greatly contributes to a new urban spirit. But also in a tangible way, shared spaces offer amenities that balance tighter private living quarters and offer high quality to urban lifestyles. However, all too often we see how our cities are determined mainly by profit-driven developments and short-term oriented investments, or how the most expensive apartments in the center of the city stand empty as luxury assets, while the majority of citizens struggle to afford the ever-increasing rent prices. More than an architectural project: who makes the city? What are the qualities and potentials of Self Made projects? Can self-organized projects be more than a niche market and have a real impact on the development of the city? Which strategies and development models can contribute positively? The self-made projects not only create living spaces that are based on the real needs of people today, but also bring new neighbors into existing communities that have a vested interest in staying there and "making city"—adding to the micro economies and sustainable, resilient urban development. We can observe how, in a very short period of time, the projects just in Berlin have grown from small in-fill buildings with just 8 parties to the SPREEFELD with 64 parties and currently projects with upwards of 400 living units. The final text will cover ten examples that illustrate these important qualities, focusing in-depth on 3 projects that show typologies for cooperative mixed-use and in what ways the projects can be scaled up to large development models—manifestos that inspire us to think about the future of urban residential construction and quality urban ways of life in general. These examples will show: _How initiators set objectives and what kinds of goals these are: Urban (mixed-use, open public space) Social and Societal (inclusion, contribution and sustainability) Architectural and Ecological (adaptability, new typologies and construction methods) _Who the various initiators are, what kinds of constellations and project timelines? How this model effects the professional role of architects? Self-made projects with real impact Currently, citizens are recognizing that ultimately city-owned land must be used wisely with long-term social and financial goals in mind and not sold to the highest bidder for development. England, Finland and many other countries are reestablishing policy in order to facilitate collective building. So, lets go from being consumers to being pioneers and create livable cities that are constantly driven with new ideas that come from within. The success of our cities in the future will hinge upon how we utilize further development to improve urbanity—with an adequate amount of suitable, affordable living and working spaces, and planning that meets our growing ecological challenges. The quality of these developments will determine our resilience; not only of the built environment, but also socially, in terms of the people living there and how society interacts and evolves. Together, we can make our cities better places.



THE MAIN PROBLEMS OF FORMATION OF ECOLOGICAL COMPENSATION SYSTEMS IN LITHUANIAN URBAN TERRITORIES

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ABSTRACT

Formation of the territorial ecological compensation system, which is often labeled as a nature frame (NF), ecological or green network, is an integral part of the intensive land management process of a civilized society. However, in Lithuania, the planning and practical formation of the nature frame system within the existing and perspective residential areas are facing a number of problematic situations. Areas with ecological compensation functions identified and localized in spatial planning documents in the existing and potential building development zones form a kind of problematic territories. Conservation requirements and activity restrictions provided for the nature frame system in such documents very often do not match the future users' needs and expectations. For that reason, the planning and localization of ecological compensation systems in the central parts or planned development zones of the settlements, in contrast to the relatively natural areas, should be more rigorously and scientifically based in the process of distinguishing NF territories, setting and adjusting their boundaries, substantiating their ecological value. The planning process of NF in the documents of master and special territorial planning should be consistently described and linked to the rank of the planning documents and aligned with the operating scale of the drawings. In addition, it is essential to establish the system of the detection of geo-ecological potential of NF territories for that will allow the differentiating of NF areas into qualitatively distinct parts attracting respectively different sets of management tools. Full-scale functioning of the NF territories in the potential building development zones is directly related to a greater or lesser anthropogenic activity, including building development. For that reason, the use of NF area should be linked to clearly and unambiguously defined, depending on the the functional purpose of NF spatial components and their geographical location, differentially applied norms. The latter should be expressed by the possible minimum and maximum permissible territorial urban structure parameters (the minimum allowed cadastral land plot size, the maximum allowable building density, the mandatory minimum green space, etc.), as well as by providing alternative remedies for the compensation of the naturalness loss. Scientific justification, creation of the legal framework and formation of practical recommendations would help to objectively reduce the conflict between NF and urbanized areas. This would also improve the quality of living environment and enable maintaining and enhancing the geo-ecological potential of ecological compensation areas.



ECOLOGICAL FOOTPRINT IN RELATION TO CLIMATE CHANGE STRATEGY IN CITIES

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ABSTRACT

Ecological footprint determines how much natural resources are consumed by an individual, city, region, state or all inhabitants of our planet in order to ensure their requirements and needs. It includes all activities, from food consumption, housing, transport to waste produced and allows us to compare particular activities and their impacts on the environment and natural resources. Ecological footprint is important issue for making sustainable development concept more popular using simplifications which provide the public with basic information on situation on our planet. Today we know calculations of global (worldwide), national and local ecological footprints. During our research in cities we were concentrated on calculation of city's ecological footprint. The article tries to outline theoretical assumptions of climate change consequences in cities of Bratislava and Nitra (Slovakia), to describe potential of mitigating adverse impacts of climate change and to provide information for general and professional public on theoretical assumptions in calculating ecological footprint. The intention is to present innovation of ecological footprint calculation, taking into consideration ecological stability of a city (with a specific focus on micro-climate functions of green areas). Present possibilities to reduce ecological footprint are presented.



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THE INFLUENCE OF LAW REGULATION ON SPATIAL PLANNING AND INVESTMENTS IN SOLAR ENERGY: CASE OF POLAND

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ABSTRACT

The aim of the work is to analyze changes in the law on spatial planning and investment in solar energy in Poland. Spatial order in the municipality is formed by the Local Spatial Development Plan, Study on Conditions and Directions of Development and zoning decisions. Changes in the law relating to these three elements have the greatest impact on how the planning is realized by the municipality, also for RES investment and the dynamics of their development. Analyzed regulations on investments in RES in other EU countries, ie., Germany and Greece. We analyzed the process, which the investor has to go through before being able to finalize investments in photovoltaic farm. Especially they analyzed the limitations that are regulated by the country and the EU.



LIMITS OF COMPLEX ENERGETIC RENOVATION IN CASE OF HISTORICAL BUILDINGS

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ABSTRACT

The building sector is one of the most influential energy consumer in Europe, where the energy utilization of buildings has been constantly increasing in the last 20 years. In most European Union countries, the buildings are responsible for more than 40% of the total primary energy consumption, from which the buildings built before 1960 have a substantial ratio. The development of historical downtowns were analogical until the Industrial Revolution across Europe, which results in a dense, sometimes organic inner city surrounded by a newer, looser urban fabric. The inner districts of the case study area, Budapest, contain mainly historical style, turn of the century tenement houses with enclosed courtyard. A significant part of the historical houses of Budapest downtown are in a run-down condition, due to the lack of maintenance. Their characteristics are often not sufficient for today's health, economical or ecological requirements, thus eventually becoming run-down or being demolished without proper rehabilitation. In case of contemporary buildings, the sustainability and energy saving aspects are becoming more and more important, although their number is insignificant compared to the energetically inefficient buildings. Thus it is obvious to consider the aging building stock when researching energy efficiency measures. The historical, turn of the century buildings of Budapest have distinctive, sculptural facade, which cannot be insulated by using the most common insulation technologies. Also, the renewable energy utilization has its own boundaries in the case of dense urban fabric, which raises further difficulties in cost-efficiency. Their problem, however, requires solution because of the large quantity of the building stock. There are certain possibilities to insulate even the sculptural facades and geometrically restricted structures, which methods are discussed in the present paper.



PRIMARY ENERGY OF THE SETTLEMENT UNIT AND SUBURB

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ABSTRACT

In members states of the European Union, portion of buildings in the total consumption of energy represents 40%, and their share in CO₂ emissions represents 35%. Taking into account dependence of the European Union on import of energy, this represents a large quantity of energy and CO₂ in spite of the fact that effective solutions for the reduction of energy demand of buildings exist. The European Union adopted three main commitments for fulfilment of criteria by year 2020 in the 20-20-20 Directive. Based on this Directive Slovakia declares support for renovating the building stock. The goal of the paper was to prove that renovation of the building stock is environmentally and energy advantageous as construction of new buildings. In the paper were compared the settlement unit with suburban. Both territories are dealt with in Slovakia in Kosice city. In the settlement unit are apartment dwelling houses, amenities, parking areas and green. Suburban part contains family houses. The decisive factor for the final assessment of the buildings was global indicator. Global indicator of the energy performance is primary energy. The building has to meet minimum requirements for energy performance, it has to be classified to energy class A1 since 2016, and to energy class A0 since 2020. The paper analyses effect of the use of different resources of heat considering the global indicator. Primary energy was calculated and based on comparable unit. The primary energy was accounted for on the built-up area, floor area and number of inhabitants. The study shows that the lowest values of global indicator is achieved by using wood. The highest values of global indicator are achieved by using electricity or district heating as an energy source. The difference between the highest and lowest value is 96%. Primary energy based on inhabitant is 80% lower by settlement unit compared to the suburban.



PERSPECTIVES ON PERI URBAN AREAS DEVELOPMENT IN ROMANIA

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ABSTRACT

Urban systems expansion outside of original borders to suburban areas, in parallel with population growth, especially by migration from central to peripheral areas, strains the need of soft and hard measures and investments correlated not only with adequate financing but also with elements related to sustainable development. Investments in physical infrastructure could frame elements of added value in peri-urban areas, but in the same time wasted resources if they are not implemented in accordance with local policies across entire targeted territory. Targeted investments and priority services leads to new perspectives metropolitan area (re)definition. Integrated investments bring a new perspective metropolitan area definition. In high percentage only pure technical and economic analysis aims to establish the optimal projects size beyond the real population needs. This article examines the development prospects of peri-urban areas in Romania in terms of physical infrastructure endowment with excessive funding of major projects. Also is analyzed targeted investments in physical infrastructure across different cities from Romania weighing filed projects needs financed by operational programs. Population stringent needs require problem solving, as well as mobility and accessibility, housing or public facilities whether it is implemented in central areas or peripherals.



CULTURAL ECOSYSTEM SERVICES AWARENESS TO ENHANCE THE QUALITY OF URBAN PARKS

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ABSTRACT

As the resource of ecosystem services is scarce in urban areas, they become even more relevant for decision-makers (Kabisch and Haase, 2014). The multiple ways, in which humans interact with urban green spaces including parks, makes landscapes multifunctional. Parks provides a number of ecosystem services (MEA, 2005) to society, such as provisioning (e.g., food) and regulating (e.g., pollution control) services (Potschin and Haines-Young, 2006; Primdahl and Swaffield, 2010), and a variety of cultural services, such as cultural heritage, and amenity (Bromley, 2000; Wascher, 2000; Belletti et al., 2002; Yrj   and Kola, 2004). The urban parks also provide cultural services by giving people opportunities to recreate and experience nature in the city. As the cultural values that over time are fundamental in the allocation of quality at a landscape and the logic of its use change, ecosystem values change over time. The issue of landscape quality is central in many both national and European policies. The European Landscape Convention (Florence, 2000) requires that for any place of life, whether ordinary or outstanding, "landscape quality objectives" can establish in relation to a precise definition of its users / clients (Bossi, 2008; Faro Convention, 2005). Thus, unlike environmental assessment, which can more easily refer to universal conditions, determining landscape quality requires the recognition of the value attributed by the population (expected to change over time). A value, in fact, exists, is effective, compared to someone who expresses it. It presupposes a point of view and, therefore, is a properly subjective expression, linked to the place and at the time in which it is expressed (Magoni, 2011), although mitigated by the tools and procedures used for the identification. Already at the beginning of the twentieth century Alois Riegl, in his essay *Der moderne Denkmalkultus* (The modern cult of monuments), listed some categories of values, many of which are still applying to landscape elements. First, the "historical value" that comes from the recognition of the membership of an element to a historical period, but also from his reading as evidence of human or natural history. Connected to the historical value are the value of "integrity", which refers to the state of preservation and completeness of a landscape structure (English Heritage, 2008; Agnoletti, 2011; UNESCO, 2015) and that of "authenticity" that refers to the persistence over time of landscape systems (Nara Convention, 2005; UNESCO, 2015). Then there is an "ecological and natural" value, which reveals the state of health of ecosystems, and expressed in terms of rarity, diversity, representativeness. There is still an "identity" value (or symbolic value or communal value) that is the meanings of a place for the people who relate to it, or for whom-it figures in their collective experience or memory (resulting in traditions, commemorations, uses and costumes, etc.). Our culture considers the "aesthetic" value of the landscape that is not solely its beauty. The aesthetic value can be the ways in which people draw sensory and intellectual stimulation from a place (English Heritage, 2008). Today, we recognize also an economic value of the landscape due to both the use of resources and through the jobs involved in its protection, management and planning, than to its cultural value that can contribute to the socio-economic development of a context more indirectly through its contribution to the tourist industry. Anyway, the economic value of the landscape is not only to be understood in monetary terms (for example looking at the price of real estate located in relevant landscapes) but as a common good, from which everyone should be able to benefit freely without affecting its quality or availability (Council of Europe, 2013). Finally, a "social" value tied to its importance for quality of life, health, and to its capacity to the creation of local cultures (Council of Europe, 2013). At the same time, landscape indicators need to be context specific, fluid and mutable, as meanings, values and people behaviours change over time and



space in response to economic, technological, social, political and cultural drivers (Morcillo, 2013). We empirically examine the generation of ecosystem services and investigate the co-production of ecosystem services in the context of a specific environmental setting, characterised by different landscapes: agricultural, natural and fluvial ambiances. The methodology consists of analysis and detection of ecosystem cultural services in the two time thresholds, the determination of the values in monetary terms, a cost / benefit analysis taking into account the investment intervened for the creation of the park and revenues in place, a review of the results. Taking advantage of the studies for the modification of the Parco Nord Milano Territorial Planning and contextual strategic environmental assessment, we have been proposed the study of the cultural ecosystem values in two different historical thresholds representing the past (1975, year of birth of the Park) and the current condition. The park is located in northern Italy close to the city of Milan. This area appears to be a particularly complex and diverse territory, densely populated and with infrastructures, subject to an intensive process (ongoing and still far from the end) of “tertiarisation”, often arranged for separate parts due to the persistence of large underused production facilities. However, it also plays an important role as a link between different parts of the Milan metropolitan area and where it is essential the presence of Milan's Parco Nord as a cornerstone of a fragile environmental system defined around the Lambro and Seveso rivers and local protected areas. The Park is a park “built” and the result of an architectural design modelled on the territory. In fact, it covers an area of about 640 hectares in one of the most densely urbanized Europe, characterized by the presence of large industrial areas (now almost all abandoned) and large building neighbourhoods that, over time, have welded the periphery north of Milan to its hinterland seamless. Just for the purpose of an environmental and landscape recovery of residual agricultural plots escaped the overbuilding and otherwise destined to disappear in time meets the institution of the Park. The study aims at improving the awareness of ecosystem values during the process of planning building. We empirically examine the generation of ecosystem services and investigate the co-production of ecosystem services in the context of a specific environmental setting, characterised by different landscapes: agricultural, natural and fluvial ambiances. The methodology consists of analysis and detection of ecosystem cultural services in the two time thresholds, the determination of the values in monetary terms, a cost / benefit analysis taking into account the investment intervened for the creation of the park and revenues in place, a review of the results.



CORRELATIONS BETWEEN CLIMATE CHANGE AND THE MODERN EUROPEAN CONSTRUCTION

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ABSTRACT

The aim of the research study was to examine what are the relationships between climate change and a way of shaping contemporary urban or contemporary urban development is shaped in response to climate change, which are used in construction materials and technologies, as climate change will affect the type of applied technology and materials. The most important results included the effects of analysis of selected examples of modern European building, the use of materials and technologies, adapting buildings to the changing climate. Selected examples of contemporary architecture from Germany, Italy and Denmark, Norway and Sweden. Also used in the work of photographic documentation. They were the most important criteria influencing the climate on the building due to the changing climate, and also take into account existing legal provisions and technical requirements. The main conclusions were that the modern urban construction is adapted to the changing climate. Unprecedented climate phenomena: intense and sudden rain, snow, floods, strong winds, plentiful sunshine, large temperature changes, shock tectonic effect "of the city - heat island", atmospheric pollution require a different shape of buildings and central areas in a manner consistent with the development of sustainable. The materials and construction technologies contribute to an optimum saving of natural land resources, buildings are shaped in a way that ensures safety, resistance and structural impact on the environment. However, there is still a need for continuous monitoring of climate change, the criteria influencing the design and structure of objects urban and central areas.



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SUSTAINABILITY TRENDS REFLECTED IN THE ARCHITECTURE OF THE EXAMPLES OF EUROPEAN

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ABSTRACT

In modern architecture, one of the leading trends are striving to obtain the most economical energy-efficient building. Eco-development focuses on contemporary use, inter alia, the technological and material solutions that meet the conditions in most of the existing laws by using renewable energy sources. These findings apply primarily to new objects. Old, historical already existing superstructure is treated in a manner less demanding adaptation to environmental conditions, mainly on the behavior of the aesthetic. This can be disadvantageous for these properties due to increased operating costs, and thus the loss of attractiveness. At work, an attempt was made on the basis of the analysis of the literature and documentation shoot made "in situ" possible use of latest technological developments to both the renewal of the historical buildings of the central areas of European cities through the renovation of an existing building or the emergence of subsidiary buildings while preserving the cultural values, aesthetic or symbolic objects, the environment. Analyzed examples show possibilities of adapting new and upgraded properties both to your power requirements, green and to the context of the existing built environment and cultural heritage.



CORRELATIONS AESTHETICS AND ECOLOGICAL TECHNOLOGY IN ARCHITECTURE HOUSING IN SOME EXAMPLES OF GERMAN, DANISH, SWEDISH AND NORWEGIAN

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ABSTRACT

Contemporary problems of residential architecture are focused mainly on the issues of energy efficiency and the impact of building on the environment. An equally important aspect of the built environment is its aesthetics. The use of modern, energy-efficient building materials and technologies in residential architecture affects the aesthetics of the building. The study attempts to analyze some aesthetic, modern facilities and residential areas located in Denmark, Germany, Sweden and Norway. The main elements studied were: the size of buildings, housing estates, division, management and arrangement of individual social spaces, to adapt to the trends of renewable energy sources and the quality of aesthetic objects and social spaces. The study was based on an analysis of literature and photographic documentation made "in situ". Analyzed examples show specific aesthetic elements used in housing construction due to the adaptation of these objects to the requirements of renewable energy sources. In this environment, there is a lot of natural elements, as well as technical elements related to energy efficiency, energy production, both in buildings and the use of space. In the studied examples, there are correlations between aesthetics and environmentally friendly technologies and building materials. The materials, urban layout and structure of the objects reveal trends naturalistic and ecological. Adapting to the needs of users is different and depends on the size of the housing complex and its structure.



GREEN INFRASTRUCTURE AS AN OPPORTUNITY TO ENHANCE BIODIVERSITY AND ECOSYSTEM SERVICES

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ABSTRACT

The concept of Green Infrastructure (GI) emphasises the quality as well as quantity of urban, peri-urban greens spaces and natural areas, their multifunctional role, and the importance of interconnections between habitats. If a Green Infrastructure is proactively planned, developed, and maintained it has the potential to guide urban development by providing a framework for economic growth and nature conservation. GI includes parks and reserves, sporting fields, riparian areas like stream and river banks, greenways and trails, community gardens, street trees, and nature conservation areas, as well as less conventional spaces such as green walls, green alleyways, and cemeteries. Today we have to face new challenges about increasing energy use, decreasing water resources, limited spaces and ecological preservation. This problem must be solved in a sustainable way using innovative GI that combine technology with landscape design by enhancing ecosystem services provision. The aim of this research is to evaluate and develop multifunctional role of GI in terms of biodiversity and ecosystem services" enhancement by taking into account two case study in southern Italy: Constructed Treatment and photovoltaic energy plants. An effective way of tackling water resource problem is to use Constructed Treatment Wetlands (CTW) as low-cost alternative to conventional secondary or tertiary wastewater treatment. For this purpose an annual monitoring of fauna and vegetation has been carried out in order to identify species of national and international interest strongly related to the new habitats availability. Results have shown the ability of CTW in providing ancillary benefits, well beyond the primary aim of water purification, such as sustaining wildlife habitats and biodiversity at local and global scales, as well as its potential role in terms of recreational and educational opportunities. In the second case, We have developed a GI project idea that proposes to evolve the photovoltaic energy plants in southern Italy, especially in Apulia region, into "new urban photo-ecological gardens". The aim of my research is to harmonise economic development and biodiversity conservation to safeguard the ecological processes that underpin human well-being, creating a strong synergism between renewable energy planning and valorization of ecosystem services. Therefore, A new approach is developed to manage photovoltaic solar farms, shifting from "negative vegetation management", aimed mainly at the elimination of invasive plants, to "active vegetation management", i.e. the cultivation of plants with an economic and ecological value. This approach would offer many opportunities for integration between economic development, nature conservation and public health promotion.



RENEWABLE ENERGY AS CATALYST FOR SUSTAINABLE URBAN DEVELOPMENT

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ABSTRACT

The quest for urbanization is leading to the rapid growth of cities world-wide. Growth is impossible without energy. For our cities to grow sustainably, energy, which is the life-line between economic and social growths, must be sustainable. Sustainable energy is at the centre of sustainable cities and climate change issues. In this regard, renewable energy resources are one of the most efficient and effective solutions. The use of renewable, clean and efficient energy is increasing and will be the effective and practical choice to guarantee future global development. Renewable energy sources such as solar, wind, biomass and geothermal offer solutions for various problems that challenge the development of many regions around the world. The vital role and the potential of renewable energy in regional development have been globally recognized, however, its widespread implementation is not progressing as rapidly as is needed. Amongst other, this may be due to poor legal framework, lack of strategic energy policies, lack of finance to exploit and meet up with technological advancements, lack of political will, lack of research institutions, poor data bank, absence of a national energy council, absence in world bodies like the world solar council, weak human resources, poor publicity of a country's potentials as well as lack of knowledge in the area of renewable energies. In this paper, will be presented an overview of techniques and options of renewable energy such as wind, solar, tidal, wave and biomass energy; how to develop a secure and sustainable energy infrastructure that is reliable and affordable; energy efficiency in buildings and industry as a way of reducing the emission of CO₂ and cost of energy; and how to translate international climate policy targets to national mitigation actions in the area of sustainability and climate change adaptation.



SUSTAINABLE SOLUTIONS FOR GATED HOUSING ESTATES - CREATING A FRIENDLY AND SAFE SPACE WITHOUT A FENCE

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ABSTRACT

The housing developments of the 1990's and of the first two decades of the XXI century have elevated a fence to a symbol of luxury. Polish cities started to resemble guarded ghettos, in which tall walls delineate the borders between that which is worse and generally accessible and that which is superior, guarded and enclosed. Access to green areas has been restricted in a lot of places. Gated housing estates rise in opposition to socialist housing blocks with bad technical condition and many small flats with cramped rooms. Unfortunately, gated housing complexes offer often only a faux-luxury product - with high density of buildings on small plots, very expensive parking places, lack of recreational areas and greenery. Additionally the social conflicts rise up between residents of "old" and "new" housing estate. From several years in Poland voices are being heard which say that fences instead profits bring a number of drawbacks. Many communities see the differences in the manner of the shaping of housing environment in Western European cities and chaotic development of Polish cities. The members of the administration are becoming their allies more and more often, as they have finally been provided with the tools allowing them to combat this state of affairs. In the year 2016, the authorities of two of the largest cities in Poland decided to wage war on fenced off residential complexes. They have been given this possibility thanks to the Landscape Act of 2015, which allows the implementation of legal limitations regarding the construction of fenced off residential complexes. Why the gated communities has dominated the landscape of Polish cities? Searching for safety - that is a main reason, and that's why people choose living in a closed residential areas. But often this safety is misleading - the fence and guard are not substitute something more important to get safety - good social relations in neighbourhood and to identify with the place of living. Not only local administration has an opportunity to fight with gated residential areas - likewise architects and developers can shape an attractive housing space, which don't need barriers. Sense of security and good neighbour's relations can be shaped by urban structure of housing complexes and architectural form of housing buildings. Scientific research of Jan Gehl, Kazimierz Wejchert (and other architects, sociologist, psychologist etc.), on social life in urban space shows the solutions how we can create modern housing environment to enhance social relationship and then a sense of security. In this article author wants to explain a different architectural and urban solutions used in housing estates in Poland and other European countries which are good practice in shaping friendly and safe housing environment. Perhaps this solutions became an guidelines in developing housing estates in polish cities. The fence is not only need to live in attractive and safe housing estate. But to prove that we need not only good law solutions and restrictions for developers, very important is good practice - creating friendly and safe public spaces in housing estates which will be accepted by local communities.



THE DIVERSIFICATION OF LOCAL ECONOMY THROUGH URBAN ANALYSIS: THE CASE OF ALAUSÍ, ECUADOR

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ABSTRACT

Alausí is a small town located in the middle of the Ecuadorean Andes. Its history has been empowered by two main activities: agriculture and the construction of the Ecuadorean Railroad. Since the end of the 19th century, the railroad has been the most important activity for Alausí. Its location turned it into the connection point between the port of Guayaquil and the Ecuadorean highlands. The town was used as the headquarter to build up “la Nariz del Diablo”; in Spanish, “The Devil’s Nose”; a complex system of ramps used by trains to climb up to the mountain valleys. Since then, the train has been the only source of income in Alausí. Unfortunately for this town, the Government of Ecuador wasn’t always able to maintain the national railroad network. It started to collapse partially, since the 1970s. During the 1990, Alausí’s economy declined, turning it into a Ghost Town. However, the train and Alausí had a recovery since the beginning of this decade. The National Government started a plan to recover the railroad; much more as part of Ecuador Historical Heritage, than as a transportation infrastructure. Nowadays, the train works as a touristic attraction, taking local and foreign travelers across the country. Obviously, the train recovery improved local economy in Alausí. However, they fear to be unprepared for another crisis in the near future. This study was done with the purpose to find how to diversify Alausí’s economy, searching for undeveloped activities that do not rely on the train. The methodology used for this matter combined site recognition of the town’s actual condition, a small charrette with the community, and an urban analysis via GIS, done with the obtained data. The results show a broad specter of alternatives that go from extreme sports, archeological attractions in the outskirts, to the rescue of Alausí historical buildings.



SAFETY ANALYSIS OF BIKE LANES ON BI-DIRECTIONAL NARROW STREETS

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ABSTRACT

Bike lanes are increasingly popular among planners and designers to serve cyclist traffic. They assist in channelize cyclist traffic along the road side and promote accommodating response by motorists. Bike lanes occupy lateral space on the road sides which can be an issue in case of limited road width. This problem is especially pronounced within urban streets and central business districts. The competition for space as well as necessary resolution of conflicting movements are often a complicated tasks which require compromise by involved road users. On narrow streets intended to serve two directions, it is sometimes impossible to afford bike lanes for both directions along with vehicular traffic lanes. In these cases, bike lanes can be painted with the intention of channelizing cyclist traffic and promoting following behaviour (single-file operation) of motorists. The treatment analyzed in this study takes place in the downtown area of the City of Ottawa, Canada. The study site is a street with limited right of way and bi-directional wide traffic lane. The vehicular traffic is advised to follow the cyclists (if any) along the latter's path and overtake them whenever possible. Gap availability in opposing traffic along the bi-directional central lane is the criterion for overtaking a leading cyclist. This treatment has the potential for efficient utilization of what is essentially significantly restricted road space. The study involves video data collection before as well as after this treatment. The video data is analyzed and a number of performance measures are identified before and after the treatment. These performance measures are: cyclist speed, rate of overtaking maneuvers, and gap acceptance. The study further analyzes the change in the behaviour of cyclists and motorists. The post-treatment data is to be collected in the spring of 2017 and is to be analyzed.



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PREDICTING MAPS OF GREEN GROWTH IN KOSICE (SLOVAKIA)

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ABSTRACT

The paper deals with changing the traditional roofs of KoÅ¡ice into green roofs. Possible areas of city housing estates, after taking into accounts conditions of each of them (types of buildings, statics o buildings), are listed in the paper. The research is picturing the prediction maps of KoÅ¡ice city from 2017 to 2042 in 5 years interval. The paper is a segment of a dissertation work focusing on changing traditional roofs into green roofs with the aim to retain water, calculate the amount of retained water and show possibilities how to use this water.



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INTER-RELATEDNESS OF 3D URBAN ANALYSIS OF CITYSCAPE AND DATA-BASED BENCHMARKING IN COMMUNAL PLANNING

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ABSTRACT

The recent trends in urban planning indicate enhancing relations between computer tools and analytic methodologies in planning and monitoring of urban processes. The contemporary possibilities to collect and storage a different kind of data concerning the communal development, arise the questions about how such tools as 3D virtual city models can be applied in data collection, how to use data concerning the communal development in order to improve the communal planning and what type of data based on 3D urban analyses have the best informational potential for benchmarking methods? The authors propose in the paper the analytical approach to the data collection based on analysis in 3D virtual city models environment, their selection and evaluation using the benchmarking method. This approach will be applied on hand of examples of selected small historic towns in the West Pomeranian Region in Poland in reference to urban structure transformation and development in the years 2004-2014. This period, due to the EU subventions, was a time of outstanding communal grow and improvement of the city structures. One of the measurable factors to be used in benchmarking approach is transformation of urban structure parameters. The results of application of individual 3D computer methods for analysis of city structures in the chosen town examples are used in benchmarking manner of analysis to enrich evaluation of cityscapes of small towns. The inter-relatedness between computer environment and benchmarking method will also undertake the task of evaluation of the development tendencies. The data-based benchmarking approach will indicate suggestions of development directions for the towns in the future.



APPLICATION OF GIS AND REMOTE SENSING IN MULTI-TEMPORAL STUDY OF CITIES SPATIAL DEVELOPMENT

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ABSTRACT

The aim of this paper is to present the possibility of using remote sensing data and GIS techniques as tools to obtain information about changes that occurred in a given time period in an urbanized area. Archival data has been used for analyzes: Landsat MSS, Landsat TM images, topographic map scans (from the 80's and 90's) and current data: Topographic Database (BDOT10k), orthophotomaps, Digital Terrain Models (DTM), OpenStreetMap (OSM)(www.openstreetmap.org), Urban Atlas (UA) database (<http://land.copernicus.eu>), ortofotomaps, Sentinel-2 and Landsat 8 images. The cartographic and elevation data were obtained from the Main Office of Geodesy and Cartography (Główny Urząd Geodezji i Kartografii GUGIK)(www.mapy.geoportal.gov.pl), while satellite images from USGS and Copernicus servers (www.ers.cr.usgs.gov and www.scihub.copernicus.eu/apihub). At present, in Poland, the primary source of information on topographic objects is the BDOT 10k database, which was created in the years 2012-2013. The amount and variety of information contained within it can also be used as a source of statistical data. The article presents the sequential steps of integrating vector and image data into one GIS system and the process of mapping spatial changes in particular periods. For this purpose, analyzes were performed on selected BDOT10k database object classes and then compared with topographic maps made in 1988, 1998 and with the orthophotomaps (satellite and aerial). A map of changes was also generated on the basis of quantitative analyzes. The areas in which the largest number of new objects (roads and buildings) have been identified and the changeability over time has been demonstrated for selected sites. The spatial analysis of the change of the development area was carried out in consecutive periods of time. Results are presented on appropriate maps that perfectly visualize the spatial development of the area under study



ENERGY-WATER-FOOD SYNERGY POSSIBILITIES IN HOUSING ENVIRONMENT

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ABSTRACT

Strategic directions of development of contemporary cities, according to emerging master plans and policies are providing appropriate technical, spatial, social and economic conditions for the inhabitants in a sustainable way. In order to improve the urban areas' performance and to minimize the negative environmental impact there are new solutions introduced to save energy, water and food resources. There are actions undertaken to educate and activate community that also appear in the way of designing housing environment, especially public spaces accompanying residential areas. Therefore there are experimental forms of buildings and urban spaces designed to meet the demands of community serving the environment at the same time. There have been a variety of solutions implemented successfully in housing environment to solve either the problems of energy or water management, and also bringing up the food production problem especially in the contact areas between the buildings and their surroundings. Nowadays we are searching for a new type of housing environment, a home for the resilient community capable of independent development. In order to create that kind of space there is a need of new solutions providing synergy between energy, water and food management and production. There is a need of identifying the new type of architecture that is capable of satisfying the contemporary community demands. The paper is an attempt to classify the implementation of synergy solutions in housing environment. It also refers to the significance of natural elements of composition in achieving energy, water and food independence. The trends in architectural design of contemporary residential areas are described based on contemporary investments and future city concepts.



ASSESSING THE RELIABILITY OF LAND-USE DATA IN SLOVENIA: A CASE STUDY OF TERRACED LANDSCAPES

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ABSTRACT

Land use relates to the exploitation of land through human activity in the landscape. Land use is also one of the best indicators of a landscape's structure and processes. Land cover comprises manmade surfaces, agricultural areas, forest and semi-natural areas, wetlands, and bodies of water. In Slovenia more than half of the land (63%) is forested. Manmade surfaces represent less than 5%. The forested area is increasing where there is already forest cover. In areas with intensive farming and especially in suburban areas, there is also pressure on forests. A large proportion of relatively inaccessible forest is the main reason why society had a less critical impact on forests in the past in Slovenia in comparison to the majority of central European countries. Regarding the high-quality landscape in the country, Slovenia's natural features are characterized by a mix of forest and farmland. These land categories (i.e., complex cultivation patterns and land principally used for agriculture with significant areas of natural vegetation) cover 23% of Slovenia. Land-use data for farmland are gathered and provided to the relevant institutions by landowners, who are not specialists in land-use data. In addition, land use is only a two-dimensional tool, which does not recognize elevation differences and terraced slopes. Terraced areas are either omitted from the inventory of land-use data because landowners do not report them, or they are included in the inventory because landowners do not realize that their land is not terraced. Consequently, the differences between the official data on vineyards, orchards, and olive groves on terraces and actual terraced slopes with such land use may differ significantly.



IDENTIFYING AND FIGHTING URBAN HEAT ISLANDS

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ABSTRACT

Urban heat island (UHI) has been proved. Green, blue and white strategies to mitigate UHI are known. Creating urban comfort and building skin optimization lowers cooling energy demand and emissions, i.e. heat production hence it iterates towards urban comfort. However, the empiric approach is not sufficient for balancing outdoor comfort in particular inter-building situations. The urban model requires blending of thermo-radiative and CFD simulations. The SOLENE-microclimat tool complied with the prerequisites. Diverse scenarios of universal thermal comfort index (UTCI) in a small neighbourhood in Prague were investigated. The second case study was done for a building in the Philippines with different skin quality evaluating the energy cooling demand. The third case study presents the CFD analysis of wind speed in a planned high-rise buildings neighbourhood in Prague. The implications for the renewable energy systems can be taken from the case studies.



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Session Title:

Urban Sociology



**MONUMENTS IN THE STRUCTURE OF AN URBAN ENVIRONMENT: THE SOURCE OF SOCIAL MEMORY
AND THE MARKER OF THE URBAN SPACE**

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ABSTRACT

The major research objective was to analyse the role of monuments in the formation of local residents' and guests' representations about the city, its history and traditions. The authors consider the system of monuments' location in the urban space as a way of its social construction, as the system of influence on citizens' aesthetic feelings, as the formation of their attitudes towards maintaining of continuity in the activities of different generations for the improvement of the territory of their permanent residence. Methodology The urban monument is considered in two ways: as a transfer of historical memory and as a social memory transfer, which includes the experience of previous generations. One of the main provisions of the study is the idea that monuments can lose their former social value, transforming into "simple" objects of a public place. The study was conducted in the city of Yekaterinburg, one of the largest, cultural, scientific and industrial Russian megalopolises in 2015. The primary data was collected using standardized interviews. Four hundred and twenty respondents at the age of and above 18 were questioned on the basis of quota sampling. Interviews with respondents were conducted in order to identify key problems involved and reasons for shaping respondents' representations of monuments in the urban environment typical for the population of Russian megalopolises. The standardized interview guide included 15 questions. Findings and discussion. Our investigation has revealed that different monuments fulfill various functions in an urban environment (ideological, aesthetic, transferring, valuable, etc.). The study has unequivocally confirmed that objects in the urban space have a different emotional colour background: people paint them in accordance with the feelings that arise in their perception. Hence, some monuments effectively fulfil the functions of social memory' transferring: they are remembered, they tell us about the events to which they point. Other monuments in the physical space remain in citizens' consciousness only as a point on the map of the city. It has been found that "old" and "new" monuments as semantic points of the urban space have an ambiguous perception and a significance for the citizen: some monuments are inscribed in mental maps, while others are ignored or their appearance is condemned.



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Session Title:
Economics and Politics



LOCALISATION DECISIONS OF ENTREPRENEURS: THE ROLE OF PATH DEPENDENCY AND MARKET FORCES

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ABSTRACT

According to the business literature, numerous factors affect entrepreneurs deciding to start new companies or open new branches of existing ones, including regional or local labour markets, infrastructure, the environment and economic and social stability. However, the literature rarely considers factors related to path dependency and market forces, as it focuses on factors attracting investors to new destinations, which usually change the local economy's structure and renew the local or regional development path. Large new investments are one of the most significant mechanisms allowing local or even regional economies to break out of path dependency. However, little is known about the localisation decisions relatively small and local, home-grown companies make. Companies make many of these decisions in every community, and these decisions are likely to be path-dependent and market-driven. In fact, path dependency interweaves with market forces, as suppliers, competitors and clients may be path-dependent to varying extents. Low barriers to market entry and the ease with which substitutes can be introduced can also lead to path dependency. Thus, the purpose of this research is to determine the role of path dependency and market forces in the localisation decisions of entrepreneurs from different industries. We hypothesise that most industries develop new entities based on the number of companies from the same industry that already exist in a region. In some industries, the number of entities may even decrease when industry rivalry is high. We also hypothesise that entrepreneurs create new entities based on related industries that include not only suppliers, clients and substitute providers but also industries operating within the same knowledge pool. To test these hypotheses, we used the data mining method decision tree learning. The input variables are the number of companies from 86 industries located in 2,531 communities in Poland in 2009. The target values are the number of new companies from these industries created in the years 2009–2015. Decision trees allow us to predict how many new companies from each industry will be created in communities given the precise number of companies from the same and related industries and the number of communities in which these relationships occur. Thus, the trees indicate the elements of economic structure influencing the creation of new companies from every industry to the greatest extent. The principal results show the diverse role of path dependency in the process of new company creation. Most industries related to agriculture, fishing, forestry, and manufacturing are path-dependent. The service sector seems to be less dependent, as services usually serve other industries. Hence, service industries' related variety is often broader than that of manufacturing industries, so it is easier to renew a development path through services than through manufacturing. In turn, competition within manufacturing industries decreases the number of companies in these industries, so path dependency seems to negatively impact these industries and hamper their development.



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Session Title:

Risk Management and Mitigation Planning



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A NOVEL APPROACH TO GAS PIPELINE RISK MANAGEMENT UNDER INFLUENCE OF HORIZONTAL STRAINS

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ABSTRACT

The costs of laying and maintenance of gas transport infrastructure depend to a certain degree on such factors as safety of gas pipelines. The hazard relating to the potential loss of tightness and breaking should be excluded and their probability minimized. The gas pipelines frequently have to pass through areas which are subject to anthropogenic movements and deformations. A proper analysis of potential influence of impact of such deformations on the gas pipeline in the aspect of failure occurrence can be done by predicting deformations, taking into account causes of ground movement. On the other hand the hazard also depends on technological factors connected with the pipeline design. The presented method is based on the artificial intelligence methods and allows for variant evaluation of the risk of the gas pipeline sections. Its application can contribute to the optimization of the cost of protection of the planned pipelines and evaluation of demands as far as maintenance of the existing lines is concerned. The method has been exemplified in the paper.



RISK MANAGEMENT IN COMPLEX CONSTRUCTION PROJECTS THAT APPLY RENEWABLE ENERGY SOURCES: A CASE STUDY OF THE REALIZATION PHASE OF THE ENERGY EDUCATIONAL AND RESEARCH

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ABSTRACT

Nowadays, one of the characteristic features of construction industry is increased complexity of an increasing number of projects. Almost each construction project is unique, has its project-specific purpose, its own project structural complexity, owner's expectations, ground conditions unique to a certain location, and its own dynamics. Failure costs and costs resulting from unforeseen problems in complex construction projects are very high. Project complexity drivers pose many vulnerabilities to a successful completion of a number of projects. This paper discusses the process of effective risk management in complex construction projects in which renewable energy sources were used, on the example of the realization phase of the ENERGIS teaching-laboratory building, from the point of view of DORBUD S.A., its general contractor. This paper suggests a new approach to risk management for complex construction projects in which renewable energy sources were applied. The risk management process was divided into six stages: gathering information, identification of the top, critical project risks resulting from the project complexity, construction of the fault tree for each top, critical risks, logical analysis of the fault tree, quantitative risk assessment applying fuzzy logic and development of risk response strategy. A new methodology for the qualitative and quantitative risk assessment for top, critical risks in complex construction projects was developed. Risk assessment was carried out applying Fuzzy Fault Tree analysis on the example of one top critical risk. Application of the Fuzzy sets theory to the proposed model allowed to decrease uncertainty and eliminate problems with gaining the crisp values of the basic events probability, common during expert risk assessment with the objective to give the exact risk score of each unwanted event probability.



EFFECTIVE RISK MANAGEMENT IN INNOVATIVE PROJECTS: A CASE STUDY OF THE CONSTRUCTION OF ENERGY-EFFICIENT, SUSTAINABLE BUILDING OF THE LABORATORY OF INTELLIGENT BUILDING IN CRACOW (POLAND)

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ABSTRACT

Many construction projects fail to meet deadlines or they exceed the assumed budget. This scenario is particularly common in the case of innovative projects, in which too late identification of a high risk of delays and exceeding the assumed costs makes a potentially profitable project untenable. A high risk level, far exceeding the level of risk in standard non-innovative projects, is a characteristic feature of the realization phase of innovative projects. This is associated not only with greater complexity of the design and construction phases, but also with the problems with application of new technologies and prototype solutions, lack of qualified personnel with suitable expertise in specialized areas, and with the ability to properly identify the gaps between available and required knowledge and skills. This paper discusses the process of effective risk management in innovative projects on the example of the realization phase of an innovative, energy-efficient and sustainable building of the Laboratory of Intelligent Building in Cracow - DLJM Lab, from the point of view of DORBUD S.A., its general contractor. In this paper, a new approach to risk management process for innovative construction projects is proposed. Risk management process was divided into five stages: gathering information, identification of the important unwanted events, first risk assessment, development and choice of risk reaction strategies, assessment of the residual risk after introducing risk reactions. 18 unwanted events in an innovative construction project were identified. The first risk assessment was carried out using two-parametric risk matrix, in which the probability of unwanted event occurrence and its consequences were analyzed. Three levels of risks were defined: tolerable, controlled and uncontrolled. Risk reactions to each defined unwanted events were developed. The following risk reaction types were considered: risk retention, risk reduction, risk transfer and risk elimination. Three-parametric risk matrix was developed to make it possible to assess residual risk after implementing risk reactions. The possibility of implementing risk management was inversely proportional to the probability of unwanted event occurrence and its contribution to the project outcome. Introducing this risk management strategy allowed to significantly reduce the risk of the innovative construction project. It proved to be an effective tool to reduce risk to an acceptable level. It had a significant contribution to carrying out the project within the assumed time, budget and quality standards.



SEISMIC ANALYSIS OF PORTUGUESE ADOBE BUILDINGS

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ABSTRACT

Adobe masonry is one of the oldest and most diffuse building techniques hence a significant percent-age of people live in earthen constructions. Considering the likely unfavourable behaviour under seismic action of adobe construction, the present work aims at providing a seismic fragility characterization of two adobe Portuguese traditional buildings, using numerical models calibrated over experimental results. Two case-study buildings located in the region of Aveiro, Portugal, were numerically modelled to estimate their structural behaviour under seismic loading. The adobe material properties were calibrated based on the experimental results of a cyclic in-plane test of a full-scale I-shaped adobe wall (carried out at the University of Aveiro). Fragility functions were then derived, based on the above-mentioned numerical models, using nonlinear static analysis. The method chosen to characterize adobe masonry and model its nonlinear behaviour followed a total strain crack-based macro-modelling (TSCM) approach, whereas pushover analysis was carried out to reproduce the pseudo-static experimental test in order to allow a refined calibration of adobe masonry mechanical properties. Among different possible nonlinear static procedures, N2 method was then used for the demand estimate of each adobe dwelling, for ten different return periods. As engineering demand parameter, top displacement was chosen to express the building capacity and fragility curves were finally derived as function of peak ground acceleration (PGA) as intensity measure for different limit states. Yielding and collapse limit states were hence identified according to the ground motion intensity, bringing further insight on the seismic fragility of traditional Portuguese adobe dwellings.



LANDSLIDE RISK: AN ECONOMIC VALUATION IN THE EASTERN ZONE OF MEDELLIN CITY

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ABSTRACT

Natural disasters of a geodynamic nature (landslides or mass movements) can cause enormous economic and human losses. The economic costs of a landslide disaster include relocation of communities and physical repair of urban infrastructure. However, when performing a quantitative risk analysis, generally, the indirect economic consequences of such an event are not taken into account. Landslide risk assessment has become more applied in recent years, since it generally has a lower economic and environmental impact in relation to the cost of structural interventions, thanks to its ability to reduce risk by means of warning systems to the exposed population and its infrastructure, so that the respective actions can be taken to avoid or reduce risk and to prepare an effective disaster response. Many efforts have been made in shaping databases and inventories of events associated with disasters, both at the global, regional and national levels, which are the center of the risk assessment process, but generally suffer for the level of detail of the assessments, the interaction between the landslides and their economic consequences, and the reliability of the models used for the assessment of the elements exposed to a potential threat of mass movement. A probabilistic approach methodology is proposed that considers several scenarios of hazard and vulnerability to measure the magnitude of the landslide and to quantify the economic costs. With this approach it is possible to carry out a quantitative evaluation of the risk by landslides, allowing the calculation of the economic losses before a potential disaster in an objective, standardized and reproducible way. The possibility of comparing different scenarios facilitates the urban planning process, the optimization of interventions to reduce risk to acceptable levels and an assessment of economic losses according to the magnitude of the damage. For the development and explanation of the proposed methodology, a simple case study is presented, located in eastern zone of the city of Medellín, and corresponds to an area adjacent to the slope of the urban area in commune 8. This area has particular geomorphological characteristics. The conditions of deposits in the residual soils and the presence of local geological faults and several streams. It is also characterized by the presence of several buildings in bad structural conditions, which extend to the foot of slope.



NUMERICAL SIMULATION OF BLAST ACTION ON CIVIL STRUCTURES IN URBAN ENVIRONMENT

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ABSTRACT

Nowadays, a lot of industrial accidents accompanied by explosions are happening throughout the world. Also, increase in the number of terrorist acts committed by means of explosions is observed. For improving safety of buildings and structures it is necessary to raise their resistance to explosive effects, as well as to be able to predict degree of potential damage upon explosive loads of various intensities. One of the principal goals in designing the structure resistant to explosive effects is to determine the dynamic response of structures to the impact of the blast wave. To this end, the transient pressure loads on the walls of the civil engineering structures are to be determined. The simulation of explosion is highly complicated, involving an explosion causing the shock wave propagation in air and then interaction with a structure. The engineering-level techniques permit one to estimate an explosive shock impact only for isolated buildings. The complexity of the building, the presence of nearby structures and the surrounding environment can't be taken into account. Advanced computer aid engineering (CAE) software techniques combined with the latest methods of discrete three-dimensional city modelling permits one to simulate and analyse the effects of explosions in urban areas with a precision which previously was not possible. In the paper, the simulation results are presented of shock wave forming due to a spherical explosive charge and its propagation in the vicinity of geometrical configuration imitating an urban environment. The numerical simulation of a flow in the vicinity of prisms of different cross-sections and heights located on a flat plate was performed. The calculations are carried out in a three-dimensional non-viscous formulation using ANSYS software. On a basis of simulation results, a complex wave structures were analysed, and all the peculiarities of flows and pressure history records on building walls were described and explained. The possibility of a correct description of the non-stationary wave flow in the vicinity of the complex of obstacles is demonstrated. The results are compared with the experimental data on the pressure distribution in gauges located on the prism walls. The estimation of shock wave exposure intensity was performed to different objects.



PROPOSAL FOR HOLISTIC ASSESSMENT OF URBAN SYSTEM RESILIENCE TO NATURAL DISASTERS

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ABSTRACT

Urban system is a complex mix of interdependent components and dynamic interactions between them that enable it to function effectively. Resilience of urban system indicates the ability of a system to resist, absorb, accommodate to and recover from the effects of a hazard in a timely and efficient manner. Most existing research consider individual components separately. On the other hand, the proposal of this study is to assess the urban system as a whole, considering all relevant components and their interactions. The purpose of this paper is a study of possibilities for holistic evaluation of urban system resilience to natural disasters. Findings from the preliminary study are presented: (i) the definition of urban system and categorization of its components, (ii) a set of parameters of individual components with impact on disaster resilience of the entire system, (iii) analysis of different methods and approaches for resilience assessment. According to extensive literature review a new conceptual framework for urban resilience assessment is proposed. Urban system components that influence the resilience to extreme natural disaster (e.g. earthquake) the most are buildings (e.g. key important buildings and other buildings), open space (green and built surfaces), their interconnections (infrastructure) and social capital. The lack of such urban qualities has proved to be fatal for city system as seen on several examples of strong earthquake motions in the past and recent time. In the presented paper a conceptual model of urban system by abstraction of its components as points (buildings), surfaces (open space, social capital) and links (infrastructures) is created. Each component in the suggested model is defined by its own quantitative attributes, which have been identified to have an important impact on the urban system resilience to natural disasters. System is presented as mathematical graph model. Natural disaster is considered as an external factor that affects the existing system and lead to some system distortion. In further analyses mathematical simulation of various natural disasters scenarios are going to be carried out, followed by comparison of the system functionality before and after the accident. Various properties of the system (accessibility, transition, complexity etc.) are going to be analysed with graph theory. The final result is going to be an identification of critical points and system bottlenecks as basis for further actions of risk mitigation.



RISK ASSESSMENT OF MINERAL GROUNDWATER NEAR ROGASKA SLATINA

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ABSTRACT

Rogaška Slatina (E Slovenia) is famous by mineral water, therefore the spa tourism and the production of natural mineral waters are the powerful economic activities in the city. Groundwater resources of mineral and thermo-mineral water are invaluable for planning a sustainable spatial and economic development of the area, which requires a protection of this natural heritage. Numerous previous investigations of Rogaška groundwaters were subjects to balneology and to demands for larger exploitation quantities, that is why information are missing that are essential for definition of the Rogaška fractured aquifer system with mineral and thermo-mineral water and for its protection. Besides, their management faced with the organization and administrative problems during the last decades. Political changes in the nineties led to the ownership fragmentation of spa tourism and bottling companies of natural mineral water. The new companies very poorly cooperate among themselves. Each one obtained the concession and the water permit, however their programs are not harmonized and they base on old research results. The Bottling Company of Droga Kolinska d.d. was aware of the problem, therefore it initiated and co-financed the presented isotopic investigations. The isotopic investigations of groundwaters stored in the Rogaška Slatina fractured aquifer system were performed aiming at answering open questions on the groundwater recharge and dynamics, on connections between different types of aquifers and on solute transport. Environmental isotopes 2H , 18O , 3H , 13C of dissolved inorganic carbon and 14C were analysed in mineral, thermo-mineral and spring waters. Results indicated the source and mechanism of groundwater recharge, its renewability, a transit time distribution, hydraulic interrelationships, the groundwater origin and its evolution due to effects of water-rock interaction. The mean residence time estimates of mineral and thermo-mineral water in the aquifer are between 3400 and 14000 years. On the other hand, the mixing processes between younger and older waters or mineral and spring waters are reflected as well as waters that infiltrated predominantly after the 1960s. These suggest the vulnerability of the research systems to man-made impacts. The presented results coupled with available information on a physical hydrogeology and a water chemistry assess the optimal balance between the environmental protection and economic use of mineral water resources in the study area. They are essential for the protection strategy development of mineral and thermo-mineral water in the Rogaška Slatina area bringing together the state administration and local authorities and stakeholders.



BASIC STUDY ON TERM OF WARRANTY LIABILITY FOR MISCELLANEOUS WORK

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ABSTRACT

In Korea, defect lawsuits for apartment buildings, the most common housing style, are becoming a social issue. Among various issues in defect lawsuits, warranty of liability is very important. This is because the business entities are responsible for assuring the maintenance of the defects during this period, and at the same time, the residents can request fair compensation for the defects. However, provisions on the term of warranty of liability provided in the current Housing Act were made 40 years ago when the social basis were weak. Thus, it does not have any rational foundation. In order to improve these problems, basic research on the warranty of liability by major types of apartments is needed. In this study, the defect cases for miscellaneous works of apartments were examined and analyzed. Miscellaneous work consists of ondol work, kitchenware work, indoor and outdoor equipment work, and metallic work. Among them, kitchenware work and metallic work showed a lot of defects. On the other hand, warranty of liability covers up to 10 years in total. The defect occurrence for the entire miscellaneous work showed a tendency to concentrate in the first and the second year. It is the third year that the total defects reach 95%, and the fourth year that exceeds 99%. The ondol work, indoor and outdoor equipment work and metallic work had this tendency. On the other hand, for kitchenware work, it is the third year that the defect occurrence reaches 99%, and it implies that the defect tends to occur more quickly than in other detailed works.



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PROMOTING AN INFORMATION FUSION IN RAILWAY INDUSTRY: A CASE STUDY OF CROYDON TRAM DERAILMENT

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ABSTRACT

Railway industry owns a massive amount of data subject to various components of train (and tram) operations and infrastructures. These data remains valueless until it turns into information, that is, a study of information fusion is highly recommended. Thus, this paper offers a taxonomy of existing techniques and technologies in information fusion, and followed with a discussion of successful stories relating to safety-related industry. The central theme of this paper is to promote an information-based method to potentially eliminate a contributing factor of the human errors in tram operations. A case study of the Croydon tram derailment tragedy is presented. Understanding components of information fusion serves as a catalyst to railway industry to actively participate in the exploration of hidden information which might improve the current safety policy and/or strategy. The research findings illustrate by an example of an unanticipated source of dividend in an investment of data management.



**DEVELOPMENT OF 3D GIS MODEL FOR SEISMIC HAZARD ANALYSIS OF SUBDUCTION ZONE
EARTHQUAKES AROUND ANTALYA (SW TURKEY) TESTING**

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ABSTRACT

Determination of seismic sources in detail to understand behavior and segmentation of fault systems is one of the most important steps in probabilistic seismic hazard analysis. In preparation of source maps, determining the seismic activity level of active fault systems comprises basic database of earthquakes. South west of Turkey is one the seismically active regions in Turkey and it lies above the Cyprus Arc subduction zone. It is the site of large earthquakes ($M_{max}=6.5$) and the hazard analysis show that the larger magnitude earthquakes are probable in the future. In the literature up to present source zones were widely defined by seismicity in 2D. Hence, after evaluation of the studies carried out around Antalya, it has been realized that subduction-zone has been ignored in seismic hazard analysis. As a result, these studies mislead the outcomes of seismic hazard analysis. In this study a 3D model was developed using Geographical Information System (GIS) to characterize the earthquakes around Antalya and to separate earthquakes which belong to the subduction zone and crustal tectonic structures of the region. The GIS supported the definition of the orientation and dip angle of the subducting plates and the depth distribution of the earthquakes. The system also enables a detailed extraction of earthquakes to support recurrence rate calculations in Probabilistic Seismic Hazard Assessment (PSHA). For PSHA of a tectonically complex region, 3D GIS is an effective tool to envisage the focal distribution and for better understanding of tectonic structures. 3D GIS can be used to define the source zones based on the distribution of observed seismicity. This simplifies definition of source zones and calculation of recurrence rate. The developed PSHA reflects the actual seismo-tectonic conditions and therefore estimation of the seismic hazard will be more complete. Studies show that the subduction-zone earthquakes in the study area can be categorized into three groups i) Interplate subduction source zone earthquakes, ii) Intermediate depth subduction area source (50 – 80 km) and iii) Deep subduction area source zone (80 – 150 km). The subduction starts around latitude 35° and dip direction of the subduction is N10E. Down to a depth of about 80 km, slope of the subduction is around 16° and then the dip angle rises to 44° down to 150 km.



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Session Title:

GIS-Based Modelling for Mitigation Planning



ANALYSIS OF THE DEVELOPMENT OF AVAILABLE SOIL WATER STORAGE IN THE NITRA RIVER CATCHMENT

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ABSTRACT

World is changing dramatically. Every sphere of our life is influenced by global climate changes, including agriculture sector. Rising air temperature and temporal variability of rainfall are crucial outcomes of climate changes for agricultural activities. Main impact of these outcomes on agriculture is change of soil water amount. Soil water is exclusive resource of water for plants. Changes of soil water storage are sensed very sensitively by farmers. Development of soil water storage was analysed in this paper. The Nitra River catchment is covered by nets of hydrological and meteorological stations of Department of Biometeorology and Hydrology, Slovak University of Agriculture in Nitra. Quantity of available soil water storage for plants was calculated for every month of years 2013-2016. Calculations were done based on real measurements for soil horizon 0-30 cm. Ratio between real available soil water storage and potential available soil water storage was specified. Amount of potential available soil water storage was derived by retention curves of soil samples. Map of risk areas was created in GIS in pursuance of these calculations. We can see the negative trends of available soil water storage in years 2015 and 2016. Main addition of this paper is selection of areas where soil moisture is limiting factor of agriculture. In these areas is necessary to do mitigation measures for sustainable development of agricultural activities.



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ANALYSIS OF THE EDUCATION INFRASTRUCTURE THROUGH THE USE OF GEO-REFERENCING SOFTWARE AND PAJ

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ABSTRACT

The distribution policies of the national budget have been showing an increasing trend of the investment in education infrastructure. This is the reason that makes it necessary to identify the territories with the greatest number of facilities (such as schools, colleges, universities and libraries) and those lacking this type of infrastructure, in order to know where a possible government intervention is required. This work is not intended to give a judgment on the qualitative state of the national infrastructure. It focuses, in terms of infrastructure, on Colombia's quantitative status of the educational sector, by identifying the territories with more facilities, such as schools, colleges, universities and public libraries. To do this a quantitative index will be created to identify if the coverage of educational infrastructure at departmental level is enough, by taking into account not only the number of facilities, but also the population and the area of influence each one has. The above study is framed within a project of the University of the Andes called "visible Infrastructure". The index is obtained through a hierarchical analytical process (PAJ) and subsequently a linear equation that reflects the variables investigated. The validation of this index is performed through correlations and regressions of social, economic and cultural indicators determined by official entities. All the information on which the analysis is based is official and public. With the end of the armed conflict, it is necessary to focus the planning of public policies to heal the social gaps that the most vulnerable population needs.



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OPTIMIZED SPATIAL PLANNING OF FTTH GPON THROUGH GEO-SPATIAL TECHNIQUES

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ABSTRACT

Telecom industry of Pakistan is boosting with immense competition and technological development. Efficiency of telecom network in Pakistan is terrible due to primitive existence of network, traditional analytical strategies, poor planning, inadequate network management, lack of geo-spatial knowledge, and legacy decision making techniques. In such circumstances telecom industry faces a host of problem and need to improve telecom services using enhanced techniques and technologies. Telecom network management, expansion and planning capabilities can be enhanced by applying systematic approaches, strategic planning methods and well suited technologies. FTTH networks based on Gigabit Passive Optical Network (GPON) is an enhanced technology that provides triple play and third generation services at door step. FTTH GPON services are fully equipped to handle market trends and future requirements. Efficiency of various telecom sectors can improve using Geoinformatics techniques in network planning, management, business and operational activities significantly. The purpose of this study is to offer an optimal solution for planning and design of FTTH GPON at exchange level through geo-spatial techniques those are still properly not applied in the field of telecom industry of Pakistan.



**QUANTITATIVE RISK ASSESSMENT IN BUILDINGS SUBJECT TO EARTHQUAKE-INDUCED LANDSLIDE
USING FRAGILITY CURVES**

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ABSTRACT

Natural disasters have a great impact on infrastructure and population. The main causes of a disaster include overexposure and vulnerability of elements at risk in urban areas, and an increase in the frequency and severity of natural phenomena. Colombia is located in the northwestern corner of South America, and about 35% of its population is located in the Andean region, which is a mountainous complex that crosses the country from south to north and presents significant seismic activity. In these types of regions, urban residential areas coincide with mountainous terrains, and thus, the risks are higher for people and their infrastructure in the event of a disaster. Due to various social and economic factors, the city of Medellín has grown rapidly with an accelerated occupation process without planning. This has resulted in inadequate urban planning and construction on hillsides, which increase the vulnerability of buildings and infrastructure in general, and insufficient investment in preventive measures to reduce the fragility of existing buildings. In this paper, we propose a quantitative assessment of the risk of earthquake-induced landslides based on physical and probabilistic models through a geographic information system (GIS), and using structural fragility curves. The study area corresponds to the eastern part of the city of Medellín, one of the area's most prone to geodynamic disasters in the city. The implemented model is able to quantify the risk caused by landslide considering different values of horizontal acceleration of the terrain, also an analysis of the costs derived from damages in some buildings under two scenarios (impact by sliding mass and differential settlement due slow movement), and two structural conditions (current structural condition and assumed structural condition that meets with NSR-10). With this type of cost analysis, it is possible to determine the amount of investment required to reduce the risk of urban infrastructure exposed to a disaster to an acceptable level of safety.



A WEBGIS PLATFORM FOR REAL TIME SEISMIC RISK ASSESSMENT: APPLICATION TO PORTUGAL

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ABSTRACT

Emergency rescue reports from several past earthquakes indicate that 85% to 95% of the successful rescues of people trapped under debris occurred within the first 24 to 48 hours. The fraction of successful rescues depends on the number of affected people, performance of the rescue operations, and most importantly, the strategic allocation of the limited resources shortly after the seismic event. Thus, the availability of a system capable of estimating the dimension and spatial distribution of damage and loss immediately after the occurrence of an earthquake is of critical importance. Furthermore, the employment of such framework to estimate building damage and economic/human losses due to hypothetical future earthquakes may also provide national authorities and other decision makers with valuable information to the development of risk mitigation actions. These events could be based on past historical earthquakes or be defined through the investigation of seismogenic sources around the region of interest. Portugal has its past marked by the occurrence of very destructive earthquakes. In the well-known 1755 Lisbon earthquake, despite the various estimates proposed by the scientific community, it is fair to assume that in Lisbon, more than 50% of the buildings were heavily damaged or destroyed and about 10% of the population perished. In the beginning of the last century, a moderate event of magnitude 6.6 Mw struck the village of Benavente, causing 46 fatalities and damaging more than 3000 dwellings. Besides this moderate seismicity, the Portuguese building stock is characterized by a large fraction of masonry buildings, which typically have a higher seismic vulnerability. This panorama strengthens the need for a reliable and accurate platform for damage estimation based on deterministic earthquake scenarios. The present paper aims to present the contribution of the most recent study in Portugal concerning seismic risk assessment, the PRISE research project – “Earthquake loss assessment of the Portuguese building stock”. PRISE covered three main lines of research, which intend to correspond to the three components typically considered in any seismic risk assessment study, which are also the key models to include in the WebGIS platform: i) the characterization of the seismic hazard in the region of interest; ii) the identification of the exposure to the action of earthquakes and loss potential; and iii) the assessment of the vulnerability of the exposed assets. Different research institutions and partners with extensive knowledge and expertise in the earthquake domains were involved in the study. A real-time web-based framework to estimate building damage and economic/human losses due to seismic events was developed, aiming to provide the Portuguese Civil Protection and other playmakers with a unique platform for planning and preparedness for emergency scenarios.



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Session Title:

Computer Aided Design



DESIGN OF SEPARATOR ELEMENT INSPIRED BY PEACOCK FEATHER FOR A PROPOSED CAFÉ-BAR

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ABSTRACT

Since the 1990s, designs that have been "learned/inspired/modelled/adapted/applied" from the formations and structures in the nature have been understood with the help of the concept "biomimesis" (bios-life and mimesis-imitation). Similarly, today, new systems have begun to be developed in order to produce design solutions by inspiring from nature in spatial design depending on the technological progresses and developments in observation/ learning tools of formations in the nature. Engineers, architects, landscape architects and other designers often refer to nature as a basis. Many engineers find their structural inspiration from plant life, in a spider's web, a piece of coral, a beehive, or in the structural development of animals. Nature provides us with an amazing array of solutions for many complex problems that we face today – the quest to learn from nature in this way is "biomimicry." In addition, nature can teach us about systems, materials, processes, structures, efficiency and aesthetics. Despite the amount of scientific knowledge mankind has gathered, nature still holds great mysteries that we may never be able to unravel. In this study, a separator element made of the peacock feather is designed for a cafe bar. The separator element is located in the centre and separates the café and bar sections. When the bar section of the space is opened in the evenings, the arms of the separator element are closed and allow passage to the other side. This element is also used as lighting. Wires supplying electricity pass from each arm to colored glass sphere. The separator element is designed by inspiring from the form of peacock feather and its opening and closing. It works like fan. It is made of metal. In addition, the colour of sitting elements of the café is chosen from the colours of the eyes on the peacock feather. The 3D modelling of the design shows that a living space is presented to people both in the city centre and in natural environment.



ARTIFICIAL NEURAL NETWORKS AS AN ARCHITECTURAL DESIGN TOOL- GENERATING NEW DETAIL FORMS BASED ON THE ROMAN CORINTHIAN ORDER CAPITAL.

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ABSTRACT

The following paper presents the results of the research in the field of the machine learning, investigating the scope of application of the artificial neural networks algorithms as a tool in architectural design. The computational experiment was held using the backward propagation of errors method of training the artificial neural network, which was trained based on the geometry of the details of the Roman Corinthian order capital. During the experiment, as an input training data set, six local geometry parameters combined has given the best results: Theta, Pi, Rho in spherical coordinate system based on the capital volume centroid, followed by Z value of the cartesian coordinate system, the surface normal vector at a given vertices coordinate and distance from the object symmetry. Additionally during the experiment, artificial neural network hidden layers optimal count and structure was found, giving results of the error below 0.2% for the mentioned before input parameters. Once successfully trained artificial network, was able to mimic the details composition on any other geometry type given. Despite of calculating the transformed geometry locally and separately for each of the thousands of surface points, system could create visually attractive and diverse, complex patterns. Designed tool, based on the supervised learning method of machine learning, gives possibility of generating new architectural forms- free of the designers imagination bounds. Additionally combining the system with other algorithms gives many possibilities to be explored in a field of computationally generated geometrical forms. Implementing the infinitely broad computational methods of machine learning, or Artificial Intelligence in general, not only could accelerate and simplify the design process, but give an opportunity to explore never seen before, unpredictable forms or everyday architectural practice solutions.



CLIMATE CHANGE ADOPTED STRUCTURES AND PARAMETRIC DESIGN OF DYNAMIC BUILDING ENVELOPES WITH USING FLOCKING BEHAVIOR TOOLS

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ABSTRACT

This paper explores the possibilities of using flocking behavior tools in a design process of dynamic envelopes in architecture. The algorithms, which were created based on the observation of nature, are gaining in recent years more and more popularity. They allow you to efficiently solve complex optimization problems and inspired to seek new solutions. An example of the algorithm may be projects of dynamic building facades, which combined with the design of generative systems create new spatial environment dependent. A building envelope is the physical distance between the conditioned and unconditioned environment of a building. In the first part of the article will be presented examples of a climate change active building envelope as a focus of design innovation in the twenty first century improvement in envelope engineering and building science, as well as developments in computer engineering, cybernetics and parametric design process. The second part presents comparison of two dynamic facades, whose creators in the design inspired by the observation of swarm behavior. The need for case studies has been created algorithm, which has demonstrated the ability to use the flocking behavior methods in design process. Article explores whether is it possible, for the designer, to improve the comfort and economy of use of the building through the use of contextual illumination of the exterior and interior of the building. It uses this algorithm comparative analyzes of action solutions. The algorithm is based on a study of profits from the use of the method of design assumptions flocking behavior.



SCRIPTING TO THE RESCUE – ISSUES OF MULTICRITERIA OPTIMALIZATION

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ABSTRACT

The aim of the article is to discuss the new opportunities of managing design challenges caused by pursuing the idea of multi criteria optimization. For more than a decade, architects and designers have the possibility to build their own customized computer programs dedicated to the particular design tasks by the means of graphical script editors (Generative Components, Grasshopper). One of the key promises of parametric-algorithmic systems is the possibility to correlate and harmonize various, often competing factors and to negotiate a compromise between the program, construction techniques and formal requirements as well as environmental considerations. Thinking up ways by which to proceed from the assignment of the context parameters (external variables) and relationships between function, structure and performance to the feedback loop with the geometry poses a serious challenge. This involves the necessity of a multidisciplinary approach and selection of key parameters / variables that are important to the quality / efficiency of the design solution. The architect usually deals with measurable criteria, partly measurable and intangible factors (such as physical comfort). The first category can be directly translated into algorithms, formulas and numbers, two other, even if they are in some way expressed numerically they will be given subjective values. In this context, important questions arise: how to assess if the key parameters / variables and the design strategy for negotiating criteria (characterized by complex dependencies or in conflict) are chosen properly. Issues of multi-criteria optimization - linking energy efficiency, economy of design (usage of materials), sunlight conditions and thermal balance, directions people's movement - still contains many theoretical, unverified assumptions. In her article the author discusses, among others, the circumstances affecting the estimation of the validity of the criteria eg. whether newly awakened environmental awareness and the issues of efficiency of buildings could stimulate curvilinear house architecture. The article is a voice in the discussion on multicriteria optimalization because so far neither theory nor practice provides sufficient answers.



AUTOMATION OF DESIGN USING SCRIPT LANGUAGES: HIGH-LEVEL CAD TEMPLATES IN NON-PARAMETRIC PROGRAMS

Ricardo Moreno-Cazorla

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ABSTRACT

The main purpose of this work is the study of the advantages offered by the application of traditional techniques of technical drawing, in processes for the automation of the design, with non-parametric CAD programs, provided with scripting languages. Given that we can solve an example drawing with traditional step-by-step detailed procedures, is possible to do the same with CAD applications and generalize it later incorporating references. In today's modern CAD applications, there are striking absences of solutions for building engineering: oblique projections (military and cavalier), 3D modelling of complex stairs and roofs, furniture, etc. The use of geometric references (using variables in script languages) and their incorporation into High-Level CAD Templates allows the automation of processes. Instead of repeatedly creating similar designs or modifying their data, users should be able to use these templates to generate future variations of the same design. This paper presents the automation process of several complex drawing examples based on CAD script files aided with parametric geometry calculation tools. The proposed method allows us to solve complex geometry designs not currently incorporated in the current CAD applications and to subsequently create other new derivatives without user intervention. Automation in the generation of complex designs not only saves time, but also increases the quality of the presentations and reduces the possibility of human errors.



**AUTOMATION IN THE TEACHING OF DESCRIPTIVE GEOMETRY AND CAD: HIGH-LEVEL CAD
TEMPLATES USING SCRIPTS LANGUAGES**

Ricardo Moreno-Cazorla

University of Granada, Spain

ABSTRACT

The main purpose of this work is the study of improvements to the learning method through exercises with traditional techniques, of Technical Drawing and Descriptive Geometry solved manually, applying automated processes assisted with High Level CAD Templates. Given that we can solve an exercise with traditional procedures, detailed step by step in technical drawing and descriptive geometry manuals. CAD applications allow us to do the same and generalize it later incorporating references. Traditional teachings have become obsolete and current curricula relegated. However, they can be applied in certain automation processes. The use of geometric references (using variables in script languages) and their incorporation into High-Level CAD Templates allows the automation of drawing processes. Instead of repeatedly creating similar exercises or modifying data in the same exercises, users should be able to use High-Level CAD Templates to generate future modifications of these exercises. This paper introduces the automation process when generating exercises based on CAD script files, aided with parametric geometry calculation tools. The proposed method allows to design new exercises without user intervention. The integration of all (CAD, Mathematics and Descriptive Geometry) facilitates their joint learning. Automation in the generation of exercises not only saves time, but also increases the quality of the statements and reduces the possibility of human error.



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Session Title:

Mathematical and Statistical Methods



DEFINITION OF THE BEST PROBABILITY DISTRIBUTION FUNCTIONS FOR ANNUAL MINIMUM FLOWS OF ÇORUH BASIN (TURKEY)

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ABSTRACT

The main aim of this study is to define the best fitted probability distribution functions for annual minimum flows (AMF) data for the duration 1-day, 7-day, 14-day, 30-day, 60-day and 90-day obtained from daily streamflow data of three stations, Çoruh Basin (Turkey). To achieve this purpose, eleven widely used distributions, namely Cauchy, Gamma, Gumbel, Generalized Extreme Value, Kappa, Lognormal, Logistic, LogLogistic, Normal, Pearson type-III and Weibull were fitted and compared. Parameters of these distributions were estimated using maximum likelihood method. To determine the most suitable distributions for AMF series of the stations, Akaike Information Criterion (AIC) and Bayesian Information Criterion (BIC) were employed. Based on these criteria, Logistic and Weibull were found to be the most appropriate distributions. Moreover, Gamma, Generalized Extreme Value, Gumbel and Lognormal distributions were appeared as alternative potential candidates.



ANALYSIS OF CRITERIA INFLUENCING CONTRACTOR SELECTION USING TOPSIS METHOD

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ABSTRACT

Selection of the most suitable contractor is an important process in public construction projects. This process is a major decision which may influence the progress and success of a construction project. Improper selection of contractors may lead to problems such as bad quality of work and delay in project duration. Especially in the construction projects of public buildings, the right choice of contractor is beneficial to the public institution. Public procurement processes have different characteristics in respect to dissimilarities in political, social and economic features of every country. In Turkey, Turkish Public Procurement Law (PPL) 4734 is the main regulatory law for the procurement of the public buildings. According to the PPL 4734, public construction administrators have to contract with the lowest bidder. Public administrators are not sufficient for selection of the right contractor because of the restrictive provisions of the PPL 4734. The lowest bid method does not enable public construction administrators to select the most qualified contractor and they have realised the fact that the selection of a contractor based on lowest bid alone is inadequate and may lead to the failure of the project in terms of time delay and poor quality standards. In order to evaluate the overall efficiency of a project, it is necessary to identify selection criteria. This study aims to focus on identify importance of other criteria besides lowest bid criterion in contractor selection process of PPL 4734. In this study, a survey was conducted to Building Works Department staff of Eskisehir Osmangazi University. According to TOPSIS analysis results, termination of construction work in previous tenders is the most important criterion of 12 determined criteria. The lowest bid criterion is ranked in rank 5.



MAXIMUM TIME HORIZON ESTIMATION FOR DISRUPTED TRACK GEOMETRY INSPECTION

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ABSTRACT

Inspection information is periodically supplied by an on-board track recording car to maintain an acceptable safety level in track geometry maintenance strategy. The information chain for k out of n track segments could be temporarily discontinued beyond the inspection time in the occurrence of disruptions due to vehicle damage, crew strike, track unavailability or sudden budget cut. This situation demands immediate but feasible recovery action(s) which could be appropriately planned and executed if an estimated planning horizon can be provided. Thus, this paper proposes a manipulation of a conditional system reliability function, $S(t)$ to estimate the maximum planning horizon, h for managing disruptions in track geometry inspection. This study considers a track line where the k track segments are located as a linear series system with $n > k$ independent components representing track segments. Solving the proposed function $\int_0^t S(x) dx = r(t)$ for an unknown t_r where $r(t)$ is the gross profit gained from the system by the time of disruption, t_r provides user with the h . Two configurations of the system reliability model which each illustrates a potential design for k in the system was formulated in the proposed function. For a system component reliability model, the random variable of the corresponding probability distribution is defined as the number of days taken for a track segment to reach the last on-board geometry inspection from a restoring point before the alert limit was flagged. Different type of distributions was configured and tested in the equation for a sensitivity analysis. Simulation analysis shows that a longer h could be gained from k -out-of- n components: (F) model. In respect to number of inspections, an absence of single inspection in k track segments has no effects to the track line safety for a short term operation. The research findings could be transferred as part of a recovery action policy for managing inspection information disruption in track geometry maintenance.



EFFECT OF NON-HOMOGENEOUS LATERAL RESISTANCE ON TRACK STABILITY

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ABSTRACT

Bad technical condition of the railway track is the source of a significant increase in the level of noise generated by moving on the vehicle, which is particularly important in areas where the railway line runs through in the urban areas. Over the years, with the advance of technology design surface railway was changing. Efforts were made primarily to increase the stiffness of the rail and to obtain higher strength. A major technological advances was the use of continuous welded rail, which is a combination of rails in a continuous tracks together by welding or heat sealing. Continuous welded rail (CWR) primarily reduces the impact of vibration and noise emission which is caused by a passing vehicle. Reducing rail noise, as a result of the modernization of the track depends on the speed of movement, but typically is greater than 5 dB. For this reason, to carry out repair and modernization of additional involving the use of CWR (with elastic fastening to the sleepers) turns out to be a very effective method of reducing. Despite the advantages, which is characterized by a continuous welded rail should also pay attention to the technical difficulties during exploitation. This involves in particular the provision of the stability of the grate track in the plan and profile. The use of CWR track makes it impossible the free movement of the rails in the longitudinal direction, which causes compressive stress or tensile. The main problem arising from a combination of rails in continuous lengths to ensure stability of the structure of the track in the plan and profile. In the urban areas the large problem related with exploitation rail road are many existing pedestrian crossings and railway level of the railhead. In these places is a change of the railway ballast stiffness - which has a significant impact on the rigidity of the entire track. This paper presents the analytical calculation model for railway track. This model is used to determine the stability of the railway track taking into account the geometrical parameters and mechanical surface. This model allows the assessment of the impact of the parameters of the track (the type of sleepers, rails, fastenings, ballast characteristics) for exploitation safety. Characterized the issue of cross-resistance track and the factors that have a direct impact on the stability of continuous welded track. It presented the idea of the exploitation safety of CWR track.



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DESIGNING BUILDINGS IN FLORIDA USA FOR HURRICANE WIND LOADS AND DEBRIS IMPACT

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ABSTRACT

Florida is the third most populous state in the USA, with a population of 20.6 million people in the current year 2017. The population distribution within Florida geographical area is quite unique with population density varying from 5 persons per square mile inland arrears to more than 5000 persons per square miles in the coastal regions. Florida is also the fourth fastest growing state with an annual population increase of about quarter of million people. A state with 1350 miles of coastline, year around sunshine and tropical climate, Florida is a go-to state for retirees. However, the state is located in one of the most active hurricane regions of the world. Florida has experienced 63 hurricanes or tropical storms between 2000 and 2016 resulting in damage of 100 billion dollars. Hurricane property losses are expected to rise as the population density in Florida's coastal regions increases. This paper discusses current understanding of wind-structure interaction, debris impact and cyclic wind loads and technologies, products and building codes currently in use in the state of Florida.



ESTIMATING OF MISSING STREAMFLOW OF THE EUPHRATES BASIN, TURKEY: USE OF NON-DIMENSIONAL FLOW DURATION CURVES AND REGRESSION MODELS

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ABSTRACT

For planning, design and management of water resources structures, a considerable amount of hydro-meteorological data (e.g. streamflow, rainfall, temperature) is required. However, these data series usually suffer from gaps which must be infill using reliable statistic methods. The study focuses on the infilling missing streamflow data of the rivers in the Euphrates River basin, which is one of the most important water resources of Turkey. To achieve this purpose, non-dimensional flow duration curves and regression models are used. The methods are applied to estimate daily missing streamflow records in the gauge stations 2119, 2133, 2149 and 2151. Performance of the considered methods are compared by means of several criterions. The results indicate that the non-dimensional flow duration curves are more suitable for infilling daily streamflow data although the both methods provide reliable estimate.



HOMOGENEITY ANALYSIS OF STREAMFLOW RECORDS IN TURKEY

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ABSTRACT

In this study, the homogeneity of streamflow records was checked by the Standard Normal Homogeneity Test (SNHT), Pettitt Test, Buishand Test. Monthly streamflow data covering of period 1969-2004 from 96 gauge stations uniformly distributed across Turkey are considered for this purpose. The data of 17, 18 and 17 stations were found non-homogeneous for the SNHT, Pettitt and Buishand tests, respectively. The data of 16 stations were found non-homogeneous according to all tests. Moreover, the double-mass curve technique was also used to adjust data in problematic stations and streamflow series of 9 stations were corrected. Finally, location map of the non-homogeneous stations was provided and the year that breaks homogeneity were determined.



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DETERMINING THE PARAMETERS OF THE INTERMEDIATE DURATION - INTENSITY EQUATION FOR MEDITERRANEAN REGION, TURKEY

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ABSTRACT

The aim of this study is to determine the parameter estimates of the general intensity-duration-frequency (IDF) formula for the 20 rainfall stations in the Mediterranean Region of Turkey. The maximum annual rainfall data were statistically analyzed for the durations 1, 2, 3, 4, 5, 6, 8, 12, 18 and 24 hours. Generalized Extreme Value (GEV), Gumbel, Normal, two-parameter Lognormal, three-parameter Lognormal, Gamma, Pearson type-III and Log-Pearson type-III distributions were considered and compared using Chi square (χ^2) goodness-fit test. Parameters of these distributions were estimated using both maximum likelihood and moment methods. The parameters of the general IDF equation and coefficient of correlation (R) for different return periods (2, 5, 10, 25, 50, 75 and 100 years) were calculated by using nonlinear estimation method. Coefficient of correlation result ($R = 0,875$) of general IDF equation showed the suitability for intermediate durations in the Mediterranean Region.



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Session Title:

Integrated Coastal Zone Planning and Management



A MORPHODYNAMIC MODEL SUITABLE FOR RIVER FLOW AND WAVE-CURRENT INTERACTION

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ABSTRACT

Morphodynamic models are numerical models able to couple the hydrodynamic issue to the sediment transport analysis and to the morphological evolution, that represents the changes in bottom height due to sediment transport. The models are a valuable tool in hydraulic and morphological studies, resulting particularly useful in comprehending and predicting the sediment movement and the following morphological response in rivers, estuaries or coastal environments. For this reason, their use is becoming more and more common in support of water environment management and decision-making, as well as in integrated coastal zone planning. With particular regards to the modelling of coastal areas, the main contributions to the morphological evolution are due to currents, waves and their mutual interaction. Moreover, the morphological evolution in lower river courses can be particularly affected by the secondary flows, which take place in presence of curvilinear flows, typical for example of bends and meanders. A model, suitable to be applied to this context, should consider all these aspects. In the last few years, 3D modeling has been profoundly developed, nevertheless, 3D-models are still too heavy from a computational point of view to be applied to complex and wide domains. Thus, bidimensional models are at present the most useful in coastal applications. In literature, several different morphodynamic models have been presented and discussed. Nevertheless, some of them neglect the interaction between waves and current or they consider it only in a limited way. Others disregard secondary flow effects. Only a few models consider both aspects. With a view to developing a morphodynamic model able to be applied to coastal areas like river mouths and lagoons, a finite volume bidimensional shallow water morphodynamic model is presented in the present paper as a first step, which is able to take into account the effect of the wave field in both hydrodynamics and morphodynamics. Moreover, also secondary flow effects on bed load are considered. The model is based on an accurate shock-capturing and C-property preserving scheme, and it is also able to describe properly shock phenomena. Finally, the present model has been developed in order to reach a balance between accuracy and simplicity: in fact, the model is suited for the study of complex 2D domains, with a minimum number of physically based parameters to be considered in sediment transport issues. In this work, a few different theories have been implemented and applied to some benchmark tests, in order to carry out a comparison between them, which permits one to focus on the most appropriate approach for each single case study. In particular, the analysis focuses on morphodynamic evolution under the combined effects of current and regular waves parallel to the current, and that under curvilinear flow.



AN EVALUATION OF INTEGRATED COASTAL ZONE MANAGEMENT PLAN PRACTICES IN THE TURKISH CASE

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ABSTRACT

In terms of both international and national contexts, mostly coastal zones are the place of complexity, vulnerability and competition, so that they have to be well-planned and managed. Diversity in users, landuses, investments, sectoral plans and policies make coastal areas highly complex and problematic zones where competition also takes place. Unless these dimensions of pressure aren't balanced with precautionary actions, coastal zones transform into more vulnerable geographies. Within this context "Integrated Coastal Zone Management (ICZM) Plan" appears as a major tool where "integration" becomes a vital keyword for such diversifying environments. This integration challenge covers sectoral, administrative, spatial, interdisciplinary (in terms of scientific research fields) and internationality dimensions. A set of basic principles could also be obtained from the literature in order to reach a better ICZM Plan practice. These could be summarized as; "a broader perspective", "a long-term perspective", "adaptive management and monitoring", "local specificities, specific solutions and flexible measures", "carrying capacity of ecosystems", "a participatory process", "well coordination of policies and partners" and "coherence between sectoral policy objectives, planning and management". A similar problematic conceptualization is also viable for Turkey, where approximately 76% of the total border length and 27 of 81 provinces are coastal. Naturally, both ICZM and coastal zone planning are within the emerging planning issues of national agenda. The purpose of this paper is to examine the Turkish practices depending on the above-mentioned principles by comparing various official ICZM plans of selected provinces. As a general conclusion it is seen that ICZM -to be an integrative and multi-dimensional tool- is contextually misunderstood. From this perspective "the determination of the plan borders", "unsuitability of the plan contents with the ideal ICZM plans" and "absence of legal basis" could be defined as the major discussion topics which reflect the dilemmas of ICZM practice in the Turkish case.



RESHAPING OF COASTLINES AS THE BEGINNING OF URBAN STRUCTURES CHANGES IN NORTH POLAND

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ABSTRACT

This article discusses the problem of strategies concerning the processes of re-shaping the Baltic Sea southern coastline applied recently in North Poland. The undertaken research is an attempt to identify the relationship between the modifications of coastline forms and the positive changes of urban structures. First of all, it can be seen that these modification are needed because of the problems of existing shoreline erosion. It can be also observed, that many realized interventions were helpful to save the land but they did not improve the conditions of cities situated along the coast. In these cases it is impossible to connect the sea coastline with the existing grid of public spaces which is a barrier to creating a system that could be perceived as a coherent landscape. The basis for proving the importance of special ways of shoreline modifications are comparative studies and in-field analyses. In facing the problems of coastal cities there is a need to analyse the condition of existing urban structures. Many studies made so far show that there are many problems which have to be identified and solved. Worth noting is the fact that these structures have a unique character because of their location. They play an important role as holiday resorts being an attraction for many inhabitants and visitors from all over the world. Such a role plays, for example, an important part in places such as Jaroslawiec, Ustka or Kolobrzeg. However, analysing the strategies applied in recent years, it can be noted that they can not be the only basis for the strengthening connections between land and water helping to preserve the land, but they may also play an important role as a factor for initiating urban structures transformations. What is also important, it can be claimed that relationships between sea water and urban structures should be strengthened due to special forms of the coast line. They should be integrated into existing structures making them more comfortable and attractive while also protecting against threats from the water. Playing the role as a protector of land they should use special constructions being at the same time accessible to all users throughout the year and regardless of weather conditions. It is worth emphasizing that special treatment of the coastline helps to establish it as a public domain which is important in achieving high quality urban-water landscapes. Therefore it should be the objective of strategies which are being prepared for parts of coastlines waiting for intervention.



INTEGRATION OF LAND AND SEA IN A PORT AREA: A CASE STUDY OF THE PORT OF KOPER

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ABSTRACT

The spatial plan for a port based on land reclamation, existing land, or a combination of both should be designed in line with both reliable data for the existing situation and precise goals based on a well-founded vision by the port authority. In ports, human activities are concentrated in the limited space of the coastal belt, where they threaten the vulnerable equilibrium of the environment. Integrated multifunctional planning of ports is necessary for the sustainability of such plans. In this process, the relation between the environment and the economy is often neglected because the ecosystem—the totality of living organisms—which is fully dependent on biological, chemical, and physical factors, prevails. This method, also called building with nature, is the basis for integrated coastal zone development and management. It emphasizes the flexible integration of land and sea, which respects and uses forces and materials present in nature, and which is an essential interaction between man and environment. Strict ecological planning conditions and the public interest obliged the Port of Koper to modify its urban planning strategies and redefine its relationship with all bordering areas. The extension of two piers and construction of a third one was the result of functional factors, infrastructure connections, technical possibilities, and environmental requirements. Solutions that were relevant for distributing cargo on the docks had to adjust to the width of the basins for maneuvering ships. Various types of construction restrict water flow under piers, thereby accelerating biomass degradation. Environmental aspects created conditions and requirements for pier construction.



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Session Title:

City and Regional Planning Education



PARADIGMS FOR THE MANAGEMENT OF THE CONSTRUCTABILITY OF PUBLIC BUILDINGS OF HIGHER EDUCATION

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ABSTRACT

Seeks to provide a palpable understanding and perception of the underlying reasons for the lack of articulation between teaching, practice and the surrounding environment, to establish criteria and research methodologies that support leading to the establishment of an added value and reinforcement of the existing and strategic role and resources Planning structures, articulated uninterruptedly monitoring precautionary measures, creating integrated opportunities unique to the authentic needs of the environment where they are inserted. At present, we can analyze that there are several paradigms of physical university systems widely studied as teaching experiences, we highlight some as the University of Beira Interior, this illustrates the experience of a public university that managed to act positively on the social environment of the place; The experience arises between the historic center and the university city, both of which develop together through an Urban Plan supported by the municipal authorities to encourage the recovery and revitalization of the city center through the recovery and rationalization of university activity. The urban fabric of the city of Covilhã is marked by the presence of higher education institutions. Only the real estate assets of the University occupy 4% of its area, created in 1986, following the Polytechnic Institute (1973), and the University Institute of Beira Interior (1979), the initial pole extends through the Real Fábrica de Panos da Ribeira Of Goldra and incorporates the Wool Museum of the UBI, open to the public since 1996. UBI's strategy seems to us to be very interesting from the point of view of reuse and urban reconstruction, for the rehabilitation of the opportunities to recover old factory premises (Convent of St. Ant3nio (rectory), the old factories of the Rat, the Rugs, the Manufacturing Company of the Wool (Pole II), the palaces Melo e Castro, and Mendes Veiga, the chapel of S Martin. Next to the Carpinteira river, already in the 90's and until 2004, the IV pole is developed. Pole III develops with the Faculty of Health Sciences and makes a total physical space of UBI of approximately 134 500 m2, with more than 5 thousand students, 32 degrees, 376 postgraduate students, 464 teachers and 408 employees In the conversion of unusual buildings, one of the most important benefits is the preservation of the "internal force", as well as all the processes related to its formation, from the choice, the manufacture of the building material, or the transport equipment. An architectural reconversion project will already be more environmentally friendly and sustainable than any new construction project and, at the same time, at more favorable costs, such as saving energy and materials. At a collective level, the adaptation of vacant buildings produces vitality, gives identity to centers with urban rehabilitation and a desirable and attractive visual diversity. Reusing a historic building enhances the quality of life in the surrounding area and, in parallel, keeps alive the collective memory of the city.



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TEACHING ARCHITECTURE - CONTEMPORARY CHALLENGES AND THREATS IN THE COMPLEXITY OF BUILT ENVIRONMENT

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ABSTRACT

Complexity of contemporary built environment problematic concerns not only architecture and urban planning issues but is also settled on the crossroads of many other disciplines and involves wide range of social activities. The idea of writing the paper is generally initiated by the debate which took place in Gdańsk in 22.01.2016 and was prepared in order to meet representatives of the four circles of interest within architectural sphere: universities, professional architectural organisations and associations, architectural practice (professionals running their own studios, managing projects and leading construction) and local social organisations active in city of Gdańsk. The paper is a trial of comparison of the results of the discussion in confrontation to the policy and methodology of architecture teaching on the University level. Teaching architecture and urban planning according to the present discussion needs to be improved and advanced to the increasing complexity of the both disciplines. Contemporary dynamic development of the cities brings the necessity of engaging multiple stakeholders, participants and users of architecture and urban space. This is crucial to make them conscious of sharing responsibility for increasing the quality of living in built environment. The discussion about architectural education is open and has nature of ongoing process adapting to a changing environment and in fact it is constant challenge which brings questions rather than simple answers. Transformation of architecture and urban planning, and consequently its education are increasingly entering into the related fields, especially into the professional practice and social environment. The question how to teach architecture and urban planning and educate users of the space should take place in the context of wide discussion. This interdisciplinary debate seem to be is crucial and challenging step towards improving future education of architecture and urban planning leading to better life in the city.



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Specific Session:

Places of post urban-conflict

Conveners: Assoc.Prof.Dr. Yehya M. Serag, Assoc.Prof.Dr. Abeer ElShater



VIOLENT AND NONVIOLENT CHANGES IN THE IMAGES OF CITIES IN THE ARAB SPRING COUNTRIES

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ABSTRACT

The Arabic Spring transformations have caused tangible impacts on the urban environment throughout the Middle East with varying levels. In some cities in countries like Libya, Yemen and Syria, deliberate and accidental destruction have taken place, resulting in a severe transformation in the image of these cities that could be considered as lasting or difficult to amend. In some cities the damaged caused to urban built environment could be considered as a co-lateral damage as a result of internal fighting between the people and their regimes, or the fighting between the different factions in the country or from external interference of regional or international powers. Urbicide, which is defined as the deliberate destruction of cities is also another form of damaging the built environment or the city image, in which parties in an internal conflict tend to destroy symbols or quarters of their rivals to inflict a tangible damage to their social and moral believes. The impacts in the built environment and the image of the city, can result as well from non-destructive measures, for example changes in land uses or decisions to demolish specific buildings that belong to the former era will also result in clear change in the city image. This paper attempts to highlight the types of transformation in the images of cities that took place as a result of the Arab Spring period. This highlighting is done in regards to the nature of change, as mentioned above, :a) change as a result of violence be that unintentionally in the form of a collateral damage or intentionally in the form of Urbicide. b) change in a nonviolent way , because of planning decisions based on the transformation period



**URBICIDE IN BAGHDAD: THE PRODUCTION AND EFFECTS OF SPATIAL DISRUPTION IN THE CITY
WITH PARTICULAR REFERENCE TO OPEN GREEN SPACES**

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ABSTRACT

While Urbicide looks at the deliberate effect of its practices on the built environment, Open green spaces in the city and its shrinkage or amplification can be a paradigm of it, which can be observed thoroughly through the spatial and social disturbance caused by post-war spatial militarization and political interventions that influenced the urban fabric and social patterns in Baghdad. Previous research provide descriptive account of the destruction of the elements of the urban environment, and examine momentous urbicidal practices to the built up areas without looking into the continual effects of them, in spite of its actual contribution in the deterioration of the built environment, the city infrastructure, its open spaces, and the disturbance of social practices and patterns within the spaces of the city. The aim of this paper is to look at the changes affecting urban territories that create a socio-spatial disturbance on the city level, and the other components of the built environment including open green spaces. According to WHO (World Health Organization), cities must obtain a minimum of nine square meter per capita of green spaces to be considered as a provider of healthy life pattern for its residents. Despite its adaptation of modern urban planning strategies since the early 1920's that included the celebration of open green spaces that apprised for their importance in enhancing everyday urban activities, Baghdad suffers nowadays from a severe damage of this vital urban layer to the extent of occupying only 1.6 square meter per capita of green spaces, as a result of being exposed to urbicidal practices that were either justified as acts against counterinsurgency, or simply illustrated power over practices of political-driven control and sovereignty, which led as well to the transformation of the usage of them from spaces of gathering and habitual cohesive social activities into spaces of fear due to security instability, and later on they became potential spaces for encroachment in its different forms. The paper will begin with the theoretical basis relevant to the case followed by a brief introduction to city's morphology until the event of war and occupation in 2003. After discussing the socio-political context of post-war and -occupation Baghdad, urbicidal practices influencing the built environment will be covered, leading to the urbicidal effects on open green spaces. In this manner, this research will not follow the conventional trend of covering the effects of urbicide on the built environment, but will rather include city's green spaces that have proven to represent key components for the comprehensive understanding of urbicide in the case of Baghdad. In the end driven recommendations will be concluding this paper.



WARTIME COPING AND ITS RECONFIGURATION OF THE URBAN SPACE IN ALEPPO CITY DURING THE PROTRACTED SYRIAN CONFLICT

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ABSTRACT

Urban warfare has been a subject of focus as more cities are becoming battlegrounds for a protracted period of time. A better understanding of war urban contexts, where the difference between civilians and non-civilians is blurred, is certainly needed. To that end, a look at how communities survive living under extreme conditions of existence can be undertaken, which concerns social, temporal, and spatial mutations. The urban space with its characteristics is one of the key determinants for survival. The way urban spaces are structured, distributed, and connected between each other is a highly relevant and influential aspect for the development of the conflict as well as for surviving the conflict in urbanized areas. Communities in cities of ordinary circumstances often learn to exercise their daily life within planned urban surroundings. Typically, it is known what to do in those urban settings and the potential opportunities they offer (schools for learning, markets for trading, parks for leisure, roads for vehicles, etc.). But when a war or a disaster strikes these certainties are lost and the meanings of spaces are broken. This requires people to find different ways of meeting their needs and creating a new web of relationships between people and place and between people and other people. Looking at the characteristics that these spaces provide and interpret them according to experience and needs as shelters, clinics, schools, open markets, or cemeteries. The world is currently witnessing the suffering of a whole population due to the so-called Syrian crisis or conflict that is causing devastating harm and trauma physically, spatially, economically, socially, and psychologically. This paper examines responses witnessed from the inhabitants in Aleppo city to cope to the imposed strictly restrained way of living in the midst of the Syrian protracted conflict as evidence will show that people do not stay helpless in these dramatic cases, with a reference to other cities' coping mechanisms such as Sarajevo and Beirut. Taking a closer look at Aleppo city, a zone of a prolonged still continuous conflict, we can notice certain specificity in terms of stability and life normality in the city. The duration of the conflict, causing the absence of public services as well as limiting resources, makes it imperative for the people to think about other alternative ways to ensure their survival. Paying attention to the people's collective and individual works in responding to the various needs under extreme conditions and how that shaped the city accordingly is the main concern of this paper. The aim is to gain knowledge, investigate, and analyse the current war urban reality in Aleppo city, to identify some of the numerous coping strategies taken by the affected-population, and then understand the means and influence of these strategies on the transformation of urban spaces in the city. The objective is to extract from the coping patterns of people characteristics of urbanism derived from considerations of extreme conditions of existence that entail valid interpretation for conceptual urban strategies and principles that can support people's resilience.



ON THE SOCIAL MEANING OF SPACE: A QUEBEC EXAMPLE

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ABSTRACT

The social use of space can only be understood by taking into account the meanings given to space and to the acts that take place there. The signification given to space by the actors of a social movement (“challengers”) will result from the use they make of this space, but also from the meanings proposed and acted upon by the opponents of the movement (“authorities”). Space, in its social dimension, is therefore a contentious performance (Tilly 2008). This paper aims to show how the actors of a particular movement produced the meaning of the space they inhabited and occupied and, in this way, transformed space into a place defined by its past and current history. It is in the meeting of time and space that the urban practices of the movement can be understood. There is no inherent meaning to space before the actors invest it. These reflections will be illustrated from the case of “Maple Spring”, an episode of political protest that took place in Quebec during the first 6 months of 2012 (Tremblay, Roche and Tremblay (eds) 2015). Initially started around a student opposition against the sudden increase in university tuition fees, this protest became a large protest against the neo-liberal policies of the Government of Quebec. This protest was one of the factors which led to the fall of the Québec government in the fall of 2012. The movement was mainly located in the city of Montreal, but it also appeared in the main cities of the province, which gave it an important inter-regional dimension. In the city of Montreal, some public places were permanently invested, and the trajectories followed by the demonstrations were the subject of incessant quarrels between the demonstrators and the police forces. To understand the movement, one must therefore look into its presence both in Montréal and in the regions and within the city of Montreal itself. This example shows that space is not a neutral terrain, but that its meaning, i.e. its existence, depends on its investment by social actors.



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Specific Session:

Spatial analysis for urban planning

Convener: MSc. Malgorzata Swiader



THE TRANSFORMATIONS OF TOURIST FUNCTIONS IN URBAN AREAS OF THE KARKONOSZE MOUNTAINS (POLAND)

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ABSTRACT

The article analyses and attempts to assess the transformations related to tourist functions in urban municipalities of the Karkonosze Mountains in Poland in the years 2005-2015. The study covered four member cities of the Association of Karkonosze Municipalities: Karpacz, Kowary, Piechowice, Szklarska Poręba and the most important city in the region – Jelenia Góra. The research also focused on the spatial diversification of these functions distribution in the aforementioned localities. Based on the group of diagnostic features, characterizing the tourist functions carried out by these cities (e.g. Gołębski's index, Baretie and Defert index, Charvat index, accommodation density ratio) the taxonomic density measures were constructed, which allow identifying the level of these functions' development. The presented study is significant for defining the distance between cities in terms of the selected development aspect in temporal and spatial perspective. The research can turn out useful in the planned city development and management.



POVERTY RISK INDEX AS A NEW METHODOLOGY FOR SOCIAL INEQUALITY DISTRIBUTION ASSESSMENT

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ABSTRACT

The paper presents new concept of poverty risk index measurement due to dynamics of urban development among years. The rapid urbanization could seriously surpass the capacity of the most cities, which may lead to insufficient services of their inhabitants. Consequence of this situation could be polarized, social differentiated cities with high rates of urban poverty. The measurement and analysis of urban poverty phenomenon requires the tools and techniques dedicated to this occurrence. The data based assessment could allow to develop more socially integrated cities by planners and public policy makers. This paper presents analysis of urban poverty phenomenon for Wrocław city (Poland) during period 2010-2012. These analysis were conducted for ten Social Assistance Terrain Units (SATU) delineated at the city area. Our primary objective concerns the proposal and calculation of poverty risk index based on diagnostic features, which represent the most common causes of social benefits granting, as: number of single households granted permanent benefits, number of people in families granted permanent benefits, number of people in families granted temporary benefits due to unemployment, number of people in families granted temporary benefits due to disability, number of people in families granted meals for children. The calculation was conducted by using the theory of development pattern - Hellwig's economic development measurement. The analysis of poverty risk index showed that commonly the central and south-eastern part of the city is characterized by the highest index of poverty risk. The obtained results refer to European and American patterns of poverty concentration in urban structures.



SPATIAL TOURIST AND FUNCTIONAL DIVERSITY ON THE VOLCANIC ISLAND OF GRAN CANARIA

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ABSTRACT

The conducted research is focused on spatial, functional and landscape diversity, the existing tourist potential and the possibilities for further development of a small, volcanic island of Gran Canaria. The discussed island was compared against the other islands of the Canarian archipelago (Lanzarote, Fuerteventura, Tenerife, La Palma, El Hierro). Similarly to the remaining Canary Islands, the economy of Gran Canaria is predominantly based on tourism (approx. 4,5-5,0 million tourists visit the Canary Island annually and approx. 2,8 million come to Gran Canaria). Additionally, Puerto de la Luz transshipment centre in Las Palmas plays a very important role for the goods imported from overseas. It is one of the largest ports in Spain (it reloads almost 2 million containers per year) also being an important Atlantic refuelling station. Apart from tourism an important role is played here by agriculture, primarily the cultivation of bananas and tomatoes, which represent the most significant export good of the archipelago. The conducted spatial research showed an extensive diversity. This situation is, to a great extent, influenced by the climate. The northern part is cooler and dominated by agriculture, whereas the southern one is definitely much warmer and characterized by a well-developed tourism infrastructure. Site inspections performed out along the outer contour of the island resembling a circle. Numerous architectural and urban sketches, urban analyses and photographic documentation were made. Community surveys were carried out. For a researcher it was extremely interesting to answer the questions whether Gran Canaria is different from the other Canary Islands, especially in the functional and landscape context, and if so what exactly these differences consist in. What is Gran Canaria in particular characterized by and what kind of role it plays in the economic sector of Spain?



LANDSCAPE CHANGE INDEX AS A TOOL FOR SPATIAL ANALYSIS

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ABSTRACT

This study analyzed spatial and temporal changes in protected landscape of Ślęza Landscape Park in Poland, covering an area of 7724 ha. The main objective was to determine level of landscape change of the research area after Polish accession to European Union by comparing orthophotomaps from 2004, 2009 and 2014. With the use of prepared land cover maps, we developed a database of the surface of the main elements constituting the background landscape of the research area. The data obtained made it feasible to assess the level of change in two different periods of time (2004-2009 and 2009-2014) by means of the landscape change index (LCI). This indicator is described by one value which is the result of all the change types taking place in the background landscape in a given period of time. Comparing the index of different parts of Ślęza Landscape Park helped to identify areas where the landscape changes were the highest and areas where the changes were hardly noticeable. The results show that when we take into account whole research area landscape changes are much more intense in the second of the analyzed periods of time (2009-2014) (LCI=1,94) then in years 2004-2009 (LCI=0,73). The same analysis were done for each part of municipalities located within the Park. This made it possible to determine which part of the park is the most threatened by spatial transformations. In this context, it should be emphasized that the highest rate of landscape changes were recorded in the municipalities where there is the most residential areas - in the municipalities Sobótka and Łagiewniki. Whereas municipalities Dzierżonów and Jordanów Śląski with a high percentage of forests inside the Park and unchanging area of arable land have the lowest landscape change index.



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**URBAN SPRAWL IMPACT ON FARMLAND CONVERSION IN SUBURBAN AREA OF WROCŁAW,
POLAND**

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ABSTRACT

The developments in suburban areas are changing the peri-urban landscape, by transforming the agricultural land into discontinuous urban fabric. Tracking these changes requires different approaches. The aim of the research is to identify the spatial development of the suburban zone with the use of the spatial information-based approach of estimating the location of suburban plots. We introduce parameters describing building plots for single-family housing in the suburban areas on the example of the surrounding municipalities of the city of Wrocław, Poland. Landscape metrics tools were used to delineate the suburban plots not identified by Corine Land Cover 2012. We verify the results with the use of the prices and values register for real estates. The results show that there is increasing pressure on farmland conversion into suburban areas expressed by the number of transactions and the total areas of sold housing plots. The plots that have been purchased for single-family housing between 2004 and 2016 constitute about 10% of all existing plots. About 42% of suburban properties are designed in the distance not exceeding 3 km from existing settlements; they are, however, not connected by infrastructure with other built-up areas.



COSTS OF URBANISATION IN POLAND, BASED ON THE EXAMPLE OF WROCŁAW

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ABSTRACT

The paper deals with the issue of charging communes with the costs of realisation of the provisions contained in local spatial development plans. When such local spatial development plan enters into force, it leads to economic consequences. In Poland, these consequences are specified in the forecast of the financial impact, which contains a prognosis of own revenues as well as of costs incurred by the budget of the commune. The research consisted in the analysis of the costs of urbanisation of land located in Wrocław, in the southern part of the Krzyki district (Poland). This area is undeveloped to a major extent, consisting mainly of agricultural land, and development requires the construction of technological and social infrastructure facilities. The prognosed costs of the realisation of local spatial development plans that are binding for the southern part of Wrocław demonstrate significant costs of the construction of sewage network and municipal roads. The planned development of residential districts is not supported by the existing infrastructure. Additionally, the development of new areas will require the city of Wrocław to take over the real properties on which public goals are planned to be realised. The estimated costs of land acquisition for the realisation of public goals amount to EUR 3 728 500.



VALUATION OF RESIDENTIAL PREMISES FOR THE PURPOSES OF SECURING THE RECEIVABLES OF THE CREDITOR IN POLAND

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ABSTRACT

The study presents an analysis of the theoretical and practical issues connected with securing the receivables of creditors, in particular the principles connected with the appraisal of real property value used for the purposes of granting loans in Poland. The scope of research included the basic elements of the functioning and organisation of the Polish banking system, legal forms of securing debt receivables and the principles of real property valuation for universal and mortgage banks. Additionally, the authors have conducted an analysis of the number and amount of loans granted in Poland in the years 2009 - 2016.



APPLICATION OF SPATIAL MODELS IN MAKING LOCATION DECISIONS OF WIND POWER PLANT IN POLAND

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ABSTRACT

In this paper we explore the process of making decisions on the location of wind power plants in Poland in connection with a gradually increasing consumption of energy from renewable sources and the increase of impact problems of such facilities. The location of new wind power plants attracts much attention, and both positive and negative publicity. Visualisations can be of assistance when choosing the most advantageous location for a plant, as three-dimensional variants of the facility to be constructed can be prepared. This work involves terrestrial laser scanning of an existing wind power plant and 3D modeling followed by. The model could be subsequently used in visualisation of real terrain, with special purpose in local land development plan. This paper shows a spatial model of a wind power plant as a new element of a capital investment process in Poland. Next we incorporate the model into an undeveloped site, intended for building a wind farm, subject to the requirements for location of power plants.



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Specific Session:

**Urban planning revisited: new challenges,
theories and methods**

Convener: Assoc.Prof.Dr. Luis Inostroza



THE ASSESSMENT OF THE ECOSYSTEM SERVICES CAPACITY IN NATURAL PROTECTED AREAS FOR BIODIVERSITY CONSERVATION

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ABSTRACT

Recently, in Italy, a legislative proposal aims to reform the role and the functions of natural protected areas promoting their aggregation (or the abolition) pursuing a better efficiency for their administration and economic saving. The system of natural protected areas is composed of different conservation levels: there are the Natural parks, established in the '80 by national or regional institution for the safeguard of natural elements, the Natura 2000 - Habitat 92/43/CEE promoted by European Union, with conservation measures for maintain or restore habitats and species of Communitarian interest, and the local parks of supra-municipal interest (namely PLIS) created by a single municipality or their aggregation with the aim to avoid the land take process. The multiple-hierarchical levels of protection have determined differences in the management of natural protected areas with various approaches and strategies for biodiversity conservation and integrity. To better assess strengths and weaknesses of the legislative initiative the new management framework should be designed considering the ecosystem characteristics of each natural protected areas in order to define opportunities and critics to manage areas with similar ecosystemic supply, or, eventually, remove the level of protection of an area for the absence of valuable ecosystem conditions. The paper provides an operative support for the legislative proposal investigating the dynamics that affect all protected areas using the land take process as a major threat to biodiversity conservation in natural protected areas. Land take process is explored using the Land Use Change proxy indicator (LUCi) as a possible way to have a preliminary overview of land use/cover conversion and relative environmental effects. LUCi is also useful to determine the loss of protected zones capacity to support Ecosystem Services. The assessment of the Ecosystem Services Capacity (ESC) index expresses the ability of each LULC to provide ES and, in particular, the Ecological Integrity, Regulating Services and Provisioning Services. The efficacy of the proposal is tested in the Lombardy Region (Northwest of Italy) where the natural protected areas are more than 500 with a territorial extension of 740 thousand hectares that correspond to 31% of the regional surface.



MONITORING THE URBAN VEGETATION CHANGE IN 13 CHILEAN CITIES LOCATED IN A RAINFALL GRADIENT: WHAT IS THE CONTRIBUTION OF THE MASSIVE CREATION OF NEW URBAN PARKS?

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ABSTRACT

The well-being of people living in cities is strongly dependent on the existence of urban vegetation because of the ecosystem services or benefits it provides. This is why governments develop plans to create green spaces, plant trees, promote the maintenance of vegetation in private spaces and also monitor their status over time. In Latin America, and particularly in Chile, the increase of urban vegetation has been stimulated through different initiatives and regulations. On the contrary, the development of monitoring at the national level is scarce, so it is not known if these initiatives and regulations have had positive effects. In this article, we monitor the change in the urban vegetation of 13 Chilean cities located in a latitudinal gradient of practically zero to almost 1800 mm of annual rainfall. We calculated the trend of change (2000-2016) of the NDVI as an indicator of change of the urban greenery using data from the MODIS Subsets platform. Likewise, to assess whether the initiatives have had effects we quantified how many urban parks existed at the beginning of the period and how many were created at the end of the period. For this, we analyzed official databases and satellite images of high spatial resolution. With this information, we evaluated if these new parks have impacted the tendency of change in the urban green. The results indicate that, in general, Chilean cities have a great interannually variability in their urban greenery and have lost urban vegetation in the last 16 years, being significant losses in four of them. Two cities located in desert ecosystems represent an exception and showed positive trends in their urban vegetation. The amount of rainfall received by cities impacts on the amount of vegetation, but not on their tendency to change, i.e. there are cities with loss of vegetation throughout the range of precipitation. Meanwhile, the creation of parks has not been able to reverse the negative trends of change, which indicates the prevalence of other drivers of change that are not sufficiently compensated by initiatives and regulations that seek to increase urban vegetation. The planning and management of urban vegetation is a current challenge for urban sustainability and must be addressed systematically, integrated and through urban regulations. It is imperative to focus on cities in extenso, considering residential areas, private spaces, peri-urban areas, etc. Likewise, the climate of each city, its interannually variability and its future change must be considered in the design of green areas, to make them resilient, do not generate increases in their maintenance costs and able to permanently provide benefits to the inhabitants.



AN INTEGRATIVE APPROACH TO ASSESS URBAN RIPARIAN GREENWAYS POTENTIAL: THE CASE OF MAPOCHO RIVER IN SANTIAGO DE CHILE

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ABSTRACT

Since streams, canals and rivers are structural components of Santiago's landscape, they can function as key links between the urban-social and natural system and provide multiple ecosystem services, helping to reduce environmental problems and ensuring long term urban sustainability. Traditionally, the analysis of river and stream sides has been focused on rural and natural landscapes as well as on environmental protection and nature conservation. Nowadays there is an increasing interest and necessity to understand the environmental status, functions and possibilities of riparian zones in urban environments in order to delineate and plan greenways which provide social and ecological benefits. Green infrastructure such as urban greenways is a key component of sustainable cities. Few studies have been conducted to evaluate the socio-ecological status of urban riparian zones and even fewer to assess these areas in terms of their potential as multifunctional greenways. New efforts should be conducted to develop analytical application-oriented frameworks in the green infrastructure field. This research elaborates and proposes a transferable conceptual-methodological framework for evaluating the potential for multifunctional riparian greenway development. An analytical application-oriented framework to assess the potential for multifunctional green infrastructure development is proposed by articulating and improving three analyzes hitherto used separately: multicriteria, least cost path and opportunities-challenges. The Mapocho River was selected for the application and testing of the proposed conceptual-methodological framework, in order to contribute to multifunctional green infrastructure planning in Santiago as a city representative of the structure and processes of megacities in Latin America.



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URBAN INFORMALITY IN SANTIAGO DE CHILE: THE "CALLAMPAS" BETWEEN 1947-1970

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ABSTRACT

Informal process of urbanization has been important in shaping large parts of the Latin American cities. Despite a strong effort to study this phenomenon under a common conceptual frame, the reality presents a much more varied situation, which is expressed by the numerous names used in the common language: favelas, barriadas, villas miseria, among many others. In the case of Chile, at the mid of the XXth century the precarious settlements were named callampas. By analyzing four surveys realized between 1948 and 1968 in Santiago, the paper aims to reconstruct the geography of informality and its variations over two decades. Moreover, it permits to analyze how informality was understood and represented at the time.



URBAN GREENWAY SUITABILITY ANALYSIS

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ABSTRACT

The purpose of this work is to estimate the suitability of riparian zones for the provision of ecosystem services within a GIS environment. In the case of Primary Ecosystem Services (ESs), optimal route models were developed. In the case of Secondary and Tertiary ESs, multicriteria evaluations were preferred. The results of these analyses are spatially explicit and correspond to a single suitability map for each ES and different suitability maps for multiple ESs. An AHP was developed to define and overlap (1) factors and (2) suitability maps. Step (1) gave rise to suitability maps for each ES (monofunctional suitability), and step (2) produced suitability maps for multiple ESs (multifunctional suitability). In this study, a fuzzy logic multicriteria evaluation was implemented. The suitability for a route for non-motorized transport was calculated using a Least-Cost Path (LCP) model. The LCP analysis was developed by using the Path Distance and Cost Path modules available on the Distance Toolset of ArcGIS 10.2. The preferred ecosystem services by local actors are diverse and do not only refer to cultural ecosystem services. In addition to the classic recreation and transport, the wind corridor and cooling effect appear. Species habitat is the least important ecosystem service for actors. It is possible to identify a certain sectoral vision that affects the perception of the importance of the different ecosystem services. The riparian zone of the Mapocho River in Santiago has good suitability as a wind corridor, cooling effect and to mitigate flood threats. The multifunctional suitability depends on the shape it is modelled, if exchange is allowed between ecosystem services and therefore, is prepared to accept higher levels of risk in decisions; the multifunctional suitability is relatively high.



**GREEN SPACE MANAGEMENT IN THE FACE OF INADEQUATE DATA IN URBAN PLANNING: ŁÓDŹ
(POLAND) CASE STUDY**

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ABSTRACT

The article analyses and discusses challenges related to urban green space management in the face of poor data availability and the 'tradition' of using inadequate data in urban and regional planning. These challenges reflect the broader political disregard for urban green spaces, their low political status. Using the case study of Łódź, the third largest city in Poland, we compare official city data (Geodesy Office of Łódź), data from Head Office of Geodesy and Cartography, satellite imagery (Landsat data), Urban Atlas data and aerial photography. The classification used in the Central Statistical Office of Poland is the main classification of green spaces in Polish cities, and it is broadly used for administrative purposes. According to this classification, green spaces account for only 12% of the area of Łódź. However, this dataset consists only of the most basic categories of green spaces, such as parks and forests. Other, more adequate sources indicate that the share of green spaces exceeds 50%, and according to the most detailed source – the share is about 60%. In the face of lack of a common and consistent green space information system in the country, many local authorities use only the first type of data, which is the least comprehensive but the most widely available. Our comparison shows large differences between the different datasets, and it suggests that a more consistent approach to green space data is necessary to support urban planning and green space management in Poland – especially in the context of planning urban green infrastructure. In this context, it is necessary to broaden the traditional perception of parks and forests as the only green spaces deserving the planners' interest, and it highlights especially the importance of agricultural land and informal green spaces.



FUNCTIONAL USE CHANGE IN GREEN SPACES: A CASE STUDY OF KIRKLARELI PROVINCE (TURKEY)

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ABSTRACT

Green spaces which are one of the most important public spaces in urban design have an important role on qualified daily urban life. People escape from intense work pressure and traffic jam of metropolises to those urban green areas to take a breath even they cover a small size. In time, people's expectations from green spaces as functional and quantitative needs are change. This change occurs due to increasing population and besides the character of the urban life. This study examines the functional use and quantitative change of urban green spaces of Kirklareli Province (Turkey) from past to present. Kirklareli is a border city to Bulgaria which is located in north-west part of Turkey and this gives a transitional and a multicultural character to the city. The population is about 67.360 In the course of time; green space needs have increased by the increasing population. In addition to this, green spaces' functional use change has been identified. According to the results of the study; from the aspect of the green space standards, Kirklareli found above standards with 17,5 m² per capita, but on the other hand, sport and playground areas found insufficient. The Oldest and the newest city plans of Kirklareli (1940s and 2012s cadastral plans) have been compared and site surveys implemented as the methodology. In site survey, current green spaces' functional uses as sport or playground are observed and determined and also current quantitative measure of the green spaces are verified. Urban green spaces in Kirklareli Province evaluated through considering world's most populated urban green space standards and Turkey's standards. This study utilizes to compose a substructure of the urban green space. Determined deficiencies and inadequacies of green spaces and functional needs in this study can guide to further studies and implementations of Kirklareli Municipality.



GREEN INFRASTRUCTURE ASSESSMENT FOR URBAN PLANNING: THE CASE OF TWO CHILEAN COASTAL CITIES

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ABSTRACT

Large scale transformations affect coastal landscapes producing permanent changes in the spatial and functional structure of cities, which impact on ecological processes and key landscape components such as forests, wetlands and rivers, and thus on the ecosystem services provided by them. Green infrastructure planning aims to balance urban growth and environmental protection contributing to long term urban sustainability. Green infrastructure can play a fundamental role in the development of coastal cities, first, helping to reduce the damage caused by natural hazards like floods, tsunamis, heavy swells and landslides, and second, promoting economic growth and local identity through the protection of valuable ecological areas. We selected the cities of Pichilemu and Algarrobo for the spatio-temporal analysis of urban and periurban green infrastructure and the provision of ecosystem services. This was performed through a combination of remote sensing, biophysical surveys and participatory mapping. Although, in general, the urbanization has severely impacted the natural green infrastructure, some wetlands and forests remain in good ecological conditions and still significant places for local identity. Novel types of green infrastructures in these cities such as parks, gardens and sport facilities provided more cultural ecosystem services and promote new uses. These and other results of this work provide relevant information for green infrastructure planning and integrated urban planning.



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Water Hazards Engineering

Convener: Dr. Eng. Rares Halbac-Cotoara-Zamfir



**NUMERICAL LIMITATIONS OF 1D HYDRAULIC MODELS USING MIKE11 OR HEC-RAS SOFTWARE:
STUDY CASE BARAOLT RIVER, ROMANIA**

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ABSTRACT

MIKE 11 is a advanced hydroinformatic tools, professional engineering software package for simulation of one-dimensional flows in estuaries, rivers, irrigation systems, channels and other water bodies. MIKE 11 is a 1-dimensional river model. It was developed by DHI Water Environment Health, Denmark. The basic computational procedure of HEC-RAS for steady flow is based on the solution of the one-dimensional energy equation. Energy losses are evaluated by friction and contraction / expansion. The momentum equation may be used in situations where the water surface profile is rapidly varied. These situations include hydraulic jumps, hydraulics of bridges, and evaluating profiles at river confluences. For unsteady flow, HEC-RAS solves the full, dynamic, 1-D Saint Venant Equation using an implicit, finite difference method. The unsteady flow equation solver was adapted from Dr. Robert L. Barkau's UNET package. Fluid motion is controlled by the basic principles of conservation of mass, energy and momentum, which form the basis of fluid mechanics and hydraulic engineering. Complex flow situations must be solved using empirical approximations and numerical models, which are based on derivations of the basic principles (backwater equation, Navier-Stokes equation etc). All numerical models are required to make some form of approximation to solve these principles, and consequently all have their limitations. The study of hydraulics and fluid mechanics is founded on the three basic principles of conservation of mass, energy and momentum. Real-life situations are frequently too complex to solve without the aid of numerical models. There is a tendency among some engineers to discard the basic principles taught at university and blindly assume that the results produced by the model are correct. Regardless of the complexity of models and despite the claims of their developers, all numerical models are required to make approximations. These may be related to geometric limitations, numerical simplification, or the use of empirical correlations. Some are obvious: one-dimensional models must average properties over the two remaining directions. It is the less obvious and poorly advertised approximations that pose the greatest threat to the novice user. Some of these, such as the inability of one-dimensional unsteady models to simulate supercritical flow can cause significant inaccuracy in the model predictions.



INTEGRATED WATER HAZARDS ENGINEERING BASED ON MAPPING, NATURE-BASED AND TECHNICAL SOLUTIONS

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ABSTRACT

Water based hazards typically occur because of people living in conflict with the environment. Floods and droughts have enormous environmental, social and economic consequences and it is expected that climate change effects will exacerbate their occurrence and impacts in the future. Climate change is expected to alter average temperature and precipitation values and to increase the variability of precipitation events, which may lead to even more intense and frequent floods and droughts. It is critically important to develop more effective integrated water natural hazards management plans, to integrate these plans into a sound spatial planning policy and to analyze effects on ecosystem services. Water hazards engineering is the branch of engineering concerned with the application of scientific and engineering principles for protection of human populations from the effects of water hazards; protection of environments, both local and global, from the potentially deleterious effects of water hazards; and improvement of environmental quality for mitigating the negative effects of water hazards. Technical solutions are already implemented at a large scale, in many cases with the price of sacrificing environmental aspects. The implementation of nature-based solutions offers major opportunities to reduce the impact of the identified hydro-meteorological hazards. Nature-based solutions focus on working with nature and, in essence, aim at increasing the natural capital of the threatened systems, for example to reduce flood risk or increase land resilience to drought. Water hazards mapping has also an important role in areas exposed to more than one hazards helping the stakeholders to analyze them for vulnerabilities and risks. An integrated approach of water hazards engineering based on mapping, nature-based and technical solutions will constitute a feasible solution in the process of adapting to challenges generated by climate changes worldwide. This paper will debate this concept also providing some examples from several European countries.



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THE GEOGRAPHY OF CRIME AND ITS RELATION TO LOCATION: THE CITY OF BALIKESIR (TURKEY)

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ABSTRACT

A person cannot continue his/her own life without security which is one of the basic needs of the human being, for not only personal security but also the security of the persons' living environment is of extreme importance. We can talk about the habitability and sustainability of the urban environment so long as the people may, in time and in place, freely select all their activities, such as their residence, work, education, shopping and entertainment options. On the other hand, it is well known that crime in the cities that create insecurity is directly related to urban areas and urban utilization. In the realization of an act of crime, the fact that the victim and the concepts of place are as much impactful as the convict indicates that the place where the crime is committed is, at the least, as responsible as the person who commits the crime. Based on this fact, in this article, we shall attempt at identifying the reasons related to place by examining the relation between the factors that bring the theft of crime into being and the urban utilization in the City of Balikesir. Thus, in the fight against crime, the prevention of crime and/or its avoidance, which is not the duty and under the authority of only the law enforcement agency, the attention and also that of other disciplines (Sociology and Criminology) is invited to be focused on the effectiveness of urban planning.



TRACES OF CULTURAL IDENTITY IN THE DESIGNS OF APARTMENT BLOCKS: THE CASE OF HISTORICAL TRAIN LINE OF IZMIT (TURKEY)

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ABSTRACT

From the primitive ages until today, cultural identity notion is one of the biggest factor that describes people's social and physical life on dwelling practices. With the various breaking points throughout the centuries, cultural accumulations are reflected on cities, dwellings and life. In this manner, dwelling notion have nourished and taken many forms with these cultural features along the history. Relations of dwellings between life practices organizes spatial systems within the frame of life itself. Just as the other countries; Turkey, the modern housing, which has been produced to meet housing needs increased due to the rapid urbanization recently without paying regard to the requirements of the natural and artificial environment and to sociocultural substructure, lead to loosing cultural identity of the people and the cities. On the other hand, it also causes many other social and physical problems. The people is alienated from the architectural values of the traditional Turkish House and a uniform housing is started to produce in series without considering the needs of Turkish family structure. This fact has leded that the contemporary housing is transformed into sheltering units, losing their character to be "home". In this research, traditional housing and their cultural features are worked through within the context of Turkish House specifications, as to modern housing are worked through within the context of apartment blocks which are based upon 19th century in Turkish culture and represent a new life style. The aim of the study is to reveal the traditional approaches and the disengagements from traditions starting from early 1900s to these days. The development and changing process of the housing starting from the traditional period extending to the contemporary period is examined on the basis of example historical train line in İzmit/Kocaeli (Turkey) and the values gained and lost from the traditional housing architecture and cultural identity are determined with 33 apartment samples on this historical train line. With the periodical conclusions drawn through the analysis data in the findings and evaluation part and through the analysis studies carried out in the conclusions. The effect of any synthesis with the cultural elements on the architectural design and social life is explained when designing the future modern apartment blocks.



THE RISE AND THE FALL OF TIOS-TIEION

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ABSTRACT

The existence or endurance of the city is determined by social, economic, cultural, and technological factors. Therefore, transportation connections become physical signifiers of the relation between two spaces. Nevertheless, the potential for change in transportation is more dynamic when compared to other factors. Change in the infrastructure and systems of transportation become evident at the urban scale more rapidly. In addition to leading to the formation of new cities or to socio-cultural and economic development in the already-existent cities, this dynamic structure may also cause the decrease in economic power, and even the desertion of settlements. Furthermore it functions as a leading, even determining, parameter in the formation of space, thereby in economic and social development. The fact that, throughout history, centres of communication and commerce were established at intersection, stopping and lodging points of transportation links and/or their development into residential areas attests to this interaction. In the commercial centres and life of the city, the effects of regional transportation networks and technologies surface relatively. By means of the analytical method, this study focuses on how, within the history of settlements, population increases due to the choice of location based on transportation and strategic significance, and how urban functions vary accordingly. As such, the interaction between urban development and transportation links for the Ancient City of Tios will be analysed, and the signifiers for urban development will be designated.



THE IMPORTANCE OF TYPOLOGICAL ANALYSIS FOR CULTURAL CONTINUITY: AN EXAMPLE FROM KOCAELI (TURKEY)

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ABSTRACT

Cities are formed from historical layers. When different periods are examined, it is possible to reach out the information about the relation with the built environment created with the society's owned culture and the location where the built environment is through these historical layers. Cultural and natural values owned by the city, shape the city identity. To have a city identity, it is necessary to provide the continuity of these values and to protect moral and material values which transfer messages of city's past to its future. City identities in the World and in Turkey have been gradually disappearing because of the immigrations which are the results of globalization and industrialization. This situation creates the feeling of "Alienation" in the people who live in the city. Also in Kocaeli, which lost its' agricultural city feature owned until 1960s and whose industrial city feature has come into prominence for 50 years, same problems can be observed. Traditional houses are formed depending on the society's different cultural values. Some places in the traditional houses have disappeared completely or have become useless time-dependently. That's why it is very important to reveal the local similarities. Thanks to the datum gathered by analysing with the Typology method, the historical traces will be the guiding light of continuing structuring and future. On this purpose, Kapanca Street has been chosen as study area. This street is one of the historical layers of Kocaeli city and which is one of the rare places still protecting the authenticity. There are 10 traditional registered houses belonging to the late Ottoman Period in the end of 19th century and the beginning of 20th century on this street. The values of Kapanca Street, which constitutes an important place in the historical identity of Kocaeli and has a historical background more than a century are thought to be in need of being recorded to provide the cultural continuity and to be transferred to future. The study has been done as two-stage. Firstly; A wide literature search about traditional house in Turkey, history of Kocaeli, type, typology, and typological analysis method which are related to topic, and area survey have been done. Other studies done with this analysis method have been observed and transmitted briefly. In the second step, Typological features of Kapanca Street have been presented by using the typological analysis method. With this study, differences about the city will have been stated, the city identity value will have been contributed and cultural continuity will have been provided.



THE SPATIAL CHARACTER ANALYSIS OF STREETS AS PUBLIC SPACES: THE CASE OF HURRIYET AND CUMHURIYET STREET IN IZMIT (TURKEY)

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ABSTRACT

The word “public” was first used to refer to the theatre audience in France in the mid-17th century. In the 18th century, it turned into the meaning of “public space incorporating a large variety of people and composed of acquaintances and strangers”. The concepts of publicity, public space, and public realm have been studied and described by many researchers in the course of time. These descriptions show the development of public space as well. In the very general sense, public spaces are areas of personal and social happiness; collective living spaces of the society; areas of expression of natural and cultural variety; and key elements providing a ground for the establishment of an identity. In the United Nations’ report on public spaces, public space is addressed under six groups: 1. The spaces we intensely used in our daily life; 2. Green open public spaces; 3. Public activity spaces which users can go in without any difficulty, are open to public, and are under protection; 4. Public sector realm (social agreements in which the people are represented, contribute to collective goods, and trust in the administrators elected); 5. City as a public space; 6. Cyberspace. As cities grow, public spaces transform and diversify. Attempts are made to meet the changing needs through types of space developed. However, the character of the existing public spaces, the distribution of open spaces and parks and their inadequacy, the destruction of public space, and the things that are required to be done stand as important issues to be addressed. One of the public spaces going through transformation are streets which we intensely use in our daily life. In general, streets are defined as roads with buildings on both sides in settlements such as provinces and districts whose boundaries are determined by neighbouring buildings. Some researchers have defined streets based on their social functions. According to them, streets are meeting spaces; spaces to deal with strangers; the house of the society; the main elements of urban existence; spaces as changeable as life; symbolic models of urban problems; and symbols of free city. However, the role of streets, which are so important in our daily life, has only been reduced to pass. They have been divided into two between pedestrians and vehicles and lost many social functions of theirs. Accordingly, the present study aims to answer the question of whether the above-mentioned features and characters of streets as public spaces are still maintained with special reference to a street, which is one of the main streets of Izmit (Turkey). The street, which was called İmre Tökeli Avenue, Hamidiye Street (1908), and Demiryolu Tekeli Street (1948) in the course of time, is currently called Hürriyet and Cumhuriyet Street. The people also call it “walking road”. According to the sources, the history of this street is the history of Izmit as well. The past and present spatial character of the study area will be revealed through archive reviews, city development plants, face-to-face interviews, and surveys. Problems will be determined, and recommendations will be developed.



**DESIGN OF A GIS-BASED CAMPUS INFORMATION SYSTEM: THE CASE OF GAZI UNIVERSITY
(ANKARA-TURKEY)**

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ABSTRACT

In the developing and continuously changing world, the speed of accessing information and documentation is becoming more important every passing day. Making correct and quick decisions in the process of evaluating spatial and non-spatial information is an essential component of a sustainable approach. Solving the emergent problems as needed, accessing the required documents without any loss of time, making expedient, correct, and quick decisions, and having a strong capacity to produce solutions are phenomena that support the administrative and academic development of universities, where information is produced. In this regard, GIS provides convenience in accessing the information with its spatial visualization capacity, co-integration of spatial and non-spatial data, ability to question and analyse, design of database, and ability to create decision support system by integrating mathematical and statistical methods into itself as well as the possibility of making correct and quick decisions it offers to users. In this respect, in the present study, a case study has been carried out for Gazi University, and Gazi University Faculty of Education Campus Information System (GUFECIS) has been designed to help the university's administrative and academic decisions and practices. Verbal and numeric data concerning the practices have been produced through questionnaires and field surveys, thereby developing a database. The spatial and numeric data obtained from the field surveys and the verbal data obtained from the questionnaires have been included in the infrastructure of GUFECIS, which allows analysis, control, and solution processes, through GIS software (ArcGIS). Following the creation of the polygon network, coordinated measurements have been carried out, and buildings, the architectural plans of the buildings, roads, trees, and infrastructure layers have been obtained. The obtained data have been classified based on their characteristics to create a numeric database via GIS. With the campus information system developed for the organization of the information pertaining to the practical area within a particular automation system, it has been aimed to collect verbal, numeric, and graphical data, transfer them to the computer environment, associate, store, and analyse them, and make accessing them in the form of documents and reports within a system easy to users. The system developed allows users to reach their targets easily by querying the pertinent data and to perform data update and data addition operations within the system. In addition, users can produce new data by using the existing data in different analyses fit for purpose. As a result, this system, which will accelerate the decision-making process of the university administration in terms of different engineering and management systems, will provide the campus with sustainability in the areas of infrastructure, engineering, planning, architecture, and construction. In this way, projects and works having a corporate identity will provide both the current and future administrators and decision-makers with access to them and contribute to their decision-making processes.



**INFORMATION SYSTEM: A CASE STUDY IN GAZI FACULTY OF SCIENCE & ARTS CAMPUS AREA,
ANKARA-TURKEY**

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ABSTRACT

The planning and development of universities, which are the primary establishments for making the society knowledgeable, as well as their carrying education and research activities in the best way depend on the sound and quick use of the existing information. Only an information system to be developed can make it possible to prepare the existing information within a particular order, produce new information based on such information, and meet users' needs in a quick way. In this regard, in the present study, attention has been focused on how the basic infrastructure of this kind of a system should be, and a campus information system has been designed through geographic information systems (GIS). Gazi University Faculty of Science & Arts Campus Area has been chosen as the study area. The base map of the Faculty of Science & Arts Campus has been obtained through one-to-one measurements carried out. At the end of the measurements conducted, the numeric data have been transformed into graphical data via drawing programmes. The verbal data, on the other hand, have been transferred to the ArcGIS environment along with the data obtained from one-to-one observations, questionnaires, university administration, and local state institutions and organizations. Such data entered in the system have been associated with one another via GIS-based ArcGIS software. With the network of connections established from different points of view, it has been aimed to query the campus included in the study area, make analyses, and develop new thematic maps that are spatially fit for purpose. In the end, with the Gazi University Faculty of Science & Arts Information System (GUFSAIS), it has been enabled for the university administration to make its decisions concerning all kinds of needs and services involved in all future plans in a quick and sound way. Furthermore, the system created will serve as a model and support provincial and country-wide geographic information systems.



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**GLOBALIZATION IMAGE ON ARCHITECTURE: TALL AND ULTRA-MODERN BUILDINGS OF ANKARA
(TURKEY)**

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ABSTRACT

Policy switching, radical socioeconomic changes and integration to globalization started in 1980s were accelerated new urban space developments in 1990s and provided urban space identity policies in 2000s. Luxurious shopping malls, hotels, and ultra-posh residences within the city and gated communities on city peripheries have formed. Thus, the urban geography, urban silhouette and urban identity are being converted through high-rise buildings that signify the created prestige, status, and power in competition with the global capital. By the globalization foresight the cities which have gotten ahead of the nation-state is seen that the architectural building converted into a symbolic (iconic) global product leads to an advantage, in the race for attracting global investments and tourism, on behalf of the cities/urban districts. This process, which was initiated haphazardly in Turkey in the 1980s, has been on-going throughout the 1990s and, especially, the years of 2000 by means of the re-structuring of the government on a neo-liberal basis. The process is concurrently observable through the tall buildings and/or building blocks which match with urban regeneration projects, urban zoning plan revisions, and fragmented zoning plans in the capital city Ankara. In this study, the global new world order will be evaluated through the tall and iconic/ultra-modern buildings actualized in Ankara according to their status in the city and their architectural characteristics.



AN EVALUATION OF THE CONSERVATION OF MODERN ARCHITECTURAL HERITAGE THROUGH ANKARA (TURKEY)'S PUBLIC BUILDINGS AND URBAN IDENTITY

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ABSTRACT

This paper evaluates the approach to the field of modern architecture in Turkey through the public buildings of Ankara. Although the conservation of modern architecture as cultural heritage has been accepted, to a limited degree, within related frameworks and disciplines, and within theory, the inconsistency in preservation legislations have been evaluated critically. The scope of conservation is limited to the state of being old and historical, thereby rendering modern architecture not worth conserving. This is valid for many countries, just like it is for Turkey. Despite various local interpretations of the mode of modern architecture that foresees mono-typing, the connotations of "culture" and the state of being a "product of the past," of the 20th century, are denied. The expanding and transforming characteristic of immovable cultural heritage is disregarded. As such, modern architecture in Turkey remains inadequately analysed and documented within the framework of cultural heritage. The conservation of buildings dating back to the 20th century remains within the preference of the related Ministry. As the criteria for this preference is not determined, some public buildings that exemplify modern architecture are rapidly lost despite their being of the same style and period with other buildings designated for conservation. The threat of being torn down or destroyed due to aging functionally and physically renders the preservation of modern architecture products within the framework of cultural heritage, as well as the updating of the legal context according to new parameters, urgent and necessary. The sustenance of public buildings, which are not only products of modern architecture but also sources of the history of the city and architecture, and therefore the history of the Republic in Turkey and the modernization process, gains even more significance through its impact on the urban identity of the capital, Ankara. To this end, this paper focuses on the city of Ankara for its case study on the present status of sustaining modern architectural heritage.



URBAN AND SPATIAL OPPOSITION BY THE SUBJECT

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ABSTRACT

In the production of spaces, an important aspect, that is 'the subject' had been neglected with the influence of the industrial revolution, modernisation, capitalism and neo-liberalism. While the rationalist reason was standardising and extending production, the relationship between space and its user had been broken-off. It initiated a tremendous change when the subject as the user of the space-produced, singled out his own existence and needs from the whole and comprehended his self-distinctiveness. Such split up indicating the act of critical thinking and liberation of the subject had also created a demand for diversity. The demands of the subject being the user of the space had not been met at the architectural and urban levels for several reasons. The subject feeling the discomfort of such a situation brings into view his criticisms first in his own individual space and then in public space for the purposes of expressing his right to live and his locus-standi. Such acts being classified as adversary are being realised in order to provide the adaptability of the subject and the space to changing living conditions using different means. Such adversary touches being provided partly by the urbanites and partly by the professionals draw attention to the issue through by-pass interventions to the architecturally choked urban areas. By taking a stance against the existing situation, the intention is to treat space in a different way than what has been produced by the system, to re-produce it and to render it more democratic. All such alternative spatial situations show us that other production methods and lines of thought, other than what has been defined by the dominant market conditions are also possible. It has been asserted through these adversary instigations that there is a requirement for micro designs towards the daily and changing needs of the subject as a user during the act of design by architects and planners. For this reason the part played by the designer should be wriggled out of 'defining' and 'controlling' effects and should turn towards using the transformational power of the society for the benefit of the same, should lead the user and provide alternatives.



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AN ASSESSMENT OF SELNIK STREET (ANKARA, TURKEY) AS A LIVING URBAN SPACE

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ABSTRACT

Urban spaces create their physical existence through streets and the spaces left between the buildings. However, the user activities within the city avail a produced area consisting of streets and buildings to become a living space. According to Jacobs, the more the urban spaces are used, livelier and more vivacious spaces are going to be provided. The use of space by the individuals is in close connection with some characteristics of the space. Among these, the multi-functionality of the space, the regularity in its night and day utility patterns, and the availability of conditions of comfort and aesthetics, its ability to transform depending on the requirements of time could be mentioned. In order to scrutinise the relationship between the spatial characteristics of a built up space and its utility Selnik Street/Ankara (Turkey) had been selected as our field of study. Firstly, the characteristics of living spaces have been defined within the study. Then the use of units and the structural analysis of Selnik Street had been undertaken; and the area had been studied in terms of the use of open spaces and conditions of comfort. The use of space by the users had been revealed through observation. As a result of the assessments, the spatial deficiencies of the field of study had been identified. Proposals have been made for transforming Selanik Street into a living urban space, such as the organisation of its utility patterns, the addition of activities that draw the users to the area, providing conditions of comfort and increasing aesthetic values.



BUSINESS MANAGEMENT IN SUSTAINABLE BUILDINGS

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ABSTRACT

The concept of the sustainability is described as efficiently and effectively consuming of exhaustible and recyclable sources of the world. A sustainable building implements sustainability criteria in its life cycle and business management is the process by which an organization uses its resources in the most efficient way to reach its goal. From the beginning, sustainable building prove their differences from the conventional buildings. Sustainable buildings are resource-efficient and environmentally responsible structures in terms of energy consumption, construction principles, siting, renovation and maintenance throughout its life cycle while conventional buildings are more traditional in these matters. The differences are observable especially in costs and expenditures. It is possible and feasible to compare and contrast the design, construction and management costs of both types of structures. Thence, contributions of sustainable buildings are priced favorably in terms of ecological and sociological aspects. In this context, a prospective projection can be made considering the extra costs of sustainable structures, as well as the consumption profits due to the use of less energy than conventional construction. Considering this, it is possible to project consumption savings in long term. By calculating a forward-looking net cash flow projection, it can be forecasted how much time it will take to cover the extra cost. When making decisions, investors always contemplate maximum profitability. An investment process, which cannot be pre-estimated, is not appealing to investors. Within the scope of this study, costs of sustainable and conventional buildings will be compared and contrasted through precedence of a green building certificated and non-certificated building. It will be analyzed in which time period the initial cost difference between them will be compensated totally and partially. Furthermore, an efficiency and effectiveness analyses will be done in the scope of the necessities and expenses of these businesses.



ASSESSMENT OF TEMPORARY AND PERMANENT HOUSING PROBLEMS AFTER DISASTER

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ABSTRACT

In the face of disasters occurrence such as earthquakes, floods, volcanic eruptions, landslides in the world; people and their surroundings are affected negatively. Individuals experience various psychological as well as economic and physical difficulties because of their lost after the disaster. In order to cope with these difficulties and despair, the victims are in an effort to return to their former lives as soon as possible. For this reason, after the physical needs are met, Reconstruction of sheltering, housing and residential areas gain great importance. In our country, with various construction systems and methods, housing needs of victims are tried to be solved by state support. As it is known, Turkey is located in a geographical area where earthquake disaster occurs quite frequently and the last earthquake in the country occurred in the city of Van in 2011. After an earthquake with magnitude of 7.0 (Mw), epicenter of it being Tabanlı village of Van city center on October 3, 2011 and a new earthquake with magnitude of 5.7 (Mw) in the district of Edremit on November 9, 2011; 1966 people were injured and 644 people lost their lives. In the earthquake, approximately 113,000 residences were recorded as heavy-moderate and slightly damaged; 36,000 of these are defined as inaccessible. The Housing Development Administration (TOKI), authorized by the central government, completed the disaster-affected housing in the short period of ten months. However, the most important point in this process is the provision of post-disaster housing that is suitable for the users in urban or rural settlements to be reconstructed after the disaster and can meet the needs and contentment of disaster victims. In this context, it is a known fact that the disaster housings that cannot meet the needs of the people has been abandoned over time, and for this reason it is also a known fact that public interest are harmed. From this point of view, in the study, by examining the process of transition from temporary sheltering centers to permanent housing after the disaster, existing problems of sheltering are being tried to be identified in Van disaster housings in particular. It is also included in the scope of this study, residential expectations of the individuals living in permanent housing, the location selection of the houses and the design criteria.



**AN EVALUATION ON LIVING PUBLIC SPACES AND THEIR QUALITIES: CASE STUDY OF KONUR,
KARANFIL AND YUKSEL STREETS (ANKARA, TURKEY)**

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ABSTRACT

Public spaces that constitutes one of the main elements of the living cities. They stand out as places reflecting the social structure of the society and the past values. They appear as the places one can observe the changes and modernity of the society as well as socializing places. Following to private and semi-private spaces, public spaces such as streets, squares and parks provide to people to get the chance to be together and make contact with each other. In living and vibrant places with these random appointments they feel that they belong their selves to social urban life. So well-designed living public spaces are important indicators for the quality of life and user satisfaction. In the scope of this paper the basic principles and design criteria that create living public spaces and their effects on user satisfaction are discussed. By analyzing the spatial reflections of used design criteria it is aimed to relate the existing arrangements to user satisfaction. For these analysis, Yksel Street located at Kzlay Square in Ankara center and side streets of Karanfil and Konur (all car-free) are selected as case study area. This area is one of the most important and densely used pedestrian zone of the capital with its green pattern, location and crossroads. At the beginning, basic design criteria and implementation methods are detailed with the literature survey. Then basic criteria and design principles are verified by using field studies including a survey with randomly asked 270 questionnaires. For defining the user satisfaction and bringing out the qualifications and failures in the case study area user surveys are analyzed by field study observations and SPSS software. Finally, practical suggestions which believed to be useful for this type of public places in developing and less developed countries are proposed.



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**THE VALUE OF SUSTAINABILITY IN ARCHITECTURAL DESIGN AND REAL ESTATE DEVELOPMENT: A
REVIEW OF AN ARCHITECT AS A REAL ESTATE VALUER**

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ABSTRACT

This manifesto is about a contribution to construction world to be sustainable within the means of genius loci. The aim to give some main points on architectural design criteria to be followed afterward and growing international standards as long as human admit the deep ecological philosophy especially in the sense of sensitive architectural design projects integrated responsive real estate development within the continuous phases of shared values. Also, the paper aims to enlighten how the greenery philosophy is/can be adapted to International value standards and the process in the mind of construction world maestro(s) to keep up the sector of constructional materials development by managing the design, appraisal and educational manner. Finally, sustainable architectural design, sustainable development and sustainable living in urban space will be discussed in a patera.



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**THEORETICAL APPROACHES IN THE CONTEXT OF SPATIAL PLANNING DECISIONS AND THE
RELATION WITH URBAN SUSTAINABILITY: A PROPOSAL**

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ABSTRACT

The sustainability agenda has maintained its importance since the days, when the production system took its capitalist form, as well as the population in the urban areas started to rise. Increasing number of both goods and the people have caused the degradation of the certain systems, which generate the urban areas. These systems could mainly be classified as social, environmental, physical and economical systems. Today, urban areas still have difficulty to protect those systems, due to the significant demand of the population. Therefore, studies related with the sustainable issues are significant in the sense of continuity of the urban systems. Therefore, in this paper, those studies in the context of the effects of physical decisions taken in the spatial planning process on urban sustainability, will be examined. The components of the physical decisions are limited to land use, density and design. Land use decisions will be examined in the context of mixed land use. On the other hand, decisions related with density will be analyzed in the sense of population density and floor area ratio (FAR). Besides, design decisions will be examined, by linking them with neighborhood design criteria. Additionally, the term of urban sustainability will only be limited to its social and environmental contexts in this study. Briefly stated, studies in the sustainable literature concerned with the effects of land use, density and design decisions taken in the spatial planning process on the social and environmental sustainability will be examined in this paper. After the compilation and the analyze of those studies, a theoretical approach will be proposed to determine social and environmental sustainability in the context of land use, density and design decisions, taken in the spatial planning process.



THE IMPACT OF STRUCTURAL DAMAGE IN URBAN TRANSFORMATION DECISION MAKING: THE ANKARA (TURKEY) EXAMPLE

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ABSTRACT

The main reasons for formation of depressed urban areas around the world and in Turkey include economic and social reasons; excessive population increases or decreases; increase in crime; the fall of the housing reserve in the region below standards in terms of quality and inadequate housing reserves; wrong site selection; and the occurrence of natural and man-made disasters such as fires, earthquakes, and landslides. Towns are losing their functionality and facing being dilapidated, reclaiming the formed depression areas for the city is becoming a necessity and urban renewal and transformation tools are used as common methods to this end. Today, urban transformation practices are more widely used in order both to save the many elements that make up the urban fabric from the threat of dilapidation by responding to the physical change requirements and to establish a successful model of economic development aimed at increasing urban welfare and quality of life. In the areas that will be subjected to urban transformation, the society is expected to enjoy state-of-the-art housing and equipment with infrastructural, social, and cultural fittings as a whole. In this study, the data, which constitutes base to urban renewal decisions and obtained from the relevant municipalities in the Ankara Province, have been analyzed and the rationales for urban renewal were comparatively investigated, considering the requirement to address the social and physical aspects, too, in order to be able to realize the reclamation of the depressed urban areas back to the city as well as the transformation activities. By determining the amount and levels of damaged structures exposed to transformation, an attempt has been made to reveal to what extent structural damage is one of the influential factors in the process of taking urban transformation decisions. It has been demonstrated in the obtained and examined feasibility reports and urban renewal decision rationales that factors such as the insufficiency of the existing housing stock, intense squatting, and unfavorable ground conditions are also effective in the decision-making processes related to the social dimension of transformation. In the study comparing the similar applications around the world with the examined urban transformation practices in the Province of Ankara, particularly with regard to the impact of structural damage on urban renewal decisions, a damage distribution map was generated using map bases obtained from the relevant institutions and geographic information systems for the Mamak District, Sehit Cengiz Topel Quarter and close surroundings, one of the neighborhoods that have been decided to go through urban renewal, in order to provide a more effective, visual, and questionable discussion of the real estate with structural damage within the urban transformation area. The damage classification adopted by decision mechanisms was used in the generated damage distribution map. When the application forms of building damage assessment processes around the world is examined, it should be emphasized that these activities remain inadequate in Turkey and that there is a requirement to develop and detail transformation or regeneration method choices to ensure that these are conducted more accurately and effectively, and that there is a requirement for professionalization and a reliable formation in taking urban transformation decisions. A proposal aimed at ensuring opportunities of access, without repetition of detections, to information regarding the areas where municipalities will conduct urban renewal or damaged structure works; facilitating decision making processes for mechanisms that take urban renewal decisions; creating middle to long term urban renewal plan projections; determination of urban renewal area boundaries to eliminate the possible need for a second transformation; and keeping urban economic rent under control has been put forward. The obtained results have been verified with stakeholder surveys conducted on decision-makers of the urban renewal projects considered in the case study.



MULTIDISCIPLINARY APPROACH DEVELOPMENT MODEL FOR EARTHQUAKE-SENSITIVE URBAN PLANNING

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ABSTRACT

Space planning, which guides the development of cities in our time being also a part of disaster management, is being implemented without any connection with small (upper) scale plans such as country and regional plans. Nevertheless, the continuity and sustainability of the measures taken before, during and after disasters in order to mitigate the damages caused by earthquake must be the essential concern. The legal arrangements prepared and to be prepared on disaster must not only include measures for strength of structures but also the measures that need to be taken in urban and regional planning which primarily include geotechnical and geological studies. Earthquake research requires working with several different disciplines due to earthquake's complex formation and various effects. Despite large amount of available research in technical engineering matters, the studies in urban planning and design are far from being sufficient. Selection of place and identification of transportation decisions regarding the new development zones in terms of earthquake safety are the most important criteria. Earthquake safety is not merely an engineering problem. Because earthquakes not only affect buildings but also create major problems for morphology and physical structure of the urban settlements. It must be demonstrated what kind of connection exists between environmental and regional conditions and disaster risks in regions inflicted with disasters or have high disaster risk. Besides, planning the zone depending on the housing topology is architecturally crucial and might also mitigate earthquake damages. Mitigation of disaster risks is clearly and expressly stated among the goals of (zoning) planning. The objective of this paper is to present a multi-disciplinary approach required for designing safe settlements in the framework of disaster and risk management. In order to achieve this objective, efforts will be shown to create a common language and approach between several disciplines and studies such as urban planning, urban design, geology and civil engineering, architecture and law. In this context, earthquake-sensitive planning, creating sustainable long-lasting cities and "disaster safety", which require cooperation of several disciplines, will be dealt with. Moreover, it will be attempted to look into necessary criteria in order for the transformed region to become a capacious and sustainable living space suitable to the socioeconomic structure of the local people with available long-term infrastructure and transportation facilities and having sufficient official and social services facilities. As a part of the paper, a multidisciplinary study will be conducted in order to identify assessment criteria for earth sciences, planning and architecture fields in reference to long-lasting and sustainable urbanization and development sensitive to earthquake. In this regard, the criteria and their respective phases to be considered in the process of urban development and selection of settlement, and synthesizing all criteria that affect the process from architectural design to housing and from geotechnical research to planning principles and urban design, and identifying their place in the process for urbanization sensitive to earthquake shall be evaluated in stages, and it will be attempted to present a multidisciplinary approach development model concerning Earthquake-sensitive Planning dynamics and practices. Besides, a case which synthesizes study, engineering and architectural viewpoint and systemizes urbanization stages will be presented.



**SOLID WASTE LANDFILL SITE SELECTION IN THE SENSE OF ENVIRONMENT SENSITIVE
SUSTAINABLE URBANIZATION: IZMIR (TURKEY) CASE**

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ABSTRACT

Each stage of the planning process should be based on the natural resource protection, in the sense of environmental sensitive and sustainable urban planning. Values, which are vital for the continuity of the life in the Earth, as soil, water, forest etc. should be protected from the undesired effects of the pollution and the other effects caused by the high urbanization levels. In this context, GIS-MCDM based solid waste landfill site selection is applied for Izmir, Turkey, where is a significant attraction place for tourism. As MCDM technique, Analytical Hierarchy Process (AHP) is used. In this study, geological, tectonical and hydrological data, as well as agricultural land use, slope, distance to the settlement areas and the highways are used as inputs for AHP analysis. In the analysis stage, those inputs are rated and weighted. The weighted criteria are evaluated via GIS, by using weighted overlay tool. Therefore, an upper-scale analysis is conducted and a map, which shows the alternative places for the solid waste landfill sites, considering the environmental protection and evaluated in the context of environmental and urban criteria, are obtained.



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THE LIQUEFACTION POTENTIAL OF THE SETTLEMENT AREA OF SUSURLUK (BALIKESIR, NW TURKEY) IN THE CONTEXT OF EARTHQUAKE SENSITIVE URBANIZATION

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ABSTRACT

The settlement area of Susurluk (Balikesir, Turkey) is located in a region with a high seismic risk and its territory is in the first degree of earthquake zone according to the earthquake hazard map of Turkey. In addition, the area is suitable for liquefaction in terms of geological criteria. For this reason, the liquefaction potential maps of this settlement area have been prepared. Standard penetration test data provided by the Susurluk (Balikesir) municipality were used directly in the so-called simplified methods. According to the results of the study, Almost all of the area where the terrace is observed has "None" or "Low" liquefaction susceptibility while the liquefaction susceptibility of the area where the alluvium is observed range "Low" to "High".



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DATA FLOW PROBLEM IN RELATION TO LIFE CYCLE COSTING OF CONSTRUCTION PROJECTS IN THE CZECH REPUBLIC

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ABSTRACT

Life cycle costing approach is important for construction projects as it enables to take into consideration future costs relating to the operation and demolition phase of an object. In this way, investor can optimize the project design with the aim to minimize the total project costs. Despite the fact that initial attempts on BIM implementation were done in the Czech Republic already, current situation does not support automated data flow between the bill of costs and applications that support facility management of buildings. The main aim of this contribution is to critically evaluate the current state and outline future framework that should allow the use of the data contained in the bill of costs for the operating costs management of buildings.



OPTIMIZATION MODEL FOR THE DESIGN OF MULTI-LAYERED PERMEABLE REACTIVE BARRIERS

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ABSTRACT

Permeable reactive barriers (PRBs) are being employed as an in-situ groundwater remediation technology. The installation of PRB is usually a major investment, where one of the biggest cost drivers are materials costs. The PRB is only the barrier for the contaminants moving under the natural gradient, not for the groundwater. The most common construction of PRB is single barrier, but in case of mixtures of contaminants more required is multi-layered construction - a combination of different reactive materials and removal processes. For PRB design, one of the most important parameters are dimensions. The barrier must be long enough to treat the entire width of the plume (dimension perpendicular to groundwater flow) and should extend to and be keyed into a impermeable layer. The problem is to determine the optimum thickness of PRB, which should to provide the residence time to reduce the concentration of the contaminants to the desired effluent concentration. In PRB's design is accomplished using a numerical methods or simulators, which are useful to predict the scenarios and evaluation of the resulting groundwater flow systems for specific site conditions. On the other hand, numerical methods are complicated and can have significant errors if discretization is too coarse or incorrectly aligned. This paper deals with a simple, conceptual model of one approach optimization method - for multi-layered PRB design. Based on literature and the laboratory test results (residence time, density and hydraulic coefficient) the selection of layers of reactive materials were determined. Considering the lowest cost of reactive materials, the required thickness of activated carbon, zeolite and zero valent-iron were calculated using two different algorithms. The simple model could be used for preliminary barrier design and cost calculations. Using the optimization model in preliminary design stage, it is possible to reject the concept of PRB and avoid the losing time for complicated analysis.



CONTRACTORS` CLAIMS AS A FACTOR OF SCHEDULE AND COST RISK IN CONSTRUCTION WORKS

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ABSTRACT

The aim of the study is to analyse claims filed by building contractors during the project implementation. The work is divided into two parts. In the first part problems associated with the management of claims in the construction process were discussed. Bearing in mind that claims may result in prolongation of the investment or exceeding planned budget, possibilities of applying information included in documents connected with claims procedure to risk management was analysed in the second part of the study. The basis of the analysis is a review of 226 documents. They originate from 8 construction sites completed in the last 5 years in south-western Poland. In each case, these were linear road projects, executed by different contractors, according to conditions in the contract set out in the "Yellow Book" FIDIC. In the study, other documents relating events that according to contractors entitled them to claim were also analysed. They included among others: project documentation, terms of reference, construction log, reports and correspondence under the contract. The events constituting the reason for contractors` claims were classified according to their sources. 8 areas of potential threats were distinguished. They were presented in the form of a block diagram. Most events initiating the claims were reported in the following group - adverse actions of third parties, while the fewest were recorded in the group - restricted access to the construction site. Based on calculated similarity indicators it was found that considered construction sites were diversified in terms of the number of the events occurrence that generated the claim and their sources. In recent years, many road projects are completed behind the schedule and their initially planned budgets are significantly exceeded. Conducted research indicated that data derived from the analysis of documents connected with claims can be applied to identify and classify both cost and schedule risk factors. Obtained data can also be useful at the stage of risk control because early diagnosis of threats in relation to technical and organizational aspects is necessary to take effective action.



EVALUATION OF SUPPLY CHAIN MANAGEMENT SYSTEMS USED IN CIVIL ENGINEERING

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ABSTRACT

One of the most important factors which have an effect on the cost and time of the building process is the organization of physical resources and the information flow structure. Depending on how effective this system is, a building project may end with a success or a failure. Because of many conditions of the construction executing and different needs of the contractors, there are different Supply Chain Management (SCM) systems connected with supplying construction projects: single-stage, multi-stage or combined. The article presents a comparative analysis of construction SCM systems based on a modified fuzzy AHP. The modification of this method is based on the use of interval type-2 fuzzy sets to aggregate evaluation according to the idea proposed by Mikhailov. The use of such a model of group preferences of decision-makers, makes it possible to take into consideration both the linguistic imprecision of an evaluation and the small number of experts. The weight values of specific criteria and the final scale vector of considered variants are obtained during the analysis. This may give a recommendation to general contractors in construction projects about which evaluation criteria and supply systems are preferred.



UPDATING LINEAR SCHEDULES WITH LOWEST COST: A LINEAR PROGRAMMING MODEL

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ABSTRACT

Many civil engineering projects involve sets of tasks repeated in a predefined sequence in a number of work areas along a particular route. A useful graphical representation of schedules of such projects is time-distance diagrams that clearly show what process is conducted where at a particular point of time. With repetitive tasks, the quality of project performance is conditioned by the ability of the planner to optimize workflow by synchronizing the works and resources, which usually means that resources are planned to be continuously utilized. However, construction processes are prone to risks, and a fully synchronized schedule may expire if a disturbance (bad weather, machine failure etc.) affects even one task. In such cases, works need to be rescheduled, and another optimal schedule should be built for the changed circumstances. This typically means that, to meet the fixed completion date, durations of operations have to be reduced. A number of measures are possible to achieve such reduction: working overtime, employing more resources or relocating resources from less to more critical tasks, but they all come at a considerable cost and affect the whole project. The paper investigates into the problem of selecting the measures that reduce durations of tasks of a linear project so that the cost of these measures is kept to the minimum and proposes an algorithm that could be applied to find optimal solutions as the need to reschedule arises. As civil engineering projects, such as road building, usually involve less process types than construction projects, the complexity of scheduling problems is lower, and precise optimization algorithms can be applied. Therefore, the authors put forward a linear programming model of the problem and illustrate its principle of operation with an example.



MINIMIZING PROJECT COST BY INTEGRATING SUBCONTRACTOR SELECTION DECISIONS WITH SCHEDULING

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ABSTRACT

Subcontracting has been a worldwide practice in the construction industry. It enables the construction enterprises to focus on their core competences and, at the same time, it makes complex project possible to be delivered. Since general contractors bear full responsibility for the works carried out by their subcontractors, it is their task and their risk to select a right subcontractor for a particular work. Although subcontractor management has been admitted to significantly affect the construction project's performance, current practices and past research deal with subcontractor management and scheduling separately. The proposed model aims to support subcontracting decisions by integrating subcontractor selection with scheduling to enable the general contractor to select the optimal combination of subcontractors and own crews for all work packages of the project. The model allows for the interactions between the subcontractors and their impacts on the overall project performance in terms of cost and, indirectly, time and quality. The model is intended to be used at the general contractor's bid preparation stage. The authors claim that the subcontracting decisions should be taken in a two stage process. The first stage is a prequalification – provision of a short list of capable and reliable subcontractors; this stage is not the focus of the paper. The resulting pool of available resources is divided into two subsets: subcontractors, and general contractor's in-house crews. Once it has been defined, the next stage is to assign them to the work packages that, bound by fixed precedence constraints, form the project's network diagram. Each package is possible to be delivered by the general contractor's crew or some of the potential subcontractors, at a specific time and cost. Particular crews and subcontractors can be contracted more than one package, but not at the same time. Other constraints include the predefined project completion date (the project is not allowed to take longer) and maximum total value of subcontracted work. The problem is modelled as a mixed binary linear program that minimizes project cost. It can be solved using universal solvers (e.g. LINGO, AIMMS, CPLEX, MATLAB and Optimization Toolbox, etc.). However, developing a dedicated decision-support tool would facilitate practical applications. To illustrate the idea of the model, the authors present a numerical example to find the optimal set of resources allocated to a project.



RISK MANAGEMENT IN CONSTRUCTION PROJECT: TAKING INTO ACCOUNT THE PHENOMENON OF FAIRNESS

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ABSTRACT

Risk management requires a comprehensive review of possible hazards, their possible outcomes as well as some recommendations about minimizing the risk. The study emphasises that the project risk management refers to an analysis of the risk factors and a creation of the strategy minimising negative effects of the risk. It was pointed out that a construction project is this kind of projects that can be defined as a unique process of high complexity (design documentation, various stages of creating the building), which has clearly defined time frames and a given financial limit. It is executed as a team work, by qualified or highly qualified specialists of different matters, for example masonry, precast, etc. Additionally, it requires a use of modern equipment and an adequate preparation of the investment. Therefore, the risk management focuses on the problems allowing for troubleshooting. A basis of the risk management is to recognise the fundamentals, which are crucial for the construction project management, i.e. a thing's perspective, including technological, supporting and management processes as well as an entity perspective – project stakeholders. Construction projects require also an acquaintance with the specificity of the branch. The article refers to the risk management in construction project and, in particular, a phenomenon of participants' fairness in such projects. The problem of fairness of the entities involved in a project should be understood as a fair play, according to the arrangements agreed in a contract and compatible with current formal procedures and social rules. It was indicated that fairness can be treated as an important factor in predicting the success of such projects. Interviews conducted among contractors in Kuyavian-Pomeranian region showed varied fairness requirements put to individual participants of construction projects. The article presents results of the research. It shows a desired attitude of the surveyed enterprises towards a problem of the fair behaviour. These behaviours, relating to individual stakeholders, have been underlined in different phases of the construction projects' life cycle.



INFLUENCE OF SELECTED STAKEHOLDERS OF CONSTRUCTION INVESTMENT PROJECTS ON THE COURSE OF PROJECT

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ABSTRACT

The article presents an entity perspective of the construction investment projects. In a course of the project there are stakeholders who have an indirect influence (e.g. decision-makers in the selection of projects) or a direct influence (e.g. members of the project team). An intuitive opinion about a significant influence of project stakeholders on the project's course encouraged the authors to undertake a research in this area. The article illustrates the initial phases of the construction project life cycle in a perspective of the entities and, in particular, a role of different stakeholders in making decisions that affect a course of the project. An analysis of the structure of the construction project life cycle makes a substantial involvement of various subjects in the initial phases of the project, i.e. in an initial phase and during a creation of the structures. A key point is to underline the factors of decision-making by the participants of the construction process. It was indicated that the stakeholders have a different impact on the course of the project. In large projects, which have many stakeholders, their role in the implementation of the investment project can vary, depending on the life cycle of the project. They can have positive or negative impacts on achieving the project objectives. The paper presents the results of 100 surveys made among participants of the building processes, executors of the construction projects in the Kuyavian-Pomeranian region. The study was conducted in December 2016 and January 2017. It revealed what is the impact of individual stakeholders of the construction projects on the course of the project. A special attention was paid to a complex relationship between objectives of the project and stakeholders' goals. A great care to the smallest possible number of risks, which may arise from the different objectives of the project and its stakeholders' goals, should be focused on the augmentation of correlation of measures of the goals. It is crucial to identify the stakeholders, whereas it is a continuous and quite difficult process. However, when ignoring the impact of specific stakeholders on the implementation of the project, a duration of the project and its costs may increase. A main problem, in establishing a relationship between participants in the construction process, is to take into account the risk of all project stakeholders.



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FORMS OF RELATIONSHIP AGREEMENTS IN CONSTRUCTION PROJECTS

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ABSTRACT

In recent years, more and more attention is paid to the benefits of building good relations in the construction projects. The article presents various forms of relationship agreements, as may be adopted by the participants of construction projects. The following forms of relationship agreements have been indicated: partnering, alliancing, public-private partnership and joint venture. Cooperation undertaken within their framework may vary time horizon and cover either a single construction project or pose strategic long term cooperation covering many projects. The forms of relational agreements have been characterized under the analysis pointing out common features and differences between them.



PROPOSAL OF THE USE OF A FUZZY STOCHASTIC NETWORK FOR THE PRELIMINARY EVALUATION OF THE FEASIBILITY OF THE PROCESS OF THE ADAPTATION OF A HISTORICAL BUILDING TO A PARTICULAR FORM OF USE

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ABSTRACT

The knowledge of a real estate developer regarding the possibilities of adapting a historical building to a particular form of use and the knowledge of the approximate costs associated with this process are some of the more important pieces of information that can influence the making of the final decision regarding commencing with such a project. The preliminary analysis of the process of adapting a historical building is a difficult task due to the specific character of this type of project. The specific character of such a project is proven by the fact that the often insufficient analysis of the structure and architecture of a building and its historical substance at the stage of carrying out the process of adaptation can generate the necessity to perform previously unforeseen additional actions. An equally important problem is the difficulty in estimating the funds required to conduct research and the analyses associated with developing design documentation, as well as carrying out construction and conservation work. This is why a real estate developer should analyse various scenarios of carrying out a project during the stage of the preliminary analysis of its feasibility, taking into account the fact that some of them can occur in a random manner. The authors of the paper propose the use of one of the planning tools known as stochastic networks, which can be used to model the undetermined structure of these types of projects. Fuzzy logic was used in order to estimate uncertain values of the parameters of a model (the probability of performing work and paying the associated costs). The approach proposed by the authors was used to perform a preliminary analysis of the adaptation of the Arsenal in Gdansk to a particular form of use along with estimating the costs associated with it. The results that were obtained have confirmed the potential of this method for real-world application.



POTENTIAL OF PROGRESSIVE CONSTRUCTION SYSTEMS IN SLOVAKIA

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ABSTRACT

Construction industry is sector with rapid development. Progressive technologies of construction and new construction materials also called as modern methods of construction (MMC) are developed constantly. MMC represent the adoption of construction industrialisation and the use of prefabrication of components in building construction. One of these modern methods is also system Varianthaus which is based on insulated concrete forms principle and provides complete production plant for wall, ceiling and roof elements for a high thermal insulation house construction. Another progressive construction system is EcoB which represents an insulated precast concrete panel based on combination of two layers, insulation and concrete, produced in a factory as a whole. Both modern methods of construction are not yet known and wide-spread in Slovak construction market. The aim of this paper is focused on demonstrating of MMC using potential in Slovakia. MMC potential is proved based on comparison of the selected parameters of construction process - construction costs and construction time. The subject of this study is family house modelled in three material variants - masonry construction (as a representative of traditional methods of construction), Varianthaus and EcoB (as the representatives of modern methods of construction). The results of this study provide the useful information in decision making process for potential investors of construction.



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IDENTIFICATION AND PROFILING THE PATTERN OF CONSTRUCTION ACCIDENTS

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ABSTRACT

The construction site and its elements create circumstances that are conducive to the formation of risks to work safety during the execution of works. Analysis indicates the critical importance of these factors in the set of characteristics that describe the causes of accidents in the construction industry. Main substantive tasks in article include isolating patterns of accidents on the site and identifying those of the analysed characteristics that are important in defining these patterns. The research was carried out on the basis of data from the register kept by the District Labour Inspectorate, in Krakow (2014 - 16).



INFLUENCE OF CEMENTS CONTAINING CALCAREOUS FLY ASH AS A MAIN COMPONENT ON PROPERTIES OF FRESH CEMENT MIXTURES

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ABSTRACT

The main goal of presented research was to examine usability of cements containing calcareous fly ash (W) from technological point of view. In the paper the results of tests concerning the influence of presence of fly ash (W) in CEM II and CEM IV cements produced using different method on rheological properties, air content, setting times and plastic shrinkage of mortars. Moreover compatibility of plasticizers with cements containing fly ash (W) was also studied. Additionally setting time and hydration heat of cements containing calcareous fly ash (W) were determined. In a broader aspect, the research contributes to popularize possibility of calcareous fly ash (W) use in cement and concrete technology, what greatly benefits the environment protection (utilization of waste fly ash). Calcareous fly ash can be used successfully as cement main component. Cements produced by blending with processed fly ash or cements produced by interginding characterize by acceptable technological properties. In respect to CEM I cements, cements containing calcareous fly ash worsening workability decreases air content, delay setting time of mixtures. Cements with calcareous fly ash shows good compatibility with plasticizers.



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**ASSESSMENT OF MATERIAL SOLUTIONS OF OFFICE BUILDING STRUCTURE WITHIN INTEGRATED
LIFE CYCLE DESIGN PROCESS**

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ABSTRACT

The paper presents an environmental and economic analysis of the material solutions of multi-level garage. The construction project approach considered reinforced concrete structure by use ordinary concrete vs. high-performance concrete - which allowed to significant reduction the share of reinforcement steel, mainly in compression elements (columns) in the construction of the object. The analysis was based on the methodology of integrated life cycle design (ILCD). By making multi-criteria analysis based on established weight of the economic and environmental parameters, three solutions have been evaluated and compared within phase of material production (information modules A1-A3).



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**THE IDENTIFICATION OF THE CAUSES OF ACCIDENTS AT WORK WITH THE PARTICIPATION OF
SCAFFOLDING AS AN EXAMPLE OF LOWER SILESIA**

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ABSTRACT

The article presents the results of research on the causes of accidents at work that involve scaffolding. The basis for the identification and classification of the causes of accidents were post-accident protocols drawn up by labour inspectors. The study involved accidents that occurred in Lower Silesia in the years 2008-2015. Based on the analysis of 41 accidents involving scaffolding, their causes were determined. They were then classified into the following three groups of causes: technical, organizational and human. Analysis of Pareto-Lorenz was applied in order to determine the most common causes in each group.



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THE METHODOLOGY OF VARIANTS ASSESSMENT OF CONSTRUCTION PROJECTS WITH THE USE OF GRAPHICAL METHODS IN MULTI-CRITERIA ANALYSIS - SYSTEM APPROACH

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ABSTRACT

Assessment of variant solutions developed for a building investment project needs to be made at the stage of planning. While considering alternative solutions, the investor defines various criteria, but a direct evaluation of the degree of their fulfilment by developed variant solutions can be very difficult. In practice, there are different methods which enable the user to include a large number of parameters into an analysis, but their implementation can be challenging. Some methods require advanced mathematical computations, preceded by complicating input data processing, and the generated results may not lend themselves easily to interpretation. Hence, during her research, the author has developed a systemic approach, which involves several methods and whose goal is to compare their outcome. The final stage of the proposed method consists of graphic interpretation of results. The method has been tested on a variety of building and development projects.



APPLICATION OF EARNED VALUE METHOD FOR EVALUATION THE TIME/COST CONSEQUENCES OF VARIATION ORDERS IN A CONSTRUCTION PROJECT

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ABSTRACT

The decision making process of acceptance of the VO for running construction projects is always subjected to the risk of consequences, which are difficult to be defined. But, even heaving all the technical and organizational consequences identified, their impact on the project completion date and final project cost, is again not easy to state. The practical methodology of using the EVM as a tool supporting the acceptance decision of the VO being considered during construction works, is presented in the paper. The main strength of the presented concept is a quick prognosis of the final project completion date and the final project cost in case the VO is accepted.



IMPACT OF ICT ON PERFORMANCE OF CONSTRUCTION COMPANIES IN SLOVAKIA

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ABSTRACT

Information and communication technologies became a part of management tools in modern companies. Construction industry and its participants deal with a serious requirement for processing the huge amount of information on construction projects including design, construction, time and cost parameters, economic efficiency and sustainability. To fulfill this requirement, companies have to use appropriate ICT tools. Aim of the paper is to examine the impact of ICT exploitation on performance of construction companies. The impact of BIM tools, ERP systems and controlling system on cost and profit indicators will be measured on the sample of 85 companies from construction industry in Slovakia. Enterprise size, enterprise ownership and role in construction process will be set as independent variables for statistical analyse. The results will be considered for different groups of companies.



PROBLEMS OF TECHNOLOGY OF ENERGY-SAVING BUILDINGS AND THEIR IMPACT ON ENERGY EFFICIENCY IN BUILDINGS

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ABSTRACT

Introduction of EPBD in legislation of EU member states caused that buildings must meet very stringent requirements of thermal protection and energy efficiency. On the basis of EPBD provisions, EU Member States introduce standard of NZEB (Nearly Zero-Energy Buildings). Such activities cause a need for new, innovative materials and technologies, and new approaches to design, construction and retrofitting of buildings. Indispensable is the precise coordination of the design of structure and technical installations of building, which may be provided in an integrated design process in the system BIM. It is also necessary good coordination and cooperation of all contractors during the construction phase.



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Specific Session:

Urban heat island effects: from urban scale to buildings and health

Conveners: Assoc.Prof.Dr. Luis Inostroza, Dr. Massimo Palme



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**NATURAL VENTILATION AS A MITIGATION STRATEGY TO REDUCE OVERHEATING IN BUILDINGS
UNDER URBAN HEAT ISLAND**

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ABSTRACT

Urban heat island effect traduces often in a sensitive increase of overheating sensation inside of buildings. To evacuate this heat, the use of air conditioning should be avoided, in order to not increase energy consumption of buildings. Natural ventilation is one of the best strategies to obtain liveable comfort conditions indoor, even in summer season, if building and urban design are conscious of the phenomenon.



KEY PARAMETERS FOR URBAN HEAT ISLAND ASSESSMENT: SENSITIVITY ANALYSIS WITH URBAN WEATHER GENERATOR MODEL

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ABSTRACT

Nowadays, the mitigation of Urban Heat Island (UHI) intensity takes a central role in urban planning and city management, especially in hot and temperate climates. Nevertheless, temperature increase in urban areas is not homogenous, as it depends on some characteristics which vary significantly among different parts of the city, such as: building density, vegetation coverage, thermal and radiative properties of materials and anthropogenic sources of heat. It is therefore useful to identify urban parameters which take key role in determining the UHI intensity, so as to ease the work of urban planners in recognizing the most critical areas within the city. This work analyses the relative weight of the major urban parameters responsible for UHI intensity that are also of high interest to urban designers and planners. To this aim, some sensitivity analysis have been carried out with the urban Weather Generator (UWG) model, considering the major urban parameters involved in the phenomenon and their range of variability in Mediterranean urban context. The parameters tested are: city dimension, urban morphology, tree coverage, anthropogenic heat from vehicles, waste heat from air conditioning systems, inertia and transmittance of buildings walls and albedo of surfaces. The range of variation of each parameter has been computed on Rome and Barcelona, being representative of urban areas of Mediterranean zone. Results show that there is a clear hierarchy of significance among the parameters considered. Some parameters assume wider range of variability in urban areas and determine a strong variation of UHI intensity with respect to others, which remain quite constant within the city. Urban morphology appears to be the most important parameter in Mediterranean context throughout the year, followed by anthropogenic sources of heat such as vehicles and cooling systems. Conversely, albedo of surfaces, tree coverage and wall properties are quite irrelevant on UHI intensity, since their variability in urban areas is very low. So, the study confirms that the UHI intensity variation within the city is mostly related to urban morphology and building density at district scale. Anthropogenic sources of heat are relevant as well; however, further studies should be carried out on this topic, since there are not enough experimental data to validate these results. The achievements reached so far suggest that the urban morphology parameters used by UWG can be used for the identification of urban climatic zones within the city. Future works could improve the accuracy of UHI predictions considering reliable criteria for the calculation of waste heat from air-conditioning systems and vehicles.



A COOL URBAN ISLAND CHANGE 1990-2014: COMPARATIVE BIOCLIMATIC ANALYSIS IN A DESERT CLIMATE, THE CASE OF ANTOFAGASTA CITY SQUARE

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ABSTRACT

This article proposes to make a comparative bioclimatic analysis from 1990 to 2014 of the main square of Antofagasta, a coastal desert city in Chile, which was remodeled in 1995, and to show how the redesigning of green areas affects the microclimatic conditions and thermal comfort of the urban space. Ex ante measurements dating 1990 were compared with ex post results from 2014. Data were obtained in both cases in the month of September at different times of the day and in different climate conditions. The variables studied were: land surface temperature, humidity, wind speed, amount of light and square use frequency inside the square and in surrounding streets. The temperatures are not statistically different during the years 1990 and 2014 for the city of Antofagasta. The main layout of the square has not changed, and inside the square it is similar for both periods, but new species were introduced and bigger trees with shadow projection were cut down. The square had a microclimate role in 2014 as well as in 1990. The highest frequency zone with an important surface lost its comfort thermic condition with an increase of 1°C. Other smaller zones with less relevance for users gained in cooling with a 0.5°C reduction. The new design has been detrimental to the intensity of its micro climatic regulatory function affecting the thermic comfort of the square's internal spaces, especially those formerly protected by shadow, which mitigate high solar radiation. The study results suggest that bio-climatic analysis of public open spaces is a key component for the design of future projects as a heat mitigating tool in the context of climate change.



DYNAMIC-PHYSICAL MODEL TO ANALYZE SOLAR CHIMNEYS IN DIFFERENT CLIMATE ZONES: CASE OF SOCIAL HOUSING IN ECUADOR

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ABSTRACT

Over the last decade, the Ecuadorian government has implemented several programs of social housing to reduce the quantitative housing deficit. The main of the social housing model is the same design and the construction materials regardless the climatic zone. For this reason, they have not been achieved the minimum living conditions related to thermal comfort in every region. With this in mind, the aim of this research is to improve indoor thermal comfort using a solar chimney. A dynamic-physical model has been implemented in order to analyze a solar chimney performance. The proposed solar chimney model was simulated using a python script in order predict the temperature distribution and the mass flow over time. The results obtained were first compared with experimental data for dry-warm climate. Then, the model was evaluated and tested over real weather conditions: dry-warm, moist-warm and rainy-cold. In addition, the assumed chimney dimensions were chosen according to those recommended in literature for the studied conditions. In spite of evaluating the best nightly ventilation, different chimney wall materials were tested: solid brick, common brick and reinforced concrete. The results showed that, concrete in dry-warm climate, a metallic layer on the gap with solid brick in moist-warm climate and reinforced concrete in rainy cold climate for the absorbent wall improve the thermal inertia of the social housing.



HEAT ISLAND EFFECT ON ENERGY CONSUMPTION IN INSTITUTIONAL BUILDINGS IN ROME

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ABSTRACT

The urban heat island (UHI) effect is constantly improving its impacts on energy consumption of buildings in summer periods. The energy GAP between the estimated energy performance (often simulated without considering UHI) and the real operational behaviour is especially relevant for institutional buildings, where the cooling needs are in general higher than in other kind of buildings, due to more internal gains (people, appliances) and sometimes to different architectural design (more transparent façades and light walls). This paper presents a calculation of the energy penalty due to UHI in two institutional buildings in Rome. Urban Weather Generator (UWG) is used to generate a modified weather files, taking into account the UHI phenomenon. Then, two building performance simulations are done for each case: the first simulation uses a standard weather file and the second uses the modified one.



ENERGY EFFICIENCY AS A KEY FACTOR IN SUSTAINABLE CONSTRUCTION: CASE STUDY OF THE SUSTENTA BUILDING, ROSARIO, ARGENTINA

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ABSTRACT

Energy consumption in the world in general and in Argentina in particular is growing. Since it is essentially based on fossil fuels, the Greenhouse Gases Emissions (GHG) emissions are also growing. It is therefore very important to take action to reduce this consumption. One possibility is the increased efficiency in energy use in buildings. In this regard, the city of Rosario (32° 57' S, 60° 42' W, 24 m above sea level) has been a pioneer at national level in the regulation of residential buildings, imposing minimum values to the thermal conductivity of walls, roofs, and windows, and solar protections. An example of such building is Sustenta, located in the center of Rosario city (San Juan 1455). It has been designed taking into account high insulations ($K_{wall}=0,43$; $K_{roof} = 0,38$, $K_{window} = 2,15$), maximum acceptable glass/wall ratio = 60 and solar protections ($FES = 0,18$). RETScreen algorithm was used for obtaining the energy savings of the Sustenta building during its operation, with respect to other buildings: a) a conventional one published in the ARQ magazine, normally used in the country for comparison purposes and cost determinations and b) a similar building to Sustenta, but including the building energy efficiency Norms that the Municipality of Rosario introduced recently. The annual energy consumption for cooling, for the 3 types of buildings (ARQ, Rosario Norm and Sustenta) results: 49, 38 and 27 MWh/year, respectively and for heating: 24, 22 and 21 MWh/year, respectively. Consequently, the total energy use for climatization is: 73, 60 and 48 MWh/year, respectively and the percentage annual energy reduction, with respect to the conventional ARQ building is: 17.2 % for Rosario Norm building and 34.5 % for Sustenta. Corresponding reductions in GHG emissions are: 29, 24 and 19 TnGHG/year. Additionally, it also includes: LED lightning in common spaces with photovoltaic panels energy supply, recovery of rainwater and air conditioner condensation in two tanks of 1000 and 1450 liters each, garden terrace with smart irrigation tanks, dual flush toilets and faucets with aerators in kitchen and bathrooms. Green areas include: terrace garden with native vegetation, flower beds, balconies vertical urban agriculture and gardens in the entrance hall. With regard to the sustainability of the materials, they are of regional origin, used rationally and those that are discarded, are recovered. The Sustenta building also meets the criteria to be as sustainable as possible, without greatly increase construction costs. A study on the subject indicates that the increased costs for the considered efficiency measures, is 10 %, compared to the ARQ one. We conclude that the buildings constructed as Sustenta collaborate in the following ways: a) to improve the rational uses of energy, materials and water, b) to improve the quality of life of the building inhabitants and c) to mitigate the rise in global temperature of the planet, if other buildings can be made in the country with similar sustainability criteria.



URBAN HEAT ISLAND OF VALPARAISO, CHILE. A COMPARISON BETWEEN 2007 - 2016

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ABSTRACT

The urban heat island phenomenon shows that the city changes the climate of the planet and affects it negatively by favoring the climatic change. Urban morphology and city metabolism defines this behavior. The city of Valparaíso, Chile, located in coastal Mediterranean climate in southern hemisphere is a city with 295,000 inhabitants. In this research, the differences between UHI phenomenon in winters of 2007 and 2016 are evaluated. The city presented a temperature difference of 4.6 °C between the outskirts and the urban center as a manifestation of this phenomenon, in 2007. By 2016 the city in population not increases and has had small morphological variations; Presents an average temperature difference of 5.2 ° C between the outskirts and the urban center as manifestation of urban heat island. This higher temperature occurs in the higher density built area, mainly of office buildings. Here is the highest density of metabolic activity of the city, as for 2007.



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Specific Session:
**Education-based research and
research-based studio
as a method of better architecture design
education**

Convener: Prof.Dr. Fathi Bashier



**INTEGRATION OF SPACE LAYOUT AND COMMUNICATION TECHNOLOGY IN HEALTHCARE DESIGN
WITH ETHIOPIAN CONTEXT**

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2 Wollega University, Nekemte, Ethiopia

ABSTRACT

Ethiopia has seen a significant deployment in changing existing paper based to electronic system based healthcare delivery: electronic system which uniquely positioned to capture, store, process, and communicate timely information to decision makers and patient for better coordination of health care at all levels of analysis. Despite significant shift in trend and practice as well as technological advancement in healthcare provision and treatment in past years, integration of systems and resources are struggling to achieve higher efficiency. Small error in coordination of space layout and communication technology and practices surrounded this technology brings hospitals overcrowding, patients' dissatisfaction, stress, anxiety and service inefficiency. The study has inquiry for how architecture, along with communication technology and practices surrounding that technology related to affect patients' satisfaction, patient movement, and hospital efficiency to improve service delivery through Architectural design. Conducting case study by survey, observation and questioner, the study found challenges which the design should address while integrating communication technology to the healthcare system. Results shows, as service delivery relay on digital computing, it influences hospitality around the reception and affects appropriate patient - doctor interaction in clinical rooms. So that the way healthcare communication technology integrated to the system should preserve other quality dimensions such as welcoming and hospitality. Also the mode of communication has sought active to shape movements. Waiting area with waiting list display had a great potential to draw patients towards it. This generate crowd and higher patient movement around waiting areas. On the other hand it promote good working environment by reduce crowd significantly around clinical areas like examination and diagnostic rooms. The provision of effective circulation spaces that satisfy both the health care professionals and patient movement is significant design consideration while integrating healthcare communication technologies with space layout. Furthermore result shows patients spent majority of their time in or around waiting areas with waiting list display. Thus waiting areas plays important role to characterize patients stay. To improve patients' satisfaction by the integration of space layout and communication technology, understanding patients' perception about waiting area design indicators and ways of integration is vital in the context. With this regard, patients are more concerned about information, privacy and safety factors such as posted waiting list, need waiting division, ancillary activities in waiting, progressive checking and likes. Integrating those waiting area design indicators with the appropriate healthcare communication elements like digital waiting list and information kiosks is important to improve patients' satisfaction in their stay. Beyond abstracting design theories, Along with the advancement of technologies and artificial intelligence in health care setting in the context, the study experiences that architects and designers has to move towards evidence-based healthcare design which supported by research.



THE DESIGN PROCESS-SYSTEM AS A DUAL FORM OF EDUCATION-BASED RESEARCH

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ABSTRACT

Studies have recognized the failure of the traditional design approach both in practice and in the studio. They showed that design problems today are too complex for the traditional approach to cope with and reflected a new interest in a better quality design services in order to meet the challenges of our time. This study has introduced the 'design process-system' as a more relevant alternative for the design complexity of our time. The main goal of the design process-system approach is that it serves for better quality design and better design education. A model of the design process-system was developed in the studio as part of the ongoing research project, which has been conducted in the design research master studio at Wollega University, Ethiopia. The model was introduced, by the author, in a previous article of the series entitled "Reflections on architecture design education", which documents the research project. The objective of the research project is to explore the design process and to develop new tools: theory, methodology and design methods to replace the conventional approach. In this article the focus is on the methodology used in the research project, which uses a new dual form of education-based research. The dual education-based research method as used in the research project means that research is based on studio practices, with students' research-based studio projects is the core activity. In this article the model of the design process-system is re-introduced and its functions discussed. In this respect, the design process-system serves double functions: it acts as a research plan for the empirical study within the research project, and as a methodology used by students in studio research-based projects. The interface between these two research activities is the dual education-based research method, which sets the inquiry platform in the research project. This article provides empirical evidence from students' research to demonstrate the potential of the new dual form of education-based research method for better quality design and better design education.



DISTRICT 13 HOUSING PROJECT, BAHIRDAR (ETHIOPIA): WITH EMPHASIS ON OPTIMIZATION OF SUSTAINABLE PERFORMANCE

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ABSTRACT

Housing is a basic need for civilized living. In Ethiopia, sustainability doesn't seem to be a major determinant for architectural design process. The country has lack of knowledge and practice in the design and construction of sustainable housing projects. Depending on the viewpoints there is a complex and at times contradictory set of issues that are affecting building sustainable housing projects, yet, sustainability is not a major concern for most of the new housing projects. Since an alternative sustainable performance optimization techniques in design and construction of buildings are not efficiently practical in Ethiopia and there is not enough work done towards to it: thereby examine cases in the existing schemes in design and construction implementation, in order to achieve the envisaged objectives of sustainable environment and socioeconomic development. Therefore to overcome the crises that building industry face in today's situation raises two complex sets of gaps that needs consideration, the first one is how to optimize the sustainability performance in development of housing projects, and the second gap is how to achieve this in means of integration from varied disciplines such as architectural design, construction methods and in selection of materials for better success in present and the coming programs implementation. Thereof this research examines the existing situation of the sustainable design approach in housing projects: to optimize the performance of architectural design, construction techniques and material used, within the frame work of sustainability. Also it discusses the concept and benefits of sustainable buildings. The end product of the research supports to devise the housing problem in accordance with optimizing the sustainable performance that will serve the wellbeing of the occupants, environment and the society in broad way.



World Multidisciplinary

12-16 June, 2017 - Prague (Czech Republic)

Civil Engineering-Architecture-Urban Planning Symposium - WMCAUS

**TRANSFORMING EXISTING TRADITIONAL CLASSROOM SPACE: A SMART CLASSROOM DESIGN
APPROACH FOR ETHIOPIAN UNIVERSITIES, A CASE OF UNIVERSITY OF GONDAR (ETHIOPIA)**

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ABSTRACT

Education in the 21st century is on the move. In this century, where agents and elements in education have changed, students, teachers, curriculum, resources and so on, the classroom, as the learning space in the universities, has experienced no change as regards configuration, structure and integration of information and communication technologies. As information and communications technology (ICT) is affecting every part of our society, education is not an exception in this trend. Today's students and teachers are rapidly becoming more and more technologically inclined. Traditional classrooms with rows of desks facing the teacher and the board do not fulfil present-day pedagogical needs and students expectations; therefore the learning space at universities requires integration and adaptation to the new pedagogical approach, contexts and roles in education. The smart classroom is distinctive from existing technology oriented learning environment instruments than the traditional classrooms. However, the Use of technology in itself does not ensure effective teaching or learning, but it can extend the reach and flexibility of what the institution offers. In this research, the author examine the need of flexibility and connectivity for Smart Classrooms, as new learning spaces which may better fit present and future learning needs and roles to improve the learning environment in Ethiopian universities.



AN ACADEMIC STAFF RESIDENCE, WOLLEGA UNIVERSITY: AN ENVIRONMENTALLY INTEGRATED DESIGN APPROACHES

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ABSTRACT

Residential issues bother every living human especially workers who cover long distances to their work places and who fail to have their own home. This thesis project attempts to examine the effect of interrelationship between built and natural environment to provide comfortable, suitable and academically friendly housing accommodation for an academic staff of Wollega University Ethiopia. This is to propose an environmentally integrated, effective and liveable staff residence that will enhance the institutional academic performance and productivity, as the higher institutions are meant to be citadels of higher learning per excellence. The residential design works to enhance the comfort ability of residents (academic staff) within their home making the buildings to fit and integrate or being in harmony with their natural environment. Similarly comfort ability will be achieved by controlling and regulating the effect of the natural environment on the interior functional spaces of the residential buildings and the impact of built forms on natural environment, particularly the topographic features and the climate conditions. Case study with much related context is used as main research project. The outcome intended to provide a framework for enhancing academic performance and productivity for the creation of strong synergy among the stakeholders of higher academics. It will also serve as a guide to the Ethiopian Ministry of Education (MoE) and other private investors while prioritizing institutional needs and supports. The application will emphasize an environmentally integrated design approaches to develop comfortable living environment integrating or fitting the natural environment of Wollega University, Nekemte town and other natural environment with similar context.



THE IMPACT OF GLASS FACADE ON USER'S COMFORT- THE CASE OF RADIATION VULNERABLE OFFICES IN ADDIS ABABA, ETHIOPIA

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ABSTRACT

The aim of this thesis was to assess the impact of glass facades on human thermal and visual comfort. The study focused on indoor environment, nearby open spaces and drivers in the emerging central business district (CBD) area of Addis Ababa. The research ranged from mapping radiation vulnerable streets of the city to selecting and analyzing the thermal and visual performance of individual buildings. The assessment was conducted using methodologies such as subjective evaluation, experiment and computer simulation. The result showed that, the ranking of indoor thermal environmental conditions slightly differed between female and male, and between perimeter and interior zone. Out of 120 participants, 78.33% dissatisfied with the thermal environment, 13.33% were comfortable, and 8.33% did not notice the thermal environment. During outdoor environment analysis, out of 50 drivers, 84% valued the risk of glare, 10% complained about the risk of accident and the rest 6% did not notice visual impact of glass facades. On the other hand, the computer simulation output of selected offices showed that March, April and May are the hottest months of the year while critical time of the day was between 2:30pm and 4:00pm. Both the survey and the simulation results showed that, with fully glazed facades, the indoor temperature gradually rises up and affects occupant's comfort and productivity. These results finally discussed and interpreted into guidelines which offers basic considerations during overall urban setup strategies as well as particular building facade component production in the city. Afterwards, the guideline was tested through innovative methodology of using light simulation and critical solar angle analysis which led to solar responsive geometric configuration. This component basically responds to particular thermal discomfort period of the day, which in this study called "critical time" while for the rest of the day, it could be opened and closed. To sum up, the study generally concerned with the role of building skins in relation to natural light and the importance of adaptive solar shading as this plays an extensive role in tropical climates, like Addis Ababa where the facade has a direct impact on the thermal and visual comfort.



TOWARDS USABLE PARKS- LEARNING FROM THE CITY PARKS OF ADDIS ABABA

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ABSTRACT

In Ethiopia there is no single literature on urban parks. As a result, non-use or wedding gardens attitude towards urban parks is hearsay among the public and a common conjecture by professionals and it has hindered garden management if not development of new ones. On the other hand Ethiopia is embarking on a new industrialization era i.e. GTP (Growth and transformation plan), which needs an effective leisure and recreation provision. And an effective leisure provision shall be based on a holistic approach than a piece meal approach of the western. Therefore, this descriptive study analyzed the true nature of the non-use or wedding garden phenomenon, through spatial analysis, structured interview and questionnaire. Identifies the relationship and difference in design philosophy of the Ethiopian and western urban park. The paper finds out that the characteristics of the parks as perceived by the general public are attributed to their neglect and poor management. After such analysis the paper puts forward elements of a usable park. It has found out that most people like glade or park land type of spaces, observed that the bigger the size the higher the users, the higher the variety of design programs the more inclusive and usable the park can be, the lower the garden management the lesser the use for wedding. Edge, foci and threshold design qualities that are necessary for the increase of users are not well used in three of the parks and using them effectively can contribute towards usability.



ARCHITECTURAL HERITAGE CONSERVATION IN ETHIOPIA: TRENDS AND CHALLENGES

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ABSTRACT

Ethiopia, with eight entries on UNESCO's register of World Heritage Sites, is a country of rich and diverse culture with more than 80 ethnic groups. Also the country has many tangible and intangible Architectural heritages. Elsewhere in Africa, the loss of heritage assets - language, music, dress, the arts, architecture, and religious traditions - was accelerated by colonization. In Ethiopia, it is claimed the loss of cultural traditions has been accelerated primarily by neglect. In any ways, the failure to have strong conservation efforts and the gap between the goal of the conservation system and the actual implementation may pave the way for the deterioration of cultural heritage. By Comparing and contrasting different approaches from different local and international practices, this study has the aim of assessing trends and challenges in Architectural heritage conservation in Ethiopia. Result shows one of the most character in Architectural heritage conservation trends in the context is isolating such artefacts from local people, current activities and context. This makes the valuable Architectural artefacts idle and forgettable in the location. Hence bringing historical buildings back to life by integrating them with the current context could be more appropriate in Ethiopia. In fact heritage buildings are highly valuable and informative in terms of socio-cultural, socio-political, socio-economical and even technological activities of a specific society or group of individual. Result indicates one of the major challenge for Architectural conservation in Ethiopia is lack of documentation. Most of historical documents in Ethiopia focus mainly on the socio cultural, religious and political issues and little or sometimes nothing connected with the Architectural and Engineering aspect of building heritages. In places such as Ethiopia, conservation requires more attention from scholars and working in the sector, and must intervene by adapting different techniques for restoration and enhancement plans in context.