WMCAUS 2018

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World Multidisciplinary
Civil Engineering - Architecture - Urban Planning
Symposium

ABSTRACT COLLECTION BOOK

Eco-friendly Symposium - WMCAUS

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JUNE 2018 18-22
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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 18-22 June 2018. 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 2018 is the 3rd 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 900+ submissions by 600+ participants of WMCAUS 2018 from 60+ different countries all over the world for their interests and contributions in WMCAUS 2018. We wish you enjoy the World Multidisciplinary Civil Engineering-Architecture-Urban Planning Symposium – WMCAUS 2018 and have a pleasant stay in the city of romance Prague. We hope to see you again during next event WMCAUS 2019 which will be held in Prague (Czech Republic) approximately in the similar period.

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Lidia Ewa Dabek, Piotr Lagowski, Zbigniew Skrobacki

THE ESTIMATION OF SINGLE-HOUSING AREAS DEVELOPMENT USING ARTIFICIAL NEURAL NETWORK
Jan Janusz, Robert Łucka

RECENT TRENDS IN OBSERVED RAINFALL AND TEMPERATURE IN MALATYA, TURKEY
Serkan Senocak, Levent Guven

MULTI-CRITERIA ASSESSMENT OF TECHNOLOGICAL AND MATERIAL SOLUTIONS IN PUBLIC UTILITY BUILDINGS- BIPLOTS
Ryszard Dachowski, Katarzyna Komisarczyk, Kamila Komisarczyk

Session Title: INTEGRATED COASTAL ZONE PLANNING AND MANAGEMENT

LANDSCAPE AND CULTURAL ASPECTS OF THE COASTAL AREA OF WESTERN POMERANIA AS FACTORS OF DEVELOPMENT OF MARITIME AND NAUTICAL TOURISM: IDENTIFICATION AND DEFINITION OF CONDITIONS
Wojciech Bal, Magdalena Czałczyńska-Podolska

2-D COASTAL HYDRODYNAMIC MODEL TO EVALUATE THE PERFORMANCE OF THE ABU DHABI SHORE PROTECTION SYSTEM
Mohamed Elhakeem, Evan K Paleologos and Mohamed El Amrousi

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Georgia Cheirchanteri

THE ROLE OF INTEGRATION OF ARCHITECTURE AND LANDSCAPE IN SHAPING CONTEMPORARY URBAN SPACES
Wojciech Bal, Magdalena Czałczyńska-Podolska

Session Title: ACCREDITATION OF CIVIL ENGINEERING, ARCHITECTURE

THE FAILURE ANALYSIS IN DESIGN OF THE HOUSING PROJECT IN ISTANBUL ACCORDING TO THE ARCHITECTURAL DESIGN AND TURKISH CODES
Mehmet Serkan Yatagan

Session Title: CITY AND REGIONAL PLANNING EDUCATION

URBAN DESIGN WORKSHOPS IN EDUCATION CURRICULUM: ADVANTAGES AND DISADVATANGES
Lucija Ažman Momirski

SPECIFIC SESSION: Technology, organization and management in construction projects

INFLUENCE OF MULTICOMPONENT AND POZZOLANIC CEMENTS CONTAINING CALCAREOUS FLY ASH AND OTHER MINERAL ADMIXTURES ON PROPERTIES OF FRESH CEMENT MIXTURES
Jacek Gołaszewski, Aleksandra Kostrzanowska-Siedlarz, Tomasz Ponikiewski, Patrycja Miera

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Grzegorz Cygan, Jacek Gołaszewski, Michal P. Drewniok

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Jacek Gołaszewski, Grzegorz Cygan, Małgorzata Gołaszewska

SUPPORTING SLAB FORMWORK SELECTION WITH DIFFERENT TYPES OF CLASSIFIER ENSEMBLES
Anna Krawczyńska-Piechna

SCHEDULE QUALITY ASSESSMENT BY UTILIZATION OF WORKING RESOURCES
Roman Marcinkowski, Anna Krawczyńska-Piechna

DRIVERS AND ANTICIPATED OUTCOMES OF SOLAR PHOTOVOLTAIC PROJECTS – THE CONSTRUCTION PRACTITIONERS' PERSPECTIVES
Peter S.P. Wong, Lucas Cronin

PREVENTIVE SERVICES OF RESIDENTIAL BUILDINGS ACCORDING TO THE PARETO PRINCIPLE
Beata Nowogońska

SCHEDULING REPETITIVE CONSTRUCTION PROCESSES WITH USE THE LEARNING-FORGETTING THEORY
Sławomir Biruk, Łukasz Rzepecki

RISK ANALYSIS FOR HIGH PRESSURE GAS PIPELINE CONSTRUCTION SCHEDULE
Michał Bogucki, Mieczysław Połoński

MODELING OF EFFICIENCY EVALUATION OF TRADITIONAL PROJECT DELIVERY METHODS AND INTEGRATED PROJECT DELIVERY (IPD)
Roman Trach, Mieczysław Połoński, Petro Hrytsiuk

TWO-OBJECTIVE OPTIMIZATION FOR OPTIMAL DESIGN OF THE MULTI-LAYERED PERMEABLE REACTIVE BARRIERS
Katarzyna Pawluk, Mieczysław Połoński, Marzena Lendo-Siwicka, Grzegorz Wrzesiński

SUSTAINABILITY IN CONSTRUCTION PROCESSES - REQUIREMENTS, CRITERIA, EVALUATION CONCEPT
Anna Sobotka, Joanna Sagan, Magdalena Gicala

CLASSIFICATION OF URBAN REGENERATION PARTICIPANTS AS A BASIS FOR IDENTIFICATION OF CONSTRUCTION INVESTMENT'S RISK SOURCES
Magdalena Apollo

THE RISK OF DELAYS IN IMPLEMENTATION OF BUILDING INVESTMENT IN URBAN CONDITIONS IN THE ASPECT OF HISTORICAL BACKGROUND OF ITS LOCATION
Magdalena Apollo, Beata Grzyl, Paweł Jakubowicz

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Magdalena Apollo, Beata Grzyl, Paweł Jakubowicz

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Robert Bucoń, Agata Czarnigowska, Piotr Kmiecik, Aleksander Robak

STRATEGY FOR MARK-UP DEFINITION IN COMPETITIVE TENDERS FOR CONSTRUCTION WORK
Piotr Jaśkowski, Sławomir Biruk, Agata Czarnigowska

A SIMULATION MODEL FOR STOCK OF BUILDING MATERIALS DEVELOPED WITH CRYSTAL BALL SOFTWARE USE
Michał Krzemiński, Nabi Inadov

THE COMPARISON OF ANN CLASSIFIER TO THE NEURO-FUZZY SYSTEM FOR A COLLUSION DETECTION IN THE TENDER PROCEDURES IN THE ROAD CONSTRUCTION SECTOR
Hubert Anysz, Andrzej Foremny, Janusz Kulejewski

COMPUTER MODELLING OF PROCESSES OF CHANGING OVER TIME AND RENOVATION OF HISTORICAL BUILDINGS
Czesław Miedziałowski, Adam Walendziuk

SELECTION OF CONSTRUCTON PRODUCTS SUPPLIERS ACCORDING TO THE CONDORCET CRITERION
Michał Tomczak, Sławomir Biruk, Piotr Jaśkowski

RISK MANAGEMENT IN CONSTRUCTION PROJECT: TAKING SUSTAINABILITY INTO ACCOUNT
Jadwiga Bizon-Górecka, Jarosław Górecki

APPLICATION OF THE WOOD-FRAMED WALLS AND DIAPHRAGMS TO PRODUCTION AND ASSEMBLING OF THE MODULAR MULTISTORY BUILDINGS
Jarosław Malesza, Czesław Miedziałowski

ANALYSIS OF OBLIGATORILY USED PRICE SYSTEMS IN PUBLIC WORKS CONTRACTS PROCUREMENT
Miloslav Výskala, Petr Aigel, Pavla Pospíšilová

SCHEDULING CONSTRUCTION PROCESSES USING THE PROBABILISTIC TIME COUPLING METHOD
Paulina Kostrzewa, Magdalena Rogalska

THE EFFECTIVENESS OF APPLYING MARKETING TOOLS IN THE REAL ESTATE MANAGEMENT
Magdalena Belniak, Elżbieta Radziszewska-Zielina

COST ANALYSIS OF THE POSSIBILITY OF SECURING AN ENERGY-EFFICIENT BUILDING AGAINST HARMFUL EFFECTS OF VIBRATIONS ON PEOPLE
Andrzej Bywalec, Małgorzata Fedorczak-Cisak, Marcin Furtak, Bogusława Karczmarska, Andrzej Kłosak , Alicja Kowalska-Koczwara, Filip Pachla, Krzysztof Stypuła, Tadeusz Tatara

ENERGY AND COST ANALYSIS OF ADAPTING A NEW BUILDING TO THE STANDARD OF THE NZEB
Tadeusz Tatara , Małgorzata Fedorczak-Cisak, Alicja Kowalska-Koczwara, Filip Pachla, Anna Kotowicz, Ewa Kozak

COST ANALYSIS OF THE BUILDING'S ADJUSTMENT TO THE STANDARD OF THE NZEB BUILDING
Tadeusz Tatara, Małgorzata Fedorczak-Cisak, Alicja Kowalska-Koczwara, Alicja Kowalska-Koczwara, Filip Pachla, Katarzyna Knap

PROPOSED INTERCONNECTING DATABASE FOR BIM MODELS AND CONSTRUCTION-ECONOMIC SYSTEMS IN THE CZECH REPUBLIC
Vojtěch Biolek, Tomáš Hanák, Michal Hanák

SCHEDULING THE PRODUCTION OF PRECAST CONCRETE STRUCTURAL ELEMENTS USING THE SIMULATED ANNEALING METAHEURISTIC ALGORITHM
Michał Podolski, Mariusz Rejment

A VARIANT CONCEPT OF ELEVATION OF A STEEL GRID TOWER
Krentowski Janusz, Mlonek Sandra, Zimiński Kamil, Knyziak Piotr

STRUCTURAL AND TECHNOLOGICAL ASPECTS OF THE HISTORIC FLOORS REPLACEMENT
Krentowski Janusz, Mlonek Sandra, Zimiński Kamil, Tofiluk Anna

IMPACT OF SEMI-RIGID JOINTS IN LIGHT-WOOD FRAMED STRUCTURES ON SERVICEABLE LIMIT STATE
Michał Baszeń, Czesław Miedziałowski

OPTIMIZATION OF TRANSPORT CONNECTIONS FOR THE SUPPLY OF RAW MATERIALS AND SEMI-FINISHED PRODUCTS TO THE PRECAST CONCRETE PLANTS
Aleksander Nicał

CIRCULAR ECONOMY MATURITY IN CONSTRUCTION COMPANIES
Jarosław Górecki

SELECTED PROBLEMS OF MULTI-CRITERIA ASSESSMENT OF CONSTRUCTION PROJECTS
Elżbieta Szafranko

INFLUENCE OF THE CONTRACT FOR WORKS FOR RISK OF VARIATION ORDERS
Andrzej Czemplik

ENERGY AND COST ANALYSIS OF WINDOWS IN LOW-ENERGY BUILDINGS: THE INFLUENCE OF WINDOWS ON THE COMFORT OF USE OF ROOMS
Małgorzata Fedorczak-Cisak, Marcin Furtak , Katarzyna Knap , Anna Kotowicz

ENERGY ANALYSIS AND COST EFFICIENCY OF EXTERNAL PARTITIONS IN LOW ENERGY BUILDINGS
Małgorzata Fedorczak-Cisak ,Paweł Hajduk, Marcin Furtak,Paweł Kwasnowski

REVITALIZATION OF TWENTIETH-CENTURY PREFABRICATED HOUSING ESTATES AS INTERDISCIPLINARY ISSUE
Anna Tofiluk, Piotr Knyziak, Janusz Krentowski

THE EFFECTIVENESS OF APPLYING MARKETING TOOLS IN THE REAL ESTATE MANAGEMENT
Magdalena Belniak, Elżbieta Radziszewska-Zielina

VARIANT PLANS OF DEVELOPMENT PROJECTS IN THE CONSTRUCTION SECTOR, INCLUSIVE OF ENVIRONMENTAL PROTECTION REQUIREMENTS
Elżbieta Szafranko, Joanna Pawłowicz, Jolanta Harasymiuk

SPECIFIC SESSION: Smart and sustainable building envelopes for energy saving and harvesting

LIVING ENVELOPES FOR BUILDINGS – A HISTORIC PARALLEL
Ana-Maria Dabija

AN INTELLIGENT APPROACH FOR IMPROVEMENT OF BIPV SYSTEMS PERFORMANCE
Dan Craciunescu, Laurentiu Fara, Ana-Maria Dabija, Paul Sterian, Florin Dragan, Corneliu Lunganoiu

DESIGNING THERMALLY EFFICIENT ROOF SYSTEMS
Thomas W. Hutchinson

ENERGY HARVESTING BUILDING ENVELOPES: A QUALITATIVE EVALUATION OF CHALLENGES AND POTENTIALS
Uta Pottgiesser, Ashal Tyurkay

SPECIFIC SESSION: Urban planning and industrial symbiosis

INDUSTRIAL SYMBIOSIS IN BROWNFIELDS IN KRANJ, SLOVENIA
Boštjan Cotič

URBAN PLANNING AND INDUSTRIAL SYMBIOSIS IN SLOVENIA
Barbara Mušič

SUSTAINABLE URBAN STRATEGY OF THE CITY OF LJUBLJANA: THE NEW CITY CENTRE IN STANEŽIČE
Lucija Ažman Momirski

SPECIFIC SESSION: Modern religious architecture: tradition and innovation

SACRAL ASPECT OF BUGA AND IGA GARDEN EXHIBITIONS IN 1999-2017: SELECTED EXAMPLES
Agnieszka Wójcik-Popek

FACE OF THE FAÇADE: STUCCO RENDERINGS IN INTERWAR CRACOVIAN ARCHITECTURE
Monika Bogdanowska

FUNCTIONING AND PROTECTION OF TRADITIONAL XIX-CENTURY WOODEN ARCHITECTURE IN THE CAPITAL OF SOUTH-EASTERN POLAND
Agata Gajdek

TRADITION THROUGH INNOVATION - "RETURN TO THE FUTURE"
Jerzy Uscinowicz

BETWEEN EARLY-CHRISTIAN ARCHITECTURAL FORM AND POSTMINIAMLISM
Bogusław Podhalański

EARTHEN TEMPLES
Olga Dagmara Kania, Krzysztof Barnaś

ETERNAL CITY - THE HERITAGE OF EUROPEAN CULTURE OR AN INNOVATIVE METROPOLIS
Olga Górnik

ARCHITECTURE OF THE MUSSOLINI PERIOD VERSUS THE SACRED
Olga Górnik

SPECIFIC SESSION: Innovation in metropolitan regions

GREEN INNOVATION IN URBAN SCALE: ACTIVATION OF SMALL CITIES THROUGH HORTICULTURAL EXHIBITIONS IN BERLIN/BRANDENBURG METROPOLITAN REGION
Agnieszka Wójcik-Popek

FROM TECHNOLOGY TO A LANDMARK - THERMAL WASTE PROCESSING PLANTS
Agnieszka Wójtowicz - Wróbel

FROM A VISION TO A NECESSITY - FROM A NECESSITY TO A VISION: THERMAL WASTE PROCESSING PLANTS
Agnieszka Wójtowicz - Wróbel

INNOVATIVENESS OF THE TRADITION OF RELIGIOUS ARCHITECTURE
Yuriy Kryvoruchko

DEVELOPMENT OF GREEN AREAS OF THE KRAKOW METROPOLITAN AREA AS A PLANNING PROBLEM
Monika Gołąb-Korzeniowska

HUMANITARIAN ARCHITECTURE – CHILIEAN AND POLISH PERSPECTIVE
Kazimierz Butelski

CAN A METROPOLITAN REGION NOT BE INNOVATIVE?
Bogusław Podhalański

SECULARISED CITY: BETWEEN RELIGIOSITY AND SPIRITUALITY
Andrzej A. Napiórkowski

THE USE OF BIM TOOLS FOR ORGANIZATION OF THE CONSTRUCTION SITE IN THE ASPECT OF WORK SAFETY
Wojciech Drozd, Marcin Kowalik

EVOLUTION OF THE METROPOLITAN AREA OF SHENZHEN: ANALYSIS FROM THEORY TO SELECTED EXAMPLES
Anna Bulanda-Jansen

THEMATIC CITEIS: THE CITTASLOW CITY NETWORK IN POLAND
Olga Dagmara Kania

ADVERTISEMENTS IN METROPOLITAN SPACE
Janusz Barnaś, Krzysztof Barnaś

THEATRE ARCHITECTURE AND URBAN CULTURE
Magdalena Kozień-Woźniak

ETERNAL CITY - THE HERITAGE OF EUROPEAN CULTURE OR AN INNOVATIVE METROPOLIS
Olga Górnik

SPECIFIC SESSION: Decision support systems in urban management

DECISION SUPPORT SYSTEM IN PUBLIC TRANSPORT PLANNING FOR PROMOTING URBAN ADAPTATION TO CLIMATE CHANGE
Jan Kazak, David Garcia Castro, Małgorzata Świąder, Szymon Szewrański

HOW TO SUPPORT BETTER DECISION MAKING FOR SUSTAINABLE DEVELOPMENT?
Jan Kazak, Jakub Chruściński, Katarzyna Tokarczyk-Dorociak, Szymon Szewrański, Małgorzata Świąder

SPATIAL ABSORBENCY CONCEPT AS A DECISION SUPPORT SYSTEM FOR SUSTAINABLE LOCAL DEVELOPMENT
Tomasz Stuła, Jan Kazak

SENSITIVITY OF POLISHSYSTEM OF MUNICIPAL REVENUE FROM REAL ESTATE MARKET TO CHANGES IN ECONOMIC SITUATION
Joanna Cymerman, Wojciech Cymerman

SPATIAL DIVERSIFICATION OF DEVELOPMENT OF THE AGRICULTURAL PROPERTY MARKET IN POLAND
Joanna Cymerman, Wojciech Cymerman

HISTORICAL HERITAGE AND SPACE TRANSFORMATION
Maria Hełdak, Eleonora Gonda - Soroczyńska

FINANCING HOUSING SUPPORT PROGRAMS IN POLAND IN THE LIGHT OF NATIONAL HOUSING RESOURCES
Maria Hełdak, Monika Płuciennik

MANAGEMENT SYSTEM OF URBAN LANDSCAPE IN POLAND ON THE EXAMPLE OF WROCLAW IN THE CONTEXT OF EUROPEAN LANDSCAPE CONVENTION IMPLEMENTATION
Piotr Krajewski, Iga Solecka

THE TRANSFORMATIONS OF TOURIST FUNCTIONS IN URBAN AREAS TERRITORIALLY LINKED WITH NATIONAL PARKS
Katarzyna Przybyła, Alina Kulczyk-Dynowska

OUTDOOR ADVERTISING IN PUBLIC SPACE AND ITS LEGAL SYSTEM IN POLAND OVER THE CENTURIES
Monika Płuciennik, Maria Hełdak

THE USE OF EUROPEAN FUNDS IN POLISH AND CZECH MUNICIPALITIES: A STUDY OF THE LOWER SILESIA VOIVODSHIP AND HRADEC KRALOVE REGION
Marian Kachniarz, Szymon Szewrański

MUNICIPAL HOUSING RESOURCE MANAGEMENT SYSTEM: ELEMENT OF POLISH CITY MANAGEMET STRATEGY OR HOUSING POLICY?
Iwona Foryś

SPECIFIC SESSION: Spatial changes of the city in the light of the idea of balancing development and restoring spatial order

URBAN SPRAWL IN THE CONTEXT OF CRACOW CITY LIMITS
Anna Ziobro, Tadeusz Kościuszko

THE MUSKAU BEND: MINING SPACE FROM DIFFERENT PERSPECTIVES
Piotr Langer

“POST-MINING REALITY” IN WESTERN EUROPE: SELECTED COLLIERIES IN BELGIUM AND FRANCE FOLLOWING DISCONTINUATION OF COAL MINING
Piotr Langer

THE GENESIS OF THE SYNERGY - PROBLEMS OF INNER CITIES
Rafał Blazy

PLANNING PROBLEMS AND THE VALUE OF THE URBAN AND NATURAL LANDSCAPE IN THE SILESIAN AGGLOMERATION
Rafał Blazy

POCKET PARK: A NEW FORM OF GREEN PUBLIC SPACE IN CRACOW (POLAND)
Rita Łabuz

PROBLEMS OF SPACE SHAPING IN THE SURROUNDINGS OF FORMER MANORS AS PRESENTED ON SELECTED EXAMPLES IN CRACOW (POLAND)
Rita Łabuz

REINSTANATION THE SIGNIFICANCE OF CITY MAIN PUBLIC SPACE - REVITALIZATION OF THE MAIN SQUARE IN POŁANIEC
Agnieszka Ciepiela

UNDERGROUND PUBLIC SPACE: CRACOW'S TUNNELS OF FEAR?
Agnieszka Ciepiela

RECREATIONAL AND TOURIST QUALITIES OF SUBMONTANE RESORTS WITHIN THE CRACOW METROPOLITAN AREA
Hanna Hrehorowicz-Gaber

JOSEPHINE COLONIES – RELICS OF THE PAST IN THE CULTURAL SPACE OF BESKID SĄDECKI
Hanna Hrehorowicz-Gaber

TECHNO-POLIS: BEYOND TECHNOLOGY PARK
Matylda Wdowiarz-Bilska

DEVELOPMENT OF WATERFRONTS IN SMALL AND MEDIUM-SIZED CITIES IN THE VIEW OF THE IDEA OF SUSTAINABLE DEVELOPMENT - SELECTED EXAMPLES
Mariusz Łysień

RECIPE FOR A CITY
Elżbieta Węcławowicz-Bilska

REVITALISATIONS IN POLISH HEALTH RESORTS VS. EUROPEAN MEASURES
Elżbieta Węcławowicz-Bilska, Matylda Wdowiarz-Bilska

FUNCTIONAL AND SPATIAL TRANSFORMATIONS OF LITTLE TOWNS IN MALOPOLSKA - SELECTED EXAMPLES
Anna Pawlak

THE SQUARE BETWEEN TWO SYNAGOGUES IN RZESZÓW (POLAND) – A PLACE WITH POTENTIAL?
Barbara Zając

REVITALIZATION OF PUBLIC SPACES OF HEALTS RESORTS IN SOUTHER POLAND: BASED ON SELECTED EXAMPLES
Wojciech Karol Wójcikowski

PLACES FOR GREEN AREAS IN THE SPACES OF THE MODERN CITY
Urszula Nowacka - Rejzner

RIVER AND RIVERSIDE AREAS – IN THE CONTEXT OF SHAPING THE URBAN SPACE. CASE STUDY
Urszula Nowacka - Rejzner

CORRIDORS OF METROPOLITAN STRUCTURE DEVELOPMENT IDENTIFICATION AND PARAMETRIZATION ISSUES ON EXAMPLE OF KRAKOW
Daniel Ogrodnik

INDUSTRIAL SPACES IN SMALL AND MEDIUM CITIES IN SOUTHERN POLAND – THE SELECTED EXAMPLES
Jakub Błachut

POLISH HUB - CENTRAL AIRPORT IN POLAND, THE SOLIDARITY PORT
Jakub Błachut

THE IMAGE OF CONTEMPORARY POLISH SEZ – SPATIAL ASPECTS ON THE SELECTED MEDIUM-SIZED CITIES
Jakub Błachut

SPECIFIC SESSION: New experiences in the field of preservation and reuse of architectural and landscape heritage in China

PRESERVATION PRACTICE BETWEEN IDENTITY AND SOCIAL ISSUES: THE CASE OF GANYANTOU ETHNIC VILLAGE IN YONGZHOU-CHINA
Francesco Augelli, Yuwei Lee, Raul A. Musiate Arellano, Davide Strada, Su Liu, Tian Changquing , Yi Yu

Session Title:

Construction Management and Engineering

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PRODUCTION OF ELEMENTS FOR AN INNOVATIVE SYSTEM OF ENERGY-SAVING PREFABRICATED CONSTRUCTION UNDER THE PROJECT PLUS ENERGY PREFAB HOUSE

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ABSTRACT

In 2012 in the international competition Future Project Awards organized annually by the prestigious English magazine Architectural Review mgr inż. arch. Lech Wojtasik from the Architectural Studio in Piła took first place in the Sustainability Prize category presenting the Plus Energy Prefab House project. It is a housing construction system, implemented by factory technology of precast concrete construction, based on the use of renewable energy sources, energy efficiency, ecology and economics. The project refers to the energy and climate package for 2020-2030, first proposed by the leaders of the EU countries in 2009 and later by the European Commission in 2014. The building consists of base modules, external structure and an adjacent garage and services part. The base module in the system is a one-storey cuboid with a base 8.80mx12.20m with a steep roof and a living surface of 148 m2 or two-storey with the same base with a flat roof, area 177 m2. The module can be a part of a single-family house, or a combination of two-family and terraced and multi-family buildings can be arranged accordingly. Thanks to special 11.6 m long concrete slabs with compressed ribs, we can cover the width of the entire building (foundation slab, ceiling, roof panel at the flat roof) which gives the possibility of any division of the interior with light partition walls. External wall elements with storey height have been designed as large-size elements with a thickness of 0.41 m, having an elevation layer of ceramic tiles from the outside, polyurethane insulation (0.15 m) and polystyrene (0.18 m), reinforced concrete construction element with a thickness of 0 , 06 m and internal plaster. Prefabricated panels are assembled on the construction site using specially designed and patented fasteners. The dimensions of all prefabricated elements are adapted to transport in 40'HCDC marine containers with dimensions of 12.2mx2.4mx2.9 m. The building is adapted to the standard of a passive house. In a separate shaft with a two-storey height, there are: recuperator, condenser, compressor, grey and hot water tanks. In 2017, the team received a grant from the National Centre for Research and Development for implementation a prototype of the building and developing precast production technology.

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THE INTERACTION BETWEEN THE RESEARCH ACTIVITIES AND THE TEACHING ACTIVITIES OF THE INSTRUCTOR IN THE MASTER OF ARCHITECTURE STUDIO AT WOLLEGA UNIVERSITY, ETHIOPIA

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ABSTRACT

This article is concerned with the design research program of the master of architecture, at Wollega University, Ethiopia. There were two research activities conducted simultaneously in the initial stage of the research program. The first, the studio-based research, which was carried out by the master students who had been engaged in knowledge development to inform better design. The other was the teaching-based research, which was conducted by the master studio instructor. This one had mainly been concerned with studying the research processes in students' research work. However, as research progressed it became clear that the focus of interest in the studio has gradually moved away from the creation of knowledge for better design services, to the creation of knowledge for better understanding the problems of design. This change means that a significant shift of orientation from the once common 'research for design' approach to the more theory oriented 'research through design' approach occurred. In this more advanced stage of the research program, while the studio-based research will be engaged in the development of knowledge associated with diagnosing the problems of design and evaluating existing problem solving, the teaching-based research will be focused on conducting inquiry into the processes of the students' research work. However, at this point another major change took place. As the research program the research program transcends the one-time teaching-based research, a combined teaching-based research and research-based teaching approach is now being carried out repeatedly in the successive batches of the master class. In the present article, the change in the nature and objectives of the research program of the master studio is examined; the interaction between teaching-based research and the studio-based research discussed; and, the relations between the teaching activities and the research activities of the studio instructor evaluated.

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MANAGING THE DEVELOPMENT & CONSTRUCTION OF PUBLIC HOSPITAL PROJECTS

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ABSTRACT

The purpose of this research is to identify effective project management strategies for developing and constructing public hospitals in Singapore to ensure that good project outcomes are achieved. The specific objectives are to: (i) identify project management related factors that contribute to the good performance of public hospital projects; (ii) investigate the key factors that lead to the poor performance of public hospital projects; and (iii) recommend a suitable project management framework for managing the development and construction of public hospital projects. The research was based on the case study of the development and construction of two public hospital projects. Data were collected via in-depth interviews with participants involved in each project. The principal results are that these factors must be present to ensure success of public hospitals projects: well-defined project scope incorporating the inputs of relevant stakeholders; proper change control system; close monitoring and control of project cost and expenses; regular site inspection for quality control; clearly defined roles and responsibilities of project team members; adequate communication mechanism; and extensive use of communication technologies. The findings for factors contributing to poor performance of public hospital projects are: unclear project scope; absence of strategy to manage cost overrun; inadequate risk assessment; incomprehensive evaluation criteria for contractor selection; and high turnover of project personnel. The major conclusion is that project participants should systematically adopt the project management strategies recommended in this study to guide the development and construction of public hospitals in order to achieve a higher chance of success.

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ENABLERS AND BARRIERS OF LEAN IMPLEMENTATION IN CONSTRUCTION PROJECTS

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ABSTRACT

Lean aims to maximize customer satisfaction while minimizing waste. However, lean philosophy has not been well understood yet in construction industry for the fact that the complexity and dynamic nature of construction projects brings up uncertainties that may be hardly handled by construction practitioners. Moreover, project-based nature of construction business makes lean implementation even more challenging for construction projects. Therefore, it is essential to reveal enablers and barriers in lean implementation so that construction industry practitioners might conduct projects more effectively and satisfy project requirements (i.e. schedule, budget, safety, quality). This study aims to provide a set of core enablers and barriers of lean implementation in construction projects and guide construction professionals to better satisfy project requirements. Within this context, the study proposes seven major enabler and barrier groups, namely the financial, managerial, technical, workforce, culture, government, and communication. The study also develops a set of components for each group. The study is expected to lead lean practitioners with creating value to customers while preventing them from losses.

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DAMAGES, CONSEQUENCES AND INFLUENCES OF ACTIVE DEFORMATION

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ABSTRACT

After a century, using concrete in construction, nowadays it is still the most complex structural material, in its congruent formulation of the analysis and its calculation. Concrete (fragile) and Steel (ductile), lay out a controversy of difficult solution that regulation try to approach to reality. The analysis of fissures and the concepts of active deflection are not enough to explain frequent phenomena of fissures in ordinary construction. This article develops and demonstrates this evidence in concrete frame structures and extracts specific conclusions on how to correct the design in frames with brick walls and diaphanous ground floor. This analysis proves an increase in active deflection not consider in current regulation. In order to show the influence of brittle partitions and their building process in building with open ground floors, we have chosen a conventional housing building with a rectangular plan, with reinforced concrete shallow beams and columns. Its structure has been analysed with code EHE-08, considering different hypotheses to take into account different quantities of storeys (5, 7 or 9), and the bay of the studied beam (5, 6 and 7 m.) that will allow to draw comparable conclusions. The increase in the value of the active deformation is evident when the loads arising from the accumulation of the plant-to-plant loads are taken into account, as a result of the discharge of the partition walls when cracking. This part of the loads is notorious that the greater number of fissured plants is greater the accumulation and the greater the value of the active arrow that occurs in descending direction, and of course the plant that suffers the most is the lowest or last which It has to bear not only its burdens of services and its own weight, but that which comes from the higher plants.

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MULTI-CRITERIA EVALUATION OF THE ORGANIZATIONAL AND TECHNOLOGICAL OPTIONS FOR GREEN ROOF SYSTEMS INSTALLATION

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ABSTRACT

This research of improving technology of installation green roof systems is aimed at reducing labour intensity, duration and cost of construction, as well as reducing labour-intensive operations and processes due to the optimal organization of installation of building structures. For the highlights of roof installation with greening systems, three options for organizational and technological solutions for roofing works have been developed, with various devices for constructive layers of inversion roofing structures. Research of technological processes of the device of green roof systems, and also rational choice of constructive-technological solutions allow to organize rhythmic installation of roofing coverings with systems of greening, using thus modern technologies of installation process and innovative methods of construction. The most promising solution at the present time for the installation of a roofing base is a multi-layer monolithic overlap with a heat-insulating layer of low-conductive lightweight concrete, that is presented as the base of one of the variants of the analysis of roofing. Modular green roof system is upper roof structure, technically advanced design solution of roofing, with innovative technological multifunctional advantages and the ability to integrate devices that convert solar and wind energy - solar panels and micro wind turbines. Moreover, hydroponics is used as irrigation control systems in green roof system. These technique has proved to be highly effective in reducing nutrient load in runoff, controlling watering over a period of time. Completed multi-criteria assessment of the construction of roofing with greening systems, that considered in this research, allows to make the right choice of a rational organizational and technological option according to the criteria of Wald, Savage and the risk factor for Hurwitz.

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ECONOMIC EFFICIENCY OF USING GREEN ROOF TO SOLVE THE PROBLEM OF REDUCING AIRCRAFT NOISE

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ABSTRACT

At present, anthropogenic pressures on the environment are increasing. The scale of this pressures threatens the reproduction of natural resources and associated with their inefficient using increased risks for life and health of people. To achieve long-term stability, a new model of the Russian economy must balance economic, social and environmental priorities. Realization of sustainable development involves the inclusion of the environmental component in the system of key socio-economic indicators. conscious transition of an intellectually developed society to environmentally friendly technologies in all spheres, including life and leisure. An important component, necessary both at the stage of transition to sustainable development, and at its further implementation, is a system of measures that reflects not only economic, but also socio-ecological aspects of urban development. The relevance of research is due increased environmental tensions associated with the noise impact of transport, including the problem of aircraft noise. The purpose of the study is the development of reduce the impact of aircraft noise on the population living near airports, and assessment of the cost-effectiveness of measures to implement measures to reduce noise interference with the device of green roof systems on residential and public buildings near aviation facilities. The predominance of green spaces, architectural forms and other elements of improvement contribute to improving the environment, quality of life, including by reducing the noise load. Based economic analysis and assessment of the noise situation use greening structures that improve the well-being of the local population, this particularity concerns the provision of health and psychological comfort of the population. The assessment of the ecological and economic efficiency of green roof systems has shown that the benefits of the green spaces are multifunctional, and in addition to reducing noise, they also reduced the island's effect of heat by creating a shadow, reduce the need for conditioning, reduce wind load, filter harmful emissions, improve air quality and preserve biodiversity.

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NEW METHOD OF QUALITY CONTROL FOR FIRE PROTECTIVE COATINGS

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ABSTRACT

This research highlights testing measurements for quality control of fire protective coating on the all life cycle services, which is aimed to improve the processing technology of product coatings, the quality of building and energy saving. Short-time experiments in resistance to climate factors were carried out in order to check the possibility of dielectric method appliance for quality control of fire protective coating during service life, with further measurement of dielectric and fire protective properties. This work analyses the thermal decomposition and fire-protective properties, based on visual inspection of surface appearance for all protected constructions at all protected area and criteria of coating surface appearance with the requirements of normative documents for its appliance. Thin-layer fire protective coatings were chosen for the experiments to appraisal fire protection quality control of steel constructions. Experiments were carried out for frequencies 100, 120, 1000, 10000 and 100000 Hz at temperature 26°C and relative humidity 45% within a week daily, for 30 min with a break 1 min. Obtained data array were processed statistically in order to determine mean root square deviation and и confidence limits. Mean root square deviations were also calculated for the data obtained for 30 measurements within 24 hours. The new research methodology uses a highlights of fire retardant coating composition to improve the coating characteristics that affect its reliability, as well as to observe the coating conditions on the surface of unprotected steel constructions to be protected, fire protection becomes mandatory requirement for safe appliance with exclusive standards for fire resistance. This takes into account the regulatory requirements of fire safety in technological processes for various purposes in their design, construction, reconstruction and maintenance. Moreover, the control of protection facilities and developing of the technological projects are conducted in conditions, provided at the objects of significant importance, buildings with large places of assembly, such as night clubs, theatres, cinemas, educational institutions, buildings of federal, state and municipal entities, storage facilities, objects with fire protected area more 5000 sq.m. Thermal analysis is fulfilled, and thermal insulating properties of the coating are determined. Determination of properties of flammable materials and construction materials for quality control is conducted based on tests or calculations given state parameters - pressure, temperature, etc. Development batch of experiments for quality of thin-layer fire protective coating, based on dielectric property measurement, was carried out in order to check the functional abilities.

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NEW METHODOLOGICAL RESEARCH OF ADHESIVES IN FIRE PROTECTIVE PAINTS FOR INCREASE OF EFFICIENCY OF METAL CONSTRUCTIONS

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ABSTRACT

This research objective is optimal adhesive selection for development of weather-resistant fire protective paint. Authors have solved the problem of solvent system selection for styrene-acrylic resin in order to provide optimal weather resistance of the coating. One of the most actual research problem for fire protective composites is a research of adhesives depending on different application conditions. High rates of building industry don't depend on seasons and climate conditions of Russian regions, accordingly requirements for paint composite need new methodological research, with account for space-planning decisions of modern transportation facility objects, which are multifunctional buildings in fact. In case of high heat fluxes and the integrity of the fireproof layer, the polymer does not withstand significant temperatures and begins the process of decomposition from the inside with the release of gaseous products. The task in view is solved by the composition of the paint be used for fire protective paint production with maintenance at temperature from -60 to +60 °C, with flame retardant weatherproof, including a suspension of fillers, pigments and flame retardants in organic solvents, such as use styrene-co-acrylonitrile resin. The technical result is the provision of a composite material with high thermal stability, durability and environmental friendliness. This paint has good fire retardant properties. The positive effect is due to the fact that an increased adhesion of the paint to the primed metal and the preservation of fireproof properties with a small thickness of the dry layer are achieved, as well as an increase in the reliability of the coating operation and the manufacturability of its production and application. This study provide the application of fire-retardant water-dispersion paints intended for fire-retardant and decorative painting for the purpose of increasing the fire resistance of steel and reinforced concrete materials and multiplicity structures for industrial and civil purposes, operated inside or outside the premises of all types of buildings is presented.

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DEFINITION MARGINAL STATES OF IRRIGATED FIREFIGHTING BARRIERS

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ABSTRACT

Major fire emergencies generating high thermal loads go along with intensive convective and thermal flows. One of the ways to address the problem is to provide firewalls for industrial enterprises. This paper examines how water-irrigated firewalls can be used as protection from heat radiation and related factors of danger. A firewall is an assembled vertical enclosure made of thermal-insulation sandwich panels. A thermal-insulation sandwich panel consists of two meshed surfaces, with water injected between them by special spray nozzles. The irrigation system for thermal-insulation sandwich panels includes spray impact-jet slot-type nozzles with a blade reflector, the nozzles are serially connected through the trunk pipeline. To address the objectives, the following marginal states were controlled: Loss of heat insulating capacity (I) and loss of integrity (E). The test also examined the marginal state for loss of heat-insulating capacity (W). Because the panel is irrigated with spray nozzles, we used an infrared imager to control regularity of such irrigation and that of temperature distribution over the sample surface. Our research found that such firewall can be used as protection against thermal radiation and related fire hazards. After the test, the water-irrigation firewall design was awarded fire resistance level of EIW 150 for standard fire emergency. The results of infrared imaging confirmed the results of TEC registered on the unheated surface of the firewall; they also demonstrated existence of certain areas, where irrigation is incomplete, causing heating to 341.5 ^{o}C at one point. This means that the system has to be further improved.

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PHENOMENON OF THE POLISH RELIGIOUS ARCHITECTURE OF THE LATE 20TH CENTURY

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ABSTRACT

It is hard to find another European country where over two thousand churches were built over the last thirty years. This boom in religious architecture in our country, which is compared to the times of the very dawn of Christianisation, or to the period between the WWI and WWII, when Poland regained independence after 123 years, should be associated predominantly with the figure of Karol Wojtyła – the Polish Pope. He encouraged crowds of investors and residents of Poland to strive for new religious buildings to be erected in new districts of towns and cities, where for decades' political authorities' permissions for new places of worship were blocked. The goal of the research was to determine differences between the style of religious buildings erected at the same time in Western Europe and in our country. Isolation of Central European states in the 1970s and 1980s from access to the most advanced building technologies and materials forced to reach for traditional methods of erecting temples. A considerable role in this respect was also played by economic reasons, as churches were largely built and financed by parishioners. Amongst churches that mushroomed in Poland since the end of the 1970s till 1990s, several stylistic tendencies can be differentiated, characteristic for the contemporary architecture. Not all directions present in the European architecture were represented in Poland in that period. It seems that the majority of the projects represent the trend of Late Modernism. In the early 1980s, Postmodernism reached Poland, much later than the Western countries. Religious architecture, inspired by forms of historical temples and monasteries, was being built according to the principles of these stylistics, too. The significance of the tradition of the place was restored; while searching for neo-nativeness, designers turned to forms well-known and accepted by the people. Elements stemming from history were appreciated by investors, as well as by users of the religious architecture. The analysis of hundreds of built churches, in terms of their external form, as well as their interiors, points to the acceptance of the quest of references to the past. The research carried out demonstrated that in Poland it is difficult to find examples of the minimalist movement or reductionism, which became quite common in the religious architecture built at the time in Western Europe. Simultaneously, it should be emphasised that within the territory of Poland, especially in the countryside or in small towns, one can encounter religious buildings which are quite uninteresting and difficult to be assigned to any trends in the contemporary architecture. Sometimes they were erected by congregations themselves, even without permissions of the authorities. Parishioners often lost patience and were tired of waiting for decades for permissions to erect new churches; at the same time, they were afraid that the period of fewer restrictions relating to building new temples would soon pass. Today, these projects, often implemented in great haste, wait for subsequent generations of users, architects, and artists to start to restore them for the resources of culture.

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RISK ASSESSMENT IN LARGE-SCALE TRANSPORT INFRASTRUCTURE PROJECTS

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ABSTRACT

The identification of risks in the planning phase of a project and the arrangement of impact values has become a fundamental basis of today's various construction projects. Despite robust and well-planned projects, unexpected problems will likely emerge in any stage of the project if possible risks are not identified and assessed beforehand. Therefore, this process has become a requisite in increasing the success as well as minimizing the problems of a project. Large-scale transport infrastructure projects (LSTIPs), technologically equipped projects, meet the essential needs of the recent era but also bring about numerous risks such as financial, technical, managerial, political, economic, natural or legal. Hence, being exposed to such risks in the planning and construction stage of LSTIPs, could lead to negative consequences in the fate of the project. This study aims to develop a conceptual framework which provides a pathway for the planning phase and to offer risk lists and their priority orders that reinforce the construction phase. These aims were achieved by identifying the risk factors that could arise in European and Middle Eastern LSTIPs and detecting significances of the risks according to these types of projects. Data collection was performed through a substantial review of literature and a questionnaire conducted to contracting firms and civil engineering consultancies operating in Europe and the Middle East. According to the findings, the comparison between the leading risks encountered in European and in Middle Eastern LSTIPs revealed that two of the regions were confronted with both similar and different risks. Europe and the Middle East's foremost common risk factor is the financial strength of the client listed under the financial category. When regions are considered individually, Europe gives prior importance to the resource availability risk factor in the economic category whereas increased material cost located under the same category is the primary risk factor for the Middle East. As a result, the data obtained from this research study could be deployed as a standardized risk list in the planning stage of forthcoming LSTIPs as well as a guideline for the assessment phase of priority orders. Furthermore, this study suggests a further and detailed investigation on mitigating risks that occur in LSTIPs.

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QUALITY OF PROJECT DOCUMENTATION

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ABSTRACT

The article deals with the issue of the checking of project documentation and the quality of project documentation. The analyses of expert reports, which are created in expert institutions in Czech Republic, point to the fact, that a large proportion of defects in construction projects often have roots in the defects of the project documentation. The cause of the defect is often already in the design concept itself. The analyses of expert reports show the need to pay attention to the checking of project documentation of construction projects before the actual realization. The proposal for a method of the checking of project documentation is based on the principle of continuous improvement of quality. The principle of continuous improvement of quality is often described in the PDCA diagram. In this article, i deal with the checking of project documentation in connection with the analysis of the claimed defects. The data obtained by monitoring the claimed defects form good basis for the creation of the documents for the following checking of project documentation. In order to make effective use of information come from the claimed defects, we have to set properly the criteria, which we will evaluate in the context of the monitoring of claimed defects. When selecting a suitable method for analysing data obtained by monitoring claimed defects, the choice of the Failure Mode and Effect Analysis method (FMEA) was made. In the beginning, it is necessary to choose appropriate expert ratings for the monitoring of claimed defects from the point of view of the cause of the defect, the financial difficulty to eliminate the defect and others. FMEA method is a multi-criteria analysis, so it is up to the author how many expert ratings he chooses to obtain the necessary input data. Expert analysis of input data will provide risk areas and technologies, that need to be dealt with in more detail and which should be followed in the checking of project documentation. My goal is to create a system, that will prevent the recurrent occurrence of identical claimed defects. By eliminating of claimed defects it is possible to achieve considerable financial savings within building companies. Based on the obtained data, tools for the effective checking of project documentation are created. During the initial checking of project documentation before the actual realization of construction project, it is possible to successfully prevent future defects and eliminate the ever-increasing costs of defects removal.

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HAZARDS REALIZATION INVESTMENT RAILWAY CARRIED OUT IN POLAND BY RED BOOK FIDIC CONTRACTUAL CONDITIONS

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ABSTRACT

Large rail investments are increasingly implemented in Poland on the basis of FIDIC Design & Build formula conditions of contract. Unfortunately, this formula is fraught with many risks, both for the contractor and the contracting authority. In order to reduce risks that are difficult for the investor to predict, more and more often they decide to carry out the investment implementation procedure according to the red FIDIC book. This procedure, transfers most of the risk to the contractor but, according to the authors, is also burdened with numerous threats, what has been confirmed in the course of the research. The paper contains information on the identified threats during the implementation of railway investments in Poland carried out in the FIDIC Red Book formula. The study was conducted on the basis of a well-thought-out set of questions, which was sent to a selected group of respondents from Poland with good knowledge and experience relevant to the results. The data obtained has been developed using the appropriate statistical models. Statistical analyses of threats were performed using the IBM SPSS Statistics 23 package. The paper presents a list of threats with an indication of the frequency of their possible occurrence on future railway investments. The study did not examine typical causes of threats to general construction works, only those that result from the specifics of works at rail facilities. The obtained results confirm that the implementation of railway investments is burdened with significant risks. The results presented in this report, according to the authors, may contribute to reducing the impact of the most common threats and the importance of more reliable planning for the implementation of future rail investments in Poland.

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RESISTENCE OF METAL ANCHORS IN TERRITIES COVERED UNDER SEISMIC ACTIONS

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ABSTRACT

In areas affected by the threat of the substrate's influence, in the form of its movement, it is advisable to estimate the load-bearing resistance of metal anchors by testing in areas affected under seismic actions. These tests involve determining the load resistance for pull-out metal anchors of cracked concrete. Cracked concrete can take place in cycles. In the international literature, tests is conducted on metal anchors for various classes of concrete substrates, including cycles of initiation of cracked w_c = 0.10 ÷ 0.30 mm. The tests was carried out with the assumption of determining the reduction coefficient $\alpha_{N,seis}$, C1. The coefficient can lower the determined final load capacities of the fasteners to scratch out of scratched concrete substrates. Depending on the scale of the occurrence of the amplitude of the gravitational acceleration, able to cause seismic actions influences greater than 0.05 g, C1 or C2 categorization was adopted, giving European Guidelines to determine the load resistance for pull-out metal anchors from cracked concrete. In the case of a seismic action of less than 0.05 g (gravitational acceleration), it is not required to determine the ultimate lifting capacity including reduction factors for seismic activity. The occurrence of amplitude from 0.05 to 0.1 g requires testing, for initiation of scratches in concrete Δw = 0.50 mm for category C1or Δw = 0.80 mm for category C2. In the case of interactions of amplitudes greater than 0.1 g, tests for the initiation of scratches in concrete Δw = 0.80 mm, for the regions of southern Europe and Asia are required. The article presents the results of tests for specific pull-out resistances of metal anchors installed in a cracked concrete. All tests were carried out for the purposes of this paper at normal temperature, without factoring in influence of concrete or air moisture content.

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IMPACT OF ADDED CHALCEDONITE POWDER ON SELECTED CONCRETE PROPERTIES

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ABSTRACT

The article discusses the results of laboratory tests on the effect of chalcedonite dust on the parameters of hardened concrete and rheological characteristics of the concrete mix. The addition to concrete mixtures was a chalcedonite dust with a diameter of less than 0.1 μm. It is a waste coming from the mine of broken chalcedonite aggregates. The rheological properties of concrete mixes, i.e. consistency, density, aeration degree and parameters of hardened concrete, including compressive strength, capillary pull and absorbability. The laboratory tests carried out indicate that the use of chalcedonite dust in the composition of the concrete mix has a positive effect on parameters such as capillary rising and water absorption. The addition of 15% chalcedonite dust results in a reduction of the compressive strength compared to the reference concrete by 10%. The use of a concrete additive in the form of chalcedonite powder can solve the problem of storing and managing waste in the production of broken chalcedonite aggregates. Concrete with chalcedonite dust can be used in places exposed to water, humidity and atmospheric conditions, where the compression strength parameter is of secondary nature. The test results provide the basis for drawing the following conclusions: A. The introduction of 15% chalcedonite dust into the concrete mix results in a reduction of the compressive strength after 28 days by 10% compared to the reference concrete. B. In the capillary test, it can be noticed that the weight gain is comparable for the series tested, in which 5% and 10% chalcedonite dust was used and is about 37 kg/m2 after 28 days of ripening. C. Absorbability after 28 days of ripening is 20.8% lower for a series with 15% chalcedonite dust compared to a series of concretes without additives. D. The use of chalcedonite dust in concrete mixes causes the cement matrix to seal. E. Considering economic and environmental factors, it is advisable to use concrete additive in the form of chalcedonite dust in an amount of up to 15%. The use of chalcedonite dust as a concrete additive could help solve the problem of storage and use of waste from the production of chalcedonite aggregates.

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POROUS CONCRETE AS A ANTI–AQUAPLANING BUILDING MATERIAL

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ABSTRACT

The paper considers the use of porous concrete for the needs of communication construction. For comparison, two sets of concrete, ordinary blend have been developed, which is currently used in Poland as road and porous concrete, which is used by Americans in the United States. After concrete testing, molding and care of the samples under laboratory conditions, compressive strength tests were started after 7, 14, 28, 56 and 90 days. Absorption and capillarity were investigated after 28, 56 and 90 days. In addition, fragments of cubic samples were examined by scanning electron microscopy. Samples measuring 10x10x10 cm were ripened in water at + 18 degrees Celsius. Plain concrete has a higher percentage increase in compressive strength than porous concrete. After 90 days, plain concrete had 60.8 MPa strength and porous concrete 22.8 MPa. The carried out tests on absorbability show that the mass increase of porous concrete samples is larger compared to ordinary concrete. It can be concluded from the capillary rising tests that ordinary concrete absorbs less water than porous concrete. Based on the laboratory tests carried out, it was found that porous concrete has a lower compressive strength compared to ordinary road concrete. It is too low due to the use of concrete in the top layer of the road surface. Concrete used for the lowest category of roads, which are municipal roads have a strength of 25-30 MPa after 28 days, while the strength of porous concrete after such time is only 12.5 MPa. In the case of domestic roads, it is 35 MPa, so the only solution is to redesign the composition of the concrete mix. Despite the fact that porous concrete has excellent features for draining water from the surface and can be used as a drainage system in road surfaces (where there is the so-called aquaplaning phenomenon), on parking lots, large flat surfaces it cannot be used due to the very low durability at squeezing, which does not meet the requirements of municipal roads.

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REVIEW OF EXTRAVAGANT PROJECTS BY SANTIAGO CALATRAVA

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ABSTRACT

The topic of the article is a review of the most interesting and extravagant projects of Santiago Calatrava from the moment of his architectural beginning in civil engineering to the present. I focused on structures that caused the greatest wave of admiration and at the same time criticism of this known in the world architect. I chose objects, e.g.: buildings, structures, bridges and footbridges. I described the most important information, e.g.: construction time, construction costs, functionality, architectural style, technology and curiosities. The idea for the paper arose from my trip to the United States of America, where I had the opportunity to see one of the most interesting buildings - The World Trade Center Transportation Hub in New York. In addition, Santiago Calatrava's projects I discussed during lesson that in my university. The first part of the paper describes the author, his education, fascination with architecture, ideas for work and the future. In addition, I have included trivia related to childhood and adulthood of the architect. I described Calatrava's approach to projects and the entire implementation process from concept to finished construction. The following parts describe specific projects that I chose for analysis, these are: Stadelhofen railway station in Zurich, Bac de Roda bridge in Barcelona, Puente del Alamillo Expo 92 in Seville, Atrium of Brookfield Place in Toronto, Gare de Lyon Saint Exupéry railway station in Lyon, Gare do Oriente in Lisbon, Milwaukee Art Museum in Milwaukee, Auditorio de Tenerife in the Canary Islands, Science Museum in Valencia, Museum of Tomorrow in Rio de Janeiro, The World Trade Center Transportation Hub in New York. In the article, I've also placed interesting pictures that perfectly illustrate the architectural style, the scale of the building, and assess whether the object fits into the surroundings. In summary, I checked all the information and expressed my opinion on Calatrava's projects, its approach to architecture and described future plans for new buildings.

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IMPACT OF ADDED CHALCEDONITE POWDER ON SELECTED CONCRETE PROPERTIES

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ABSTRACT

The article discusses the results of laboratory tests on the effect of chalcedonite dust on the parameters of hardened concrete and rheological characteristics of the concrete mix. The addition to concrete mixtures was a chalcedonite dust with a diameter of less than 0.1 μm. It is a waste coming from the mine of broken chalcedonite aggregates. The rheological properties of concrete mixes, i.e. consistency, density, aeration degree and parameters of hardened concrete, including compressive strength, capillary pull and absorbability. The laboratory tests carried out indicate that the use of chalcedonite dust in the composition of the concrete mix has a positive effect on parameters such as capillary rising and water absorption. The addition of 15% chalcedonite dust results in a reduction of the compressive strength compared to the reference concrete by 10%. The use of a concrete additive in the form of chalcedonite powder can solve the problem of storing and managing waste in the production of broken chalcedonite aggregates. Concrete with chalcedonite dust can be used in places exposed to water, humidity and atmospheric conditions, where the compression strength parameter is of secondary nature. The test results provide the basis for drawing the following conclusions: A. The introduction of 15% chalcedonite dust into the concrete mix results in a reduction of the compressive strength after 28 days by 10% compared to the reference concrete. B. In the capillary test, it can be noticed that the weight gain is comparable for the series tested, in which 5% and 10% chalcedonite dust was used and is about 37 kg/m2 after 28 days of ripening. C. Absorbability after 28 days of ripening is 20.8% lower for a series with 15% chalcedonite dust compared to a series of concretes without additives. D. The use of chalcedonite dust in concrete mixes causes the cement matrix to seal. E. Considering economic and environmental factors, it is advisable to use concrete additive in the form of chalcedonite dust in an amount of up to 15%. The use of chalcedonite dust as a concrete additive could help solve the problem of storage and use of waste from the production of chalcedonite aggregates.

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PARAMETERS OF MORTARS MADE OF ALUMINUM AND PORTLAND CEMENT

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Alumina cement is included in special cements, which are used primarily for the production of refractory materials. It is significantly different in chemical terms from the Portland cement commonly used in construction. The consequence of this are the different properties of these two hydraulic binders. Portland cement consists mainly of CaO and SiO_2. In turn, the main constituents of aluminum cement are Al_2O_3 and CaO, which form calcium aluminates. However, the main phase constituent of aluminum cement is CA calcium monohydrate. It consists of about 36-42% Al_2O_3 with a significant amount of gelenite (C_2AS). Strength of CA_2 after three days of hydration is comparable to the strength of pure hydrated CA. It is also worth mentioning such phases as C_2S and C4AF. They often occur in Portland cement and in clay cement. The article discusses the results of laboratory tests on the impact of replacing Portland cement with Portland cement on the physical and mechanical properties of mortar. The rheological characteristics of mortars, ie consistency, density, aeration degree and parameters of hardened mortars were examined, among others compressive strength, capillary rise and absorbability. Replacing aluminum cement with Portland cement decreases compression strength. The reduction in compressive strength depends on the amount of Portland cement applied to the mortar. Parameters such as absorbability and capillary rising are improving. Compressive strength was tested after 1, 7, 28 days on samples with dimensions 4 x 4 x 16 cm. Absorption and capillary rising were tested 28 days after being molded.

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PHYSICO-MECHANICAL FEATURES OF PORTLAND CEMENT MORTARS REPLACED PARTIALLY WITH ALUMINIUM CEMENT

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The aim of the research was to recognize the effect of the addition of aluminium cement on the properties of cement mortar made of Portland cement CEM I 42.5R. Alumina cement is a hydraulic binder. It is a finely ground organic material that when mixed with water binds as a result of reactions and hydration processes. After hydration, stable hydrate phases form and, as a consequence, the material strength parameter is obtained. The main constituent is calcium aluminate ($CaO \cdot Al_2O_3$), in smaller amounts there are: calcium aluminate, dicalcium silicate and calcium aluminium silicate or gelenite. Hydraulic hardening of aluminium cement occurs mainly through calcium hydration but other chemicals may also take part in the hardening process. The specific chemical composition of aluminium cement and the fact that calcium hydroxide is not released during hydration allows the leaven to resist many aggressive factors. Therefore, in the literature, we can meet guidelines so that the w / c ratio is not greater than 0.40 for applications to structural elements. The article discusses the results of laboratory tests on the impact of replacing Portland cement with aluminium cement on the physical and mechanical properties of mortar. The rheological characteristics of mortars, i.e. consistency, density, aeration degree and parameters of hardened mortars were examined, among others compressive strength, capillary rise and absorbability. Replacing Portland cement with aluminium cement gives rise to early compressive strength. Parameters such as water absorption and capillary rise also improve. Compressive strength was tested after 7 and 28 days on samples with dimensions 4 x 4 x 16 cm. Absorption and capillary rising were tested 28 days after being molded. The mortar was made with the coefficient w / c = 0.45.

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USE OF UAVs FOR TECHNICAL INSPECTION OF BUILDINGS WITHIN THE BRAIN MASSIVE INSPECTION PLATFORM

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ABSTRACT

Till now Unmanned Aerial Vehicles (UAVs) become more and more popular for use in a various sectors of the economy. The paper presents the results of experiments using UAV, equipped with a high resolution digital camera, for a visual assessment of technical condition of the building with connection to big project implemented in Barcelona that requires visual data about buildings and their changing with time. Authors trying to find out possibilities for the usefulness of digital images obtained from the UAV deck in concrete examples and figure out if they may be complementary with traditional ways used so far in a project called: Building Research Analysis and Information Network which is a platform for analysis in order to allow strategic decisions making for the maintenance and the sustainability of the building stock.

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RESEARCH OF INFLUENCE OF THE SHAPE OF UNREINFORCED MASONRY SHEAR WALLS MADE OF CALCIUM SILICATE MASONRY UNITS

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ABSTRACT

We performed tests on six calcium silicate masonry units which were laid in thin layer mortar with uneven head joints. Compressive strength of masonry (according to EN 1052-1:2000) was $f_{c,mv}$ = 11.3 N/mm^2, and modulus of elasticity was E_{cm} = 7833 N/mm^2 . Shear strength determined in accordance with EN 1052-3:2004 was f_{vo} = 0.70 N/mm^2, and shear modulus for walls under diagonal compression (in accordance with ASTM E519-81) was G = 895 N/mm^2 . Walls were divided into two series and denoted by convention as HOS (Jasiński 2016) and HOS-H,. Those two series differed in overall dimensions of specimens. Three walls of HOS series had identical external dimensions: l = 4.50 m, h = 2.45 m (h/l = 2.45m/4,50m), and thickness t = 180 mm. Three walls without reinforcement were tested at three different values of initial compressive stress σc = 0; 0.1; 1.5 N/mm^2. Test units of HOS-H series were unreinforced, with length equal to l = 2.25 m, height equal to h = 2.45 m (h/l = 2.45m/2.25 m), and thickness equal to t=0.18 m. The wall tests were performed under initial compressive stress equal to σc = 0.1; 0.75; 1.5 N/mm^2. The tests were carried out on an original test stand designed to apply monotonic shear load to shear walls by forces parallel to bed joints and to compress simultaneously the walls by forces perpendicular to bed joints (Jasiński 2010, Jasiński 2016). I analysed cracking and failure mechanism, variations in cracking and failure stresses, shear angles, shear strain and wall stiffness. The tests showed that a wall shape had a negligible effect on the morphology of cracks and the failure mechanism. An increase in wall length caused a roughly proportional increase in values of cracking and failure stresses. Shorter walls were under considerably greater cracking and failure stresses. An increase in wall length led to a significant decrease in values of shear strain angle regardless of initial compressive stress. The reverse situation occurred at the moment of failure. Values of shear strain then increased along with increasing length of the wall.

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EFFECTS OF TECHNOLOGY OF PLACING DIFFERENT TYPES OF REINFORCEMENT IN BED JOINTS ON COMPRESSIVE AND SHEAR STRENGTH OF AAC MASONRY WALLS

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ABSTRACT

Reinforcement for bed joints in masonry structures is commonly applied to prevent crack propagation and to increase values of cracking stress, and compressive or shear strength. Recommendations on construction only suggest that a cladding layer of mortar should be uniformly applied to top and bottom parts of the reinforcement. This paper presents results from testing reinforced and unreinforced masonry walls made of AAC. Compressive strength of masonry determined in accordance with EN 1052-1:2000 standard was $f_{c,mv}$ = 2.97 N/mm^2, and modulus of elasticity was E_{cm} = 2041 N/mm^2. Shear strength determined in accordance with EN 1052-3:2004 was f_{vo} = 0.306 N/mm^2, and shear modulus for walls under diagonal tension (in accordance with *ASTM E519-81*) was G = 475 N/mm^2. Details of tests on ACC walls were described in the previous papers. Main tests were performed on 12 wall elements with the length l = 1180 m, height h = 1208 – 1212 mm and thickness t = 180 mm. TBM-Reinforcement was applied in all walls. We used single mortar laying in all six models, where the reinforcement was embedded into mortar. The double mortar laying was applied in other six models. The models were subjected to compression in accordance with EN 1052-1:2000 and diagonal tension in accordance with ASTM E519-81. We compared the obtained results with the tests (Jasiński, Drobiec 2016) on walls with and without truss reinforcement. The technology of placing reinforcement was similar. We demonstrated that single mortar laying led to noticeably lower values of cracking and failure stresses in comparison to the unreinforced walls. A favourable increase in compressive and shear strength was observed for the technology of double mortar laying.

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EFFECTS OF OPENING SHAPES ON BEHAVIOUR OF SHEAR WALLS MADE OF AAC MASONRY UNITS

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ABSTRACT

Stiffening walls in masonry structures give support against lateral forces, such as wind or earthquakes. Traditional calculation methods for stiffening walls with openings (Rosman 1971) determine internal forces in the components and distribution of loads over individual walls. These aspects in brick walls, which have very low compressive and shear strength, require further observations (Jasiński 2018). This paper demonstrates our own results from tests performed on ten masonry units made of autoclaved aerated concrete. The tests were performed in four series of two elements. The first series denoted as HOS-AAC included four elements without openings, with the length l = 4.43 m, height h = 2.43 m, and thickness t = 180 mm. The wall tests were performed under initial compressive stress values σ_c = 0 N/mm^2, 0.75 N/mm^2 and 1.0 N/mm^2. In remaining three series, we used walls (external dimensions l = 4.43 m, h = 2.43 m, t = 180 mm) with different opening shapes denoted by convention as A, B and C. Elements with A-type opening, 1.48 m wide and 0.98 m high, consisted of two models marked with the symbol HAS-AAC. The models were tested under two values of initial compressive stress σ_c = 0.1 N/mm^2 and 1.0 N/mm^2. Elements with B-type opening, 2.66 m wide and 0.98 m high, consisted of two unreinforced models were marked with the symbol HBS-AAC. The models were tested under two values of initial compressive stress σ_c = 0.1 N/mm^2 and 0.50 N/mm^2. The third series included a window opening with the width of 1.62 m and the height of 0.98 m, and a door opening with the width of 1.03 m and the height of 1.90 m. The arrangement of openings was denoted by convention as C. Similarly, as in case of walls with A- and B-type openings, the series of C-type opening included tests on two models marked with the symbol HCS-AAC. The models were tested under two values of initial compressive stress σc = 0.1 N/mm^2 and 0.50 N/mm^2. Compressive strength of masonry determined in accordance with EN 1052-1:2000 was $f_{c,mv}$ = 2.97 N/mm^2, and modulus of elasticity was E_{cm} = 2041 N/mm^2. Shear strength determined in accordance with EN 1052-3:2004 was f_{vo} = 0.306 N/mm^2, and shear modulus for walls under diagonal compression (in accordance with ASTM E519-81) was G = 475 N/mm^2. The results were compared with test results for unreinforced walls without openings, tested under the same initial conditions. We described the failure mechanism and changes in cracking morphology. We also analysed parameters responsible for wall stiffness and changes in values of cracking and failure stresses.

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STAIRCASE - DIMENSIONS OF STAIR STEPS AND THEIR DEVIATIONS OF GEOMETRICAL ACCURACY

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ABSTRACT

The staircase is an integral part of most buildings. It is subject to the same technological principles and constraints as for other building structures. This design must meet basic technical requirements, including stairway safety. The requirements for selected geometric parameters of stair steps are defined in Czech technical standards and regulations. Generally, the requirements of these regulations are summarized as follows: "All the stairs to the walking line in one flight must have the same height and width and must be horizontal, without inclination in the transverse or longitudinal direction." This provision prescribes mainly design requirements of stairs, while the requirements for as-built stairs are not taken into account. This is evidenced by the fact that in the Czech technical regulations and standards the geometrical accuracy of the as-built stair steps are not specified. Deviations from the geometrical accuracy of stair steps are technologically inevitable. But in practice in the Czech Republic, we encounter situations where builders use the formulation of technical standards and binding regulations to their advantage and refuse to take over the completed staircase. As an argument, they use the formula stated in the above-mentioned regulations. Based on this wording, they require the completed stair steps to have zero geometric accuracy deviations, which are technologically unfeasible. The only way to prevent these attempts is to revise existing regulations to complement the design requirements, including allowable deviations of the geometric accuracy of stair steps. Geometrical tolerances must be determined to take account of the technological possibilities of the construction and to assure safe movement on the staircase. Measurements of dimensions (rise and going) of the as-built stair steps (rise and going) were executed. The results of the measurements were compared with the requirements of the British and German technical standards for staircases. Measurements made in buildings in the Czech Republic showed that about 95% of the measured deviations of step rise and going were not more than 5 mm, which complied with the requirements of the German technical standard.

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QUALITY OF BUILDINGS AND CONSTRUCTION WORK

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ABSTRACT

When assessing construction output and buildings as such, the quality of buildings as a whole and individual construction work is a frequent and legitimate topic. In order to achieve the required quality, the quality must be predefined by the agreed characteristics, the quality marks and the values of their parameters. At the same time, we need to know the procedures, the work operations leading to their fulfilment, and the steps that the quality parameters will verify, and the criteria by which we would evaluate the quality. Construction is a product associated with the expectation of long life and durability, usually for 50 to 100 years. Thus, the relationship between quality and time is to a large extent decisive, just like the time intervals in which quality and durability will be assessed. Defining the quality requirements is the basis for the preparatory, production and evaluation procedures leading to the desired quality (quality is the degree of fulfilment of requirements by a set of internal characteristics). Qualitative requirements are determined on the basis of the user's expectations and ideas about the use of the product, the construction. The most reliable source of this information are the operational characteristics (family house, apartment house, hotel, hospital) and the operating costs considered. The information is used by the designer, contractor and building operator. They can be considered as requirements (the requirement is a need or an expectation that is set, generally assumed or mandatory) - the basis for effective design, implementation, operation and maintenance of the building. Therefore, it is necessary to pay attention to the determination of the basic requirements (their determination, including the determination of boundary conditions, limits and tolerances), and to define procedures for the fulfilment of these basic requirements in all related operations.

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EQUIPMENT FOR THE REMOVAL-RECEIVING FALLING PHASE WITH THE BIOMASS BASE FILLER

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ABSTRACT

The essence of the contribution is the technical solution that concerns the heat sinking / overlaying portable focal point, the heat sinking / refilling cartridge and the heat sinking / overlaying portable focus. In a comprehensive way, it is a substitute for paraffin candles placed in fruit orchards in order to prevent damage caused by ground free frosts. The technical solution belongs to the field of agriculture, in particular fruit growing and viticulture. No other formulas are known in the art, and focuses enable to effectively prevent the effects of pre-spring and spring frosts in agriculture, particularly in fruit and vine-growing. These deficiencies in the prior art have provided the opportunity to solve this problem by appropriate technical means. As a result of this effort, the incandescent / overheating portable focal point, an incandescent / dirty incandescent cartridge, and a heat transfer / immersion portable fireplace. For the sole purpose of thermal insulation / overlay, it is also decisive for the incandescent / refractory focal charge, which consists of pellets and / or briquettes. Part of the experiment is the real measurement and testing of the plant, its effect of burning boxes with pellets to increase the temperature of trees in the set - as protection against spring frost. At the same time, the most appropriate structure of the pellets boxes was tested, its influence on the location of the trunks in the box, the quantity, the kind, the quality and the size of the pellets. The infrared radiation of a burning thermal insulating portable focal point heavily heats all surfaces to which it falls, even at relatively large distances. That is, while the air temperature is relatively low, the temperature of the arresters and the ground around the draft (drafts) will be significantly higher than the air temperature up to a distance of 20 m. Handling of an incandescent / removable portable focal point is clean and has a relatively long burning time of about 6 to 8 hours without the need for intervention and manipulation. After burning, there is no need to remove flame residues, as is the case with paraffin candles, where tin containers must be collected and disposed of. Upon burning of the heat-insulating portable outbreak, only ash from the burnt box and the pellet / briquettes will remain, which, after spraying, will fill the carbon fertilizer. A significant advantage is the fact that the radiant principle of the heat dissipation is used in the surrounding area with a high proportion of the radiation to the sides upwards, as the fire is shaped into the pyramid when it is burned. For clarity, burning paraffin candles emit heat in particular in the vertical direction, making them less effective than an incandescent portable focus. For this reason, the number of thermal transmitting fireplaces is reduced compared to the use of classical paraffin candles. Heat insulation with a portable focal focus also has a high energy efficiency at low emissions.

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FIRE SAFETY ASPECTS IN SUSTAINABLE BUILDING: EXPERIMENTAL AND NUMERICAL ASSESSMENT OF A STRAW-BALE CONSTRUCTION IN FIRE

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ABSTRACT

In line with a growing importance placed by developers, architects, and engineers, as well as by public on green building, renewable resources and natural materials are becoming a priority and an inherent part of sustainable architecture and building design. Offering a new approach on the manner of designing building, this perspective challenges also other fields which at the first sight seemed to conflict with it, including fire safety design. Regarding their combustibility, use of environmentally friendly and energy efficient materials in buildings may be strictly limited in fire codes and standards. In most cases, the limitations are partially based on the lack of knowledge of these materials' and structures' fire characteristics and fire performance. The current paper introduces a project on fire safety evaluation of a load-bearing straw-bale construction. The main goal of the project was to enhance the knowledge of fire behaviour of this material by acquiring new data in full-scale fire test of an experimental straw-bale house as well as to apply this data in validation process of mathematical model of the construction created in FDS programme. The fire experiment was carried out at University Centre of Energy Efficient Buildings, Czech Technical University in Prague, in September 2017. The experimental object was designed as a single-storey, stand-alone building with dimensions of 4,0 x 6,0 m and a height of 3,5 m with two symmetrical connected rooms. Each room had two openings: a door (0,7 x 2,0 m) on the shorter side of the building (western and eastern façade), and a window (0,8 x 1,4 m) on the southern façade. Walls were made of compressed straw bales 400 mm thick covered with inner and outer plaster (around 50 mm), which due to research purposes varied in mixtures of clay, reinforcement of the plaster, as well as in a way of its application. On the walls, wooden beams were laid, covered with OSB boards and water-proof insulation, thermally insulated with mineral wool between beams. Inside the building, wooden cribs, fire load representing a residential house, were deployed equally. Except the global behaviour of the straw-bale object, the research was focused on change of material properties of particular materials, on contribution of the combustible construction to fire, and on separation distances. Building, although consisting many real details that might weaken the fire resistance compared to the laboratory fire test conditions, collapsed 64 minutes after ignition when one of the opening overhead loss its structural stability. It was also observed that the wall composition did not contribute to the released radiant heat. In the FDS programme, a simplified one-reaction wall composition with material properties changing in time was modelled and a good match in the temperature profile between the real wall and the model was acquired.

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USE OF THE UNDERGROUND SPACE IN LARGE CITIES

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ABSTRACT

The article concerns the problem of the use of the underground space in large cities. It provides the international case studies of urban planning of large cities: Helsinki, Oulu (Finland), London (Great Britain), Berlin (Germany), Paris (France), Madrid (Spain), Toronto (Canada), Shanghai (China), Doha (Qatar), and also the domestic experience of urban planning and renewal of Moscow. Investigation and analysis of the use of the underground space in large cities of the world have revealed and defined the ultimate objectives for the further research: a. the provision of comfortable living and working conditions for people; b. increasing the useful area of the urbanized territories of the city without the involvement of free plots of land; c. stabilization of the dimensions of the territory of the large city; d. improving the ecological environment of the city; e. landscaping of the undeveloped areas. The current problem of the large modern city (megalopolis) is the lack of free territories. One of the main methods of solution of this challenging task is the integrated use of the underground space. This space can be used for: underground transport facilities, industrial facilities, underground urban networks, consumer services enterprises, special purpose constructions, trade, spectacular and sports complexes, transport tunnels and underpasses, garages and parking areas. In view of the different conditions of building and planning, individual geological conditions, the use of experience of the specific city is not always applicable for another one. The studying of both foreign and domestic experience will allow to reveal the characteristic regularities and approaches for more careful and differentiated approach to the development of recommendations and project solutions on the development of the underground space in each certain large city.

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SYSTEMIC INTEGRATED METHOD AS THE BASIS FOR HIGH-QUALITY PLANNING OF CONSTRUCTION PRODUCTION

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ABSTRACT

Construction technology utilized as part of a large-scale investment project is a complex process which encompasses a diverse range of contracting organizations and structural units comprised of means of mechanization, managers, engineers and workers. While hundreds of participants perform interrelated actions, a number of factors, different in nature and frequency, arise that alter the project cycle significantly disrupting its given pace. The fact that the construction system's behaviour is affected by multiple diverse factors does offer a challenge of conducting research in this area, and creating appropriate management tools to ensure quality implementation of the project. It should be noted that a contractor is an important structural unit within the construction system, which predetermines the need to set scientifically complex tasks of integrated nature and to conduct appropriate research to develop models and tools for real-time control and integrated management of construction production. Prior to designing the management system for construction of buildings and structures, one needs to collect information on external and internal factors affecting the structural unit of a construction project, the integration level of such a structural unit being a most important indicator. Once the analysis has been completed and each factor has been assigned weight, the tool needs to be developed that will help identify the dependence of the 'integration level' (for the structural division under review) on these factors. The process implies the creation of an algorithm and a series of mathematically substantiated models, supported by experiments, documentation of test results and making the management system currently being developed more flexible. The research will take a systematic approach commonly developed in systems engineering and consisting in the study of the properties of an object as a whole, as a single system, one that is based on the premise that a whole has such properties that its parts do not. One can achieve consistent and predictable results in a more effective and efficient manner when activities are well-coordinated, all processes are inter-linked and aimed at achieving a common goal. It should be noted that the problem exists of how to integrate different specialists in one team solving a common engineering task. Understanding the environment in which an organization operates is a process. As part of the pro-cess, one should identify factors that affect the intention, objectives and sustainability of such an organization.

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SYSTEMIC INTEGRATED APPROACH TO FORMATION OF PRODUCTION STRUCTURAL UNITS WITHIN A CONSTRUCTION COMPANY

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ABSTRACT

Due to the ever growing consumer demand the low-rise residential construction market is currently on the rise, where both state-funded development pro-jects and private gated community construction are concerned. Such projects are a separate type of construction with a number of features associated with calendar planning and improving efficiency potential for application of construction crew performance indicators. Quality management of human resources included in the structural unit will allow for such a unit to display increased productivity and improved reliability, which would help eliminate whatever negative consequences a construction project might be fraught with. Compensation usually accounts for an impressive part of total costs of the entire investment construction project and labour is considered decisive for any project, as it affects the increase in productivity and output. Labour productivity is the most important indicator, expressed as efficiency of labour costs. Its level is characterized by the ratio of the amount of work performed to the time spent on it. The main qualitative indicators of the implemented project, such as the construction time, the cost of construction products and, accordingly, the profits derived by the project participants, depend on the level of labour productivity. Formation of production teams and systematic planning of structural units work is an important stage when planning a construction project. The purpose of this research is to optimize performance of construction processes in order to reduce construction timelines. The tasks which have been accomplished are as follows: a. analysis of features of individual construction projects; b. analysis of impact of organizational and pro-cess-related factors on construction timelines. Results of the research: a. analysis has been conducted of factors affecting construction timelines and construction crew workload; proposals have been put forward regarding rational development of the calendar plan with due account for modelling of such factors; b. proposals have been put forward regarding theoretical recommendations for modelling of work processes performed by construction crews and teams. One of the priority problems one faces when developing a calendar plan at the initial stages of construction is to determine optimum construction time lines, which is achieved by modelling on-site work processes performed by construction crews and teams. This article is especially relevant in that it deals with trial modelling of processes when developing a calendar plan in order to improve efficiency potential for application of construction crew performance indicators.

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SYSTEMIC INTEGRATED APPROACH TO EVALUATING THE RESOURCE POTENTIAL OF A CONSTRUCTION COMPANY AS A BIDDER

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ABSTRACT

As a result of the social and economic reforms that took place in Russia since 1993, the Russian real estate market began to develop actively, as evidenced by the data of the rating Agency of the construction complex in June 2016, there were about 153,000 construction companies included in the registers of SROs. The lack of orders from many construction firms due to the economic recession of recent years, has led the primary housing market to a deep crisis in the last few decades, with competition growing fierce among contractors on the Russian construction market. All of the market players strive to surpass their competitors, while the clients face a serious task of organizing the bidding procedures in keeping with internal regulations and in line with the federal law on procurement. This paper delivers a mathematical model which uses the systemic integrated approach to evaluating the resource potential of a construction company participating in the procurement process. To this effect, research of international procurement experience has been conducted and its findings have enabled the authors to outline and assess the key factors shaping the behaviour of the suggested model. As a result of the research, recommendations have been developed for an efficient systemic integrated evaluation of the resource potential of a construction company in order to improve the quality of procurement processes in the construction sector. The formation of a strategy for a construction project is an essential condition of its existence in a complex competitive environment. Development of measures aimed at improving efficiency must be driven by market needs, production process improvement, cost optimization, and must foster higher standards of organizational culture.

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THE USE OF SANDWICH PANELS AS A SAFETY AND EASILY JETTISONABLE CONSTRUCTIONS FOR INTERNAL EXPLOSIONS

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ABSTRACT

In the protecting structures of buildings of explosive production, it is necessary to establish protective designs. Protective designs at achievement of pressure of explosion of the particular size called by opening pressure free the square for the expiration of gases from the room volume where there is an explosion. At compliance to particular requirements, namely: 1) pressure of opening is less than pressure at which the requirement of a carrying capacity is violated; 2) the protective design quick-response also manages to release the area of the expiration during explosion development; 3) the total area of the expiration of gases provides pressure decrease lower than the level of loss of a carrying capacity of the building. In the offered work as protective designs triplex panels are considered. Process of opening and driving of the panel with release of the area for a depressurization is studied during explosion development. Driving of the panel begins with the moment of destruction of its fastening to a building framework. In work regularities of change of pressure of explosion taking into account an inertance of driving of the panel are received. The triplex panel is a quick-response design. In work questions of influence of pressure of opening and speed of explosive combustion at pressure peak size are investigated. In particular, it is shown that the less ΔP_v, the relation $\Delta P_1/\Delta P_v$ is more, ΔP_1 decreases by an absolute value. At increase in burning rate the maximal pressure increases. The criterion for determination of efficiency of opening of panels is injected. Follows from results of work and the analysis of works on a carrying capacity of various designs, and regularities of opening of panels: with use of panels as protective designs it is possible to reduce efficiently pressure of internal explosion, to protect not only the bearing, but also protecting designs from a brick and concrete and panels of the smaller size and larger thickness.

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MANAGEMENT OF AIRCRAFT NOISE TO INCREASE ECOLOGICAL COMPATIBILITY OF RESIDENTIAL AREAS

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ABSTRACT

Development of air transport branch has been inevitably accompanied by environmental pollution. Using international approach, methodology assessing environmental risks from civil aviation, has been permanently enhanced. The purpose of the investigation is to decrease negative environmental effect of aircraft noise on population of the urban areas in the vicinity of airports. Within the balanced approach to management of the aircraft noise, field surveys of noise environment were performed on the residential areas adjacent to the Elizovo International Airport (Petropavlovsk-Kamchatski). Emergence of piston-engined aviation has been the main factor of adverse effect on humans and their habitat. Initially the issue was limited by the noise generated by propellers. When reactive era came to the scene, though, and aero-gasdynamic flows within the powerplants, and aerodynamic noise from airframe overflow became the main sources of noise, subsequences of aircraft noise came to be the matter of concern for wide range of specialists. The need to increase capability of aircraft and their speed lead to augmentation of the powerplants thrust, and, as a result, the sound power generated by aircraft rapidly grew. And the severity of the issue has been growing on with the development of aviation, enhancement of international air fleet and flying intensity. As a rule, the airports are located either within cities, or directly in the residential areas which generates extremely unfavourable acoustic conditions for residential population and reduces quality of life. At the present a set of operations to assess noise conditions is carried out in the vicinity of the major airports of the world. It has been established that the localities within a radius of 5-10 km under the aircraft routes are systematically subject to high levels of aircraft wide-band noise with maximal acoustic energy within 63-1,000 Hz. Based on the performed assessment of the noise environment, a foundation was issued to use the most efficient architectural and construction antinoise actions, in order to obtain maximal ecological benefits.

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ENVELOPE STRUCTURES BASED ON ENERGY-EFFICIENT LIGHTWEIGHT CONCRETE FROM LOCAL RAW MATERIALS FOR THE REPUBLIC OF CRIMEA

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ABSTRACT

The paper discusses the importance of lightweight structural insulation concretes for large-scale and economical construction of residential and social buildings in the Republic of Crimea. Constructing buildings using structures made from lightweight structural insulation concretes is cost-efficient due to availability of the necessary raw material component in the Republic of Crimea. The paper also describes the composition and process of manufacturing lightweight structural insulation concretes from fired aggregate – foam-quenched culleta, gives a comparative analysis of thermal conductivity and water absorption, foam-quenched cullet test results versus other similar materials. Tests and calculations yielded conclusions about characteristics of lightweight structural insulation concretes based on foam-quenched cullete: high structural quality coefficient, increased thermal resistance, widespread availability and easy production of input raw materials for the manufacture of foam-quenched cullet, environmental friendliness with the possibility of industrial waste recycling, durability, and fire and biological resistance.

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BANK GUARANTEES OF CONSTRUCTION PROJECTS, THEIR CONCEPT IN MANAGEMENT ACCOUNTING AND ROLE IN REGIONAL DEVELOPMENT

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ABSTRACT

On a regional scale, the intensity of construction projects is an advantage, acts as a multiplier and increases the economic potential of the region. It is a fact that construction projects are a great financial burden for investors and are associated with significant risks that can influence the regional development. These risks arise from both the project itself and from a large number of stakeholders with. Some measures of risk can be eliminated. One such risk is to ensure the keeping the contractual liabilities. For this reason, various forms of bank guarantees are used, but they increase contractor costs and project price. Regional decision is how much the contract is necessary for the positive development of the region and ensuring positive economic cash flows. Meet deadlines and flexible reactions to the current situation is in the company supported with maintaining financial frameworks at several banking institutions. The price depends on many factors including size of the company and financial situation. Then financial costs related to construction have not only variable character, but are also fixed. Market uncertainty, the changing status of labour supply on the one hand and maintaining financial frameworks, capacity and long-term contractual obligations on the other hand, requires a flexible response with respect to cost control. The aim of the paper is to analyse the current situation, define key factors for the pricing of bank products and their impact on the construction price. Methods of pricing, costing, accounting will be used for suggestion of a suitable model for true display and management of financial costs with regard to the construction specifics. These outputs will serve as a basis for finding questionable areas in this area and will be a subject to further investigation.

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MODEL EXAMPLE OF SMALL-SCALE PUBLIC CONTRACTS EVALUATION IN THE CZECH REPUBLIC

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ABSTRACT

The study addresses small-scale public contracts in small municipalities in the Czech Republic. Small-scale public contracts represent a problematic area of the public sector anywhere in the world due to attempts to manipulate and influence the results of procurement procedures. The evaluation of small-scale public contracts is not bound by any statutory procedural obligations in the Czech Republic. Act no. 134/2016 Sb. on Public Procurement does not address small-scale public contracts but it stipulates that principles of transparency, proportionality, equal treatment and non-discrimination must be followed. For the purpose of the present study, publicly accessible data from the websites of selected municipalities in the Czech Republic are used. These data were collected based on the analysis of development of information openness and analysis of the development of the existence and quality of internal regulations. In addition, data was obtained through a questionnaire survey among mayors of selected municipalities. The questionnaire results show that small municipalities in most cases do not have their own internal regulation for small-scale public procurement. They evaluate individual bids mainly based on the lowest bid price and use various forms of procurement procedure. The most common is the direct addressing of specific suppliers. This type of procurement is typical for small municipalities with a population of about 2,000. For this reason, the outcome of the study is a proposal of a procedure for small-scale construction procurement. The procedure is divided into three categories according to the expected value of the public contract. For each category, the number of suppliers contacted, the way the suppliers are contacted, the decision-maker and bid evaluation process is determined. This procedure could be employed by the municipalities as an internal rule for the small-scale construction procurement, which would increase the transparency of the procurement procedure and would allow for public control of this procedure.

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IMPLEMENTATION OF BIM TECHNOLOGY INTO THE DESIGN PROCESS USING THE SCHEME OF BIM EXECUTION PLAN

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ABSTRACT

Digital Revolution is one of the most up-to-date topics in the construction industry – and not even in that. According to the spreading of a new trend in Building Design, Construction and Facility Management – using of Building Information Modelling Technology and its Management, there are going to be many changes in the way to develop the design process and other phases of building life cycle. BIM Technology use is present in the whole life cycle of buildings and other constructions and is able to connect all participants of building process in effective way. BIM Technology as a new trend in building design reveals the need to set up effective processes, their parts, participants, their responsibilities, goals and the way to reach goals, etc. The main philosophy of BIM Technology´s implementation into the design processes lies in the BIM Execution Plan. This Plan should be specified for specific activities in specific environment and for specific participants in the whole construction process. These processes should be well conceived and managed. That´s way we can undoubtedly replace the "M" in BIM (Modelling) by the "M" as a Management. This paper contributes to the further thoughtful strategy for the specific process of the design – from the designer´s point of view and implementation of BIM Technology into this process in order to make the design process more effective. There are identified possible barriers for this implementation, their main causes, proposal to remove these obstacles and outlined a possible process of effective design using BIM technology and its principles. It is important to realize, that the implementation of BIM Technology in the design process will lead to a better virtual reality of the building and thus its transformation into physical reality, will lead to a better construction and allow for greater cost savings not only during construction phase, but also in other phases of the building life cycle, especially during its use.

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FRAMEWORK FOR APPROXIMATE ESTIMATES OF ENVIRONMENTAL LOAD BADED ON THE AVAILABILITY OF INFORMATION

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ABSTRACT

Construction industry is closely related to energy consumption and global warming. It is estimated that 30% of total raw materials is consumed in construction industry and 40% of energy is spent in facilities related to the construction (UNEP, 2006). As a result, construction industry has been pointed out as a key source of environmental load. It is necessary to evaluate design alternatives for its sustainability at early stage of a construction project. This study develops approximate environmental load estimate models which can be used as the progress of a design. As the progress of a project, availability of information on a project is getting bigger. In order to support quick design evaluation in the aspect of the environment with minimum input data at each design stage, three types of models ware developed. Based on CBR (Case-Based Reasoning) and GA (Genetic Algorithm), Model 1 and 2 were developed for planning/feasibility and budget/conceptual design. Model 3 is for the early stage of detailed design, utilizing standard sections and quantities. This study collects information from 99 bridges, and then builds a case-baded reasoning database for the estimate of environmental impacts. The range of estimate errors in the three models were also compared. The mean absolute error rates (MAER) of the model 1 is 15.68%. The model 2 is 10.52%. model 3 is . Compared to 30.57% of the unit area based estimate, the results are superior. The suggested models support quick evaluation on the environmental load of each design alternative with minimum input data.

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SUBCONTRACTOR SELECTION WITH CHOOSING-BY-ADVANTAGES (CBA) METHOD

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ABSTRACT

Construction projects are complex and require the involvement of several parties in order to complete the work with success. Therefore, many construction firms subcontract some of their work packages to successfully execute the projects. To achieve higher rates of performance, contractors need to enhance teamwork and collaboration among project participants. Thinking that complex construction projects require the involvement of multiple subcontractors, it is challenging for main contractors to select best subcontractor for the works requiring special expertise. Especially, projects conducted with Build-Operate-Transfer (BOT) or Engineering-Procurement-Construction (EPC) consists of several parties, where some tasks are challenging and bring the need for collaborative structures. This paper focuses on subcontractor selection, which is a major challenge for many construction firms and uses choosing-by-advantages (CBA) methodology to select the best alternative among different subcontractors. CBA is selected as the research methodology due to its ease of use and priorities over the other multi criteria decision making methodologies such as Analytical Hierarchy Process (AHP), Analytical Network Process (ANP) or Fuzzy Logic (FL). Within this context, the paper first identifies each subcontractor as the alternative and develops factors and attributes for each subcontractor based on various criterion. The paper is expected to guide main contractors to adopt CBA in their subcontractor selection process and assign tasks to the experts of each work package in their projects along with making transparent decisions. The main contractors would best benefit from CBA method to document and track their subcontractors' performance and involve them in the processes at the right time.

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BENEFITS OF IMPLEMENTATION OF COMMON DATA ENVIRONMENT (CDE) INTO CONSTRUCTION PROJECTS

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ABSTRACT

The BIM (Building Information Modelling) is very actual topic of contemporary research in construction management. There are many views how to observe benefits of BIM in construction industry. It is clear that project management and optimization of management processes in construction projects is big challenge nowadays. The purpose of paper is to enhance efficiency of construction management practices. Paper follows up previous papers of authors that were focused on crucial points of construction management from view of structure and hierarchy of construction projects. There were defined crucial points in exchanging information and their insufficiency for concrete participant of construction project. This paper is focused on standardized environment for exchanging information in BIM. Generally, it is called Common Data Environment (further CDE). The paper observes influence of CDE on efficiency of construction projects and options of implementation into real projects. From practical experience of authors in project management in construction business were proposed possibilities of implementation to road projects in Czech Republic from view of feasibility. For several possible types of implementation of CDE (proposed by authors) were evaluated impacts on feasibility of construction projects primarily cost and benefits of implementation. From this evaluation were find out the most appropriate types of implementation for CDE and practical proposal of strategies of implementation of CDE into construction projects of multiple types of construction projects.

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HYDRAULIC CONDUTIVITY OF THE PERMEABLE ASPHALT PAVEMENT: LABORATORY *VS* IN-SITU TEST

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ABSTRACT

Permeable asphalt pavements (PAP) are a key measure for mitigating the effects of climate change in urban areas. Cities are becoming increasingly dense and have large areas of waterproofing due to the excessive construction of buildings and highways that prevent the drainage of rainwater into the soil. Recently, the study of PAP with a double layer porous asphalt (DLPA) has been an alternative to the use of a single layer of the porous asphalt (PA), with recognized advantages in increasing water infiltration and, consequently, in decreasing surface runoff. It was developed in field a PAP of small dimensions to assess its capacity to respond to floods. The purpose of this study is to evaluate the hydraulic conductivity (K) of the DLPA applied on the PAP, both in laboratory conditions and in field conditions, and verify the representativeness of the laboratory results in relation to the results obtained in situ. In laboratory terms, the LCS permeameter was used, which evaluates the vertical and horizontal hydraulic conductivity, both in specimens produced in the laboratory and in cores extracted in situ. In the field, the LCS permeameter and the falling head permeameter were used to measure the hydraulic conductivity and the relative hydraulic conductivity (HC), respectively. The laboratory tests were performed according to standards EN 12697-19 and NLT 327 and the in situ tests according to standards EN 12697-40 and NLT 327. It was verified that the specimens produced in the laboratory of the two porous layers showed values of K (vertical and horizontal) lower than those obtained in the field, both for the individual layers PA and for the DLPA. Thus, it was found that the study in controlled environment differs from the results obtained in situ. This divergence justified the need to perform a field study in order to perceive the actual performance of the PAP surface layer. This study was characterized by the values of K (m/s) and HC (s^{-1}), which are not comparable to each other. From this study it was concluded that the methods of measuring the hydraulic conductivity in the laboratory of PA and DLPA do not present the same behaviour as in situ, as a consequence of the flow on the pavement being not restricted horizontally, and therefore their evaluation under real conditions is essential.

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EFFECT OF DEBRIS ON THE LOCAL SCOUR AT BRIDGE PIERS

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ABSTRACT

Scour is one of the most recurrent causes of failure of bridge structures in alluvial rivers. There exist a variety of formulas for the assessment of bridge scour characteristics and for the design of suitable protection. Nevertheless, current approaches neglect the effect of debris carried by natural streams during floods, even when the accumulation of debris can extremely amplify the action of scouring processes. Until now, very limited efforts have been conducted to systematically investigate these effects. The present study focuses on the effect of debris on the maximum clear-water scour depth at cylindrical piers inserted in uniform, fully-developed turbulent flows in wide rectangular channels with flatbed composed of uniform, non-ripple forming sand. For these purposes, an experimental campaign was carried out by performing 17 long-duration (t_d = 7 days) experiments. The experimental tests were performed in the hydraulic structures channel at the University of Beira Interior. The channel was 0.83 m wide, 12.0 m long and 1.0 m deep. In the central reach of the flume, a 3.75 m long and 0.83 m deep recess exists where scour is free to develop. The experiments were carried out with a cylindrical pier with 5 cm diameter and two boxes, each with debris of different dimensions, either of triangular or rectangular shape. The tests were carried out with constant approach flow depth, d = 0.15 m, and average approach flow velocity, U, approximately equal to the average approach flow velocity for the threshold condition of sediment entrainment, U_c □ 0.31 ms^{-1}. For this velocity, the scour depth can be expected to be maximal. The experiments will give a special focus to the development of scour as the accumulated debris increase. Moreover, the experimental results will be compared with a reference experimental run without debris, so that the increments on scour depth due to the accumulation of debris of different characteristics will be obtained and discussed. The following conclusions were obtained: i) The shape and position of the debris accumulation have a strong influence on the final scour depth. Debris on the bottom, upstream of the bridge pier, with a triangular shape, act as a scour countermeasure, reducing in our experiments the maximum scour depth; ii) The method suggested by Melville and Dongol (1992), as modified by Lagasse et al. (2010), performed well, replicating the main trends observed in the experiments; and the influence of the relative submerged ratio of the debris on the scour depth, followed the trend observed previously by Rahimi et al. (2017), with an increasing scour depth up to a critical value of the ratio, and then decreasing scour for ratios higher than this critical value.

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NUMERICAL ANALYSIS OF RC BEAM WITH HIGH STRENGTH STEEL REINFORCEMENT USING CDP MODEL

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ABSTRACT

The article is based on preliminary research on use of the high strength steel for RC elements. A reinforced concrete beam with a span length of 5700 mm has been subjected to four-point bending test. Bottom reinforcement of the beam was made of SAS670/800 high strength steel. This type of steel has no specific yield point. The yield limit declared by the manufacturer is specified as 670 MPa and the ultimate strength is equal to 800 MPa. The aim of research was to establish a numerical model that would render properly the real beam behaviour. The model was created in the ABAQUS software using the CDP (Concrete Damage Plasticity) material model for concrete. The paper analyses influence of several parameters on the results of numerical computations. Author intends to define values of the dilation angle that should be implemented in the model. Commonly the value of this parameter is established a priori, without any justification of the choice. The analysis reveals that in situation when the dilation angle is greater than or equal to 25 deg, the numerical model predicts properly the damage obtained in the experiment. For lower values of the dilation angle, the failure mode is not consistent with the actual beam behaviour in experiment. Another issue is whether and how the results from the model are influenced by the choice of specified concrete tensile behaviour. In the CDP model, this property may be set in three ways: by giving the stress - displacement relation, stress - cracking strain relation or determining the fracture energy. All three options are analysed and compared. Further aspect described in the paper is the difference in load application through force control and displacement control as well as the influence of amount of shear reinforcement. In order to analyse mesh size sensitivity, the results obtained for models with various mesh densities were compared.

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EFFECTIVENESS OF AGILE IMPLEMENTATION METHODS OF MARKETING PROJECT MANAGEMENT

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ABSTRACT

The development of agile processes has introduced new ways of thinking about project management, which also has impact on marketing management of organizations in various ways. Agile Project Management is built around a flexible approach. Agile Project Management is an approach that helps you to deal with challenges like meeting deadlines, decreasing costs or lowering workload of team. In this article, we'll describe what Agile is, and we'll explain why it's beneficial. Marketing project management is the efficient approach that helps you organize, create, and publish content as fast as possible. Agile marketing is a marketing approach that involves being open and responsive to change. Agility requires being flexible, and agile marketers are ready and able to adapt to the rapidly changing business of today. In fact, the goals of agile marketing are to improve the speed, predictability, transparency, and adaptability to change of the marketing function. The Agile implementation methods consist of many rapid iterative planning and development cycles, allowing a project team to constantly evaluate the evolving product and obtain immediate feedback from users. The paper covers literature review and starts with the definition of agile approach of the project management. The paper provides basis for further research on application of agile project management in marketing.

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EVALUATION THE INFLUENCE OF DIFFERENT CROP TYPES ON SOIL WATER EROSION: THE CASE STUDY IN THE MYJAVA HILL LAND, SLOVAKIA

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ABSTRACT

The main objective of the study is to calculate and evaluate the influence of the different crop types on soil water erosion by using the physically-based EROSION-3D model. The EROSION-3D model is based on physical principles and simulates the surface runoff, erosion, deposition of material, and the detachment of soil particles for a single rainfall event. The erosion model was applied on small catchment of Svacenický creek (6.3 km^2), situated in the Myjava Hill Land, the western part of Slovakia, which is known for its quick runoff response and related erosion processes. The risky parts to erosion processes are located in the northern part of the Svacenický creek catchment in the slopes with more than 20% angle. Three crop types (winter wheat, silage corn and sugar beet) considering their growing period were chosen in order to assess the dynamic character of the erosion processes, especially during growing period of each single crops. The modelling was performed for design rainfall events derived separately for each month which were inputs to the model according the growing period of chosen crops and for six scenarios of soil initial moisture in the range of 10-40%. The results pointed out the differences between the erosive effects of selected crops during their growing period. The results were finally statistically evaluated to figure out the differences between the various scenarios of initial moisture, different rainfall events and chosen crop types.

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DETECTING SIMILARITY IN FLOOD SEASONALITY OF SLOVAK AND AUSTRIAN CATCHMENTS

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ABSTRACT

The main aim of the study is the flood seasonality analysis of Slovak and Austrian catchments in 50-year period 1961-2010. Flood seasonality analysis become interesting topic for many authors worldwide. In the context of flood seasonality, the dates of annual maximum floods at 556 gauging stations across Austria (475) and Slovakia (81) were analysed. The length of selected gauging stations is variable and varies from 30-50 years. We have focused on the investigation of relationship between flood seasonality characteristic -r (concentration of flood around the mean date of flood occurrence), hydrological characteristics (long-term average air temperature (°C) for the period 1961-2010, long-term average daily precipitation (mm) for the period 1961-2010) and physiographic catchment characteristics (catchment area (km^2), outlet elevation (m a.s.l.)). The pooling of catchments was processed by nonhierarchical k-means cluster analysis and boxplot analysis. The input for k-means cluster analysis was r (concentration of flood around the mean date of flood occurrence), long-term average daily precipitation (mm) for the period 1961-2010 for individual catchments, catchment area (km^2) and outlet elevation (m a.s.l.). The results show that optimal number of clusters for selected catchments is three and these clusters show some similar features. Cluster one is located in the High Tatras, the Alps and the High Tauern (long-term average air temperature between -2°C :8°C, long-term average daily precipitation between 3 mm-6 mm) , cluster two is located in the Low Tatras and the Lower Tauern (long-term average air temperature between 1°C :10°C, long-term average daily precipitation between 2 mm-4 mm) and cluster three is located in lowlands (long-term average air temperature between 5°C :10°C, long-term average daily precipitation between 1 mm- 4 mm).

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IMPACT OF CHANGES IN ECONOMIC ANALYSIS OF PROJECTS ON RAILWAYS

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ABSTRACT

The paper is focused on the evaluation of the economic efficiency of investment projects in the area of railway structures in the Czech Republic. The economic evaluation of projects of the transport structures including the railway structures has in recent years undergone through significant changes resulting into the final form of the united resort methodology of the Ministry of Transport of the Czech Republic, which from the methodological point of view covers the economic evaluation of all projects of transport structures. The main objective of the paper is to evaluate the impact of methodological changes in the financial and the economic evaluation of projects of railway structures. New methodological approaches can have the influence on economic results of monitored investments. The attention is paid to all aspects influencing the economic efficiency of the projects, especially the issues of investment and operational costs, costs for the trains operation and whole society benefits in the form of time savings, savings resulting from externalities a savings resulting from increased safety on railway are solved. From the methodological point of view, the paper is focused on the comparison of the approach to economic evaluation according to the previous methodologies specialised exactly on projects in the railway infrastructure with the approach according to the new methodology. The new resort methodology unifies specific parts of the analysis for all types of transport constructions and at the same time defines partial methodological approaches intended for particular transport modes. Within the previous methodologies the “transition methodology” valid from the half of 2016 to the acceptation of new resort methodology in November 2017 is also considered. In the frame of research works the identified differences are also analysed. Impacts of methodological changes are presented on the case study of the model railway construction, from which the significant decrease of values of criterial indicators declaring lower economic efficiency is evident. Impacts are solved individually for particular parts of the financial and the economic analysis. From the case study is evident that the decrease of the total economic efficiency of the investment project on the railway connected with the changes in methodology is caused by all aspects included in the economic evaluation, however the changes in travel time savings and savings on externalities are the most important.

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CHARACTERIZATION OF THE SKID RESISTANCE AND MEAN TEXTURE DEPTH IN A PERMEABLE ASPHALT PAVEMENT

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ABSTRACT

Road pavements need a deep characterization of the surface layer, with which the vehicles have direct contact and, therefore, must provide security to the users. The use of permeable asphalt pavements (PAP) with porous layers has provide obvious advantages in reducing runoff and the infiltration of rainwater into the soil or for storage. However, the study of the interaction between the pavement surface layer and the tire rubber requires additional tests in terms of texture and friction, since they are important parameters for the design, construction, management, maintenance and safety of the roads. Considering the application of a PAP in a parking lot, the objective of this study was to characterize in the field the pavement surface in terms of mean texture depth (MTD) and skid resistance (Pendulum test value, PTV). The methods used were the volumetric technique by the patch test and the pendulum test, according to EN 13036-1 and EN 13036-4, respectively. The double layer porous asphalt (DLPA) at the surface is characterized by having a structure with high voids content that led to results of clearly more rough macrotexture and good skid resistance. The normalized limit values were met, however, a very strong correlation between MTD and PTV was not observed. A comparison was also made with porous surfaces of other studies and it was found that porous asphalt has a good behaviour at the start of construction which may tend to improve in the long term. From the study, it is concluded that the PAP presents good performance of the surface layer, providing road safety to users.

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THE IMPACT OF MACROECONOMIC INDICATORS ON THE FINANCIAL STABILITY OF CONSTRUCTION COMPANIES IN THE CZECH REPUBLIC AND SPAIN

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ABSTRACT

The purpose of this study is to identify the relationship between macroeconomic factors and the financial stability of companies based on a comparative analysis of the construction industry in the Czech Republic and Spain for the 2007-2015 period. The negative impact of the 2007 financial crisis on the country economy, and thus on the construction industry, is a clear illustration of the dependence of the financial health of the construction sector on the economic stability of the country. This observation leads to the necessity of determining the relationship between the external factors and the financial stability of companies. The most common and available macroeconomic indicators of economic health of the country were selected for the purpose of this research: GDP, Inflation and Unemployment Rate. In order to find the relationship between the chosen macroeconomic indicators and financial ratios, Pearson Correlation and Pooled Ordinary Least Squares Regression, were applied. According to the results of the correlation, the majority of macroeconomic indicators have a weak positive and negative relationship with the financial coefficients of companies. In both countries, the most significant is the relationship between unemployment and liquidity of enterprises. In addition, in the Spanish construction industry, a negative correlation between ROE and unemployment has been observed. The regression analysis pointed out the impact of GDP on the liquidity of construction companies in Spain. In the Czech Republic, due to relatively stable situation in the period researched, insignificant relation between the selected macroeconomic indicators and financial stability of the country's construction industry have been revealed.

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DEMONSTRATING INNOVATIVE TECHNOLOGIES FOR THE FLEMISH ASPHALT SECTOR IN THE CYPATS PROJECT

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ABSTRACT

In 2015, the ROAD_IT project initiated the development and demonstration of an integrated and coherent IT process control systems for the Flemish asphalt sector in order to modernize existing asphalt paving technologies and to obtain real-time data to monitor pavement behaviour. One of the demonstration test tracks is CyPaTs, the construction of a bicycle path built in September 2017, using innovative technologies (www.uantwerpen.be/cypats). Five technologies are described in this contribution. An asphalt solar collector with a piping system was installed directly in the asphalt. Cold water during summer season and hot water in winter season running through the pipes, keep the asphalt structure in a better temperature interval, avoiding rutting and cracking. Other advantages of this system are: energy gain, the prevention of damage to asphalt and the enhancement of traffic safety. An increased traffic safety can be guaranteed by prevention of damage by keeping the pavement ice-free during frost days. The expected energy gain per year varies between 0,5 and 0,8 GJ/m². About 20% of this energy is used for the operation of the asphalt collector itself. The remaining 80% can be used in nearby buildings. Fibre Bragg Grating (FBG) monitoring system is integrated in all three asphalt layers for the first time in Belgium. Two novel approaches of FBGs installation in asphalt layers were elaborated in this bicycle path: installation of FBGs in prefabricated asphalt specimens at the bottom of base layer and installation of FBGs in a saw cut of approx. 2mm in the previously constructed asphalt layer. The results proved a survival rate of the FBGs of 100%. The obtained strain and temperature data from FBG monitoring system has proved to be an excellent approach to establish and reflect the real condition of the asphalt pavement behaviour in time at different temperatures. The temperatures of the asphalt pavement during construction were followed up by the infrared thermography measurement techniques: a thermographic line-scanner (PAVE-IR by Moba AG) which was mounted at the back of the finisher and a hand-held IR camera (FLIR T640) was used for taking pictures every 2 meters. A real-time temperature contour plot of the pavement during construction was created to monitor asphalt pavement temperatures for quality inspection during the paving process or for later assessment. Two other non-destructive technologies for quality assessment were applied during this project. At first, the thickness was measured using aluminium plates and the MIT-SCAN T3. The obtained values were compared with topographic height measurements. Secondly, the density was measured with the PQI-380 non-nuclear density meter at several spots. The objective here is to check the density of the bicycle path, as well as the accuracy and investigate different parameters that influence the variations of the results, in particular the temperature dependency.

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MODELLING OF AN IMPROVED HYBRID COOLER USED IN SUSTANAIBLE BUILDINGS

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ABSTRACT

Sustainable buildings are resource-efficient and environmentally friendly in terms of structure and energy consumption. It is not enough for a green building to have only greener structure and envelope; the meaning is extended to all its equipment and applications used, too. The purpose is to reduce the consumption of the conventional energy, to efficiently use energy resources and to reduce pollution and environmental degradation. Due to all these aspects, sustainable buildings use renewable and other different types of alternative energies. Among these are the photovoltaic (PV) and the thermoelectric (TE) energies. In most cases, a high-performance building uses the electric energy provided by PV panels included in a more complex system. In attempt to reduce the complexity of the photovoltaic system and its investment costs, modelling an improved photovoltaic-thermoelectric hybrid cooler was a proper option (a cooler can be found in almost every existing building, especially in houses). The choice of this combination was determined by the use of the direct (DC) current delivered by the PV system by the thermoelectric cooling (TEC) modules embedded on the cooler. An improved variant of the PV-TEC cooler was investigated. The modelling analysis comprises i) an appropriate volume for the day-to-day use, ii) new materials comparing to those already used in the structure of other hybrid coolers, iii) different numbers and positions of the TEC modules on the surface of the cooler's sides. All the results are discussed to establish the proper behaviour and variant of the photovoltaic-thermoelectric cooler and to further realize a prototype to see if the theoretical results confirm.

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ARCHITECTURE AS A CONSEQUENCE OF PERCEPTION

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ABSTRACT

Usually it is assumed that the architectural form is fully dependant on its designer's vision. In fact, architecture, and the form it takes, depends on its recipient, for the creator is always the recipient as well. The shape of the building is determined indirectly and directly due to the uniqueness of the recipient, which is a human being. The process of perceiving architecture is specific. The presented studies objective is defining the relationship between the process of perception and the form of architecture. This dependence – determined by the subject and the object of perception – brings attention to the reception process. The current research is focused on searching for determinants influencing this process. They are specific for each recipient; due to both - the anatomical structure, common for the species Homo Sapiens, as well as cultural conditions – unique for each individual. The research was supported by the assumption that the sensuality of this process is distinctive for the perception of architecture in relation to other arts. Consequently, in the case of painting, the basic sense participating in the perception is vision, in the case of music - hearing, in the case of architecture all senses are involved. The aim of the research was to describe the relationship between the use of particular senses and the shape of architecture. The scope of research was limited to contemporary architecture, with particular emphasis on the buildings, which were constructed at the turn of the 20th and 21st century. The research is a case study of selected developments allowing the presentation of the features of the architectural form in relation to perception by each of the human senses and the specificity of space and building resulting from this dependence. To reveal the multidimensionality and complexity of this process, the scope of research has also been expanded to include some additional findings in field of psychology and aesthetics. At the same time, the study was limited to physiological conditions only, assuming that cultural conditions require independent, more thorough approach. The presented research leads to conclusions that can be summarized with the following statement: the shape of architecture depends on factors affecting the perception process. The language of contemporary architecture is constantly changing in relation to the one describing historical heritage, it introduces new dependencies, new processes, and changes the way we perceive the surrounding space.

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UNIQUENESS OR UNIFORMITY - STUDY OF MEDIA ARCHITECTURE

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ABSTRACT

A development of media architecture is presented in light of to such phenomena as aestheticization, consumerism, digitization and interactivity. This article deals with media architecture in commercial spaces - spaces. Media solutions impacts on architecture skin, making it visible and dynamic points of the image of post-modern city. This article presents the specificity of media solutions, depending on the function of commercial buildings (museums and other cultural objects, sports facilities, shopping centers, offices, hotels). The analyzes was based on a set of 60 representative examples of media architecture objects. Staring with own definition of media solution (understood as a synergy of form, transmission and display element), the article presents main relations between the range of solutions, the content of transmission (from commercial to noncommercial content) and technologies (from media mesh to architectural media details). The typology of media details is also proposed in order to translucency, geometry, depth and type of lighting fixtures. The analyses allow to point main similarities of components of media solutions among functional groups, so as the scope of uniformity of media architectural objects in hole group of representative examples. The article stresses that the discretion of media solutions (connected to artistic content, nonfigurative transmission and slow speed of changing images) and architectural media details are the most important factors influencing the uniqueness of media solutions. In this context, the ability to interact with the user is also taken into account, showing the scope of architectural interfaces allowing the user-building interaction, and possible effects of this interaction, including a creation of a place.

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FORMATION OF THE UNIVERSAL SYSTEM OF DEFECTS CLASSIFICATION AT CONSTRUCTION, RECONSTRUCTION AND RE-PROFILING OF BUILDINGS

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ABSTRACT

In this article, the authors study the international normative and technical base for the survey of different buildings and structures, as well as documents and regulations that establish the procedure for accepting finished construction products before the exploitation cycle. To date, guided by building codes and regulations, the supervisor has the opportunity to define a specific defect and, according to the described features, to establish the presence of different defective areas when accepting finished buildings, structures and their parts - at the stages from the functioning of the contractor's internal construction control service to the activities of the external state supervision. However, in the absence of universal classification and structuring, these defects cannot be unequivocally attributed to a certain group by the degree of danger and the effect on operational reliability, which introduces a number of uncertainties and errors in the process of establishing the actual technical condition of structures and of the object as a whole. From the statistical analysis of the inspection activity and various structural defects, the authors formulate this universal classification, which allows structuring the identified defects and, according to the totality of the indicators, to establish a general category of technical condition that is necessary for inspecting structures, buildings and survey to further reconstruction, re-profiling and capital repairs. This addition to the existing qualimetric (quality metering) technique and methods with proper normative regulatory support will improve the quality of construction control and also reduce the risk of acceptance of a poor-quality product by the Customer's services.

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OPTIMUM RESOURCE FIELD FORMATION IN SCHEDULING AND GRAPHICS OF LABOR ALLOCATION BETWEEN OBJECTS OF THE CONSTRUCTION COMPANIES' ANNUAL PRODUCTION PROGRAMS

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ABSTRACT

In this article, the authors consider the possibility of forming the most optimal variant of the distribution of resources (resource fields) on timeline while constructing workforce schedules as part of the Construction Organization Projects (Stage "P" when designing the facilities) or as part of the reporting documentation for planning the annual production program of the construction companies. Based on the analysis of international experience in organizational and technological design and the formation of periodic production programs, authors determined the relevance of the development of the structure of such organizational and technological design, the practical significance of the indicators of calendar plans and resource schedules in the conditions of the modern production environment and economy. The article presents a principal diagram of a new algorithm for constructing and optimizing such calendar plans and labor allocation graphic, taking into account the maximum permissible number of subcontractors, the existing restrictions, the specialization of a particular general construction organization and various features of construction processes. In addition, this research paper highlights the issues of the principal morphological matrix - the step-by-step algorithm of the current planning in the integrated system of planned provision of finished products with indication of direct and inverse relationships. This principle, taking into account the specialization of general contracting organizations and the specific features of the constructed facilities of the construction complex, will allow to introduce methods of the most optimal and rational resource distribution in the planning system in the conditions of existing restrictions - by terms, cost, capacity of the construction organization or others.

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FORMATION OF METHODS FOR ASSESSING THE EFFECTIVENESS OF INDUSTRIAL AREAS' RENOVATION PROJECTS

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ABSTRACT

As the urban environment develops, issues related to the zoning of megacities are becoming more acute. Environmental requirements are raised, the cadastral value of real estate objects is increased, for objective reasons, the wage fund of enterprises located on the territory of cities is increasing. All these factors create prerequisites for the withdrawal of industrial enterprises outside the city limits. Many of these enterprises were established several decades ago on the outskirts of cities, but as the urban environment developed, they found themselves in the central parts of the city, surrounded by residential and administrative quarters. However, the evaluation of the effectiveness of participants in the implementation of such projects has not been studied yet, and there is also no scientifically based system approach that allows to predict the required level of effectiveness of each participant, evaluate it at any time, in order to promptly adjust it, and also design a common level of effectiveness of the whole project. Five main structures involved in the implementation of projects for the renovation of industrial areas were singled out. To assess the effectiveness of each of them and further forecast their overall performance, it is necessary to study the individual parameters of each of them. It should be noted that the value of the allocated parameters of each of the participants in the course of the project implementation will change, moving from a larger one to a less significant one and vice versa. It is advisable to formulate common criteria for assessing the effectiveness of all participants, to create the possibility of a uniform approach to the analytical processing of the obtained parameter results. In the organizational and technological structures of the plots, the main single modules are the interrelations of the Information Support Is (information support) - Organizational and technological activities Eot (Organizational and technological events) - Organization structure Os (Organizational structure). Assessing the activities of each of the participants in the project, it is possible to identify and systematize individual parameters, assessing which it is possible to determine the effectiveness of the organization. And for further analysis and modelling of processes, the identified parameters and their specific weights, it is necessary to group by 3 modules: information support; organizational and technological measures; structure of the organization. And determine the coefficient of influence of this parameter on the overall level of performance of the participant.

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TECHNOLOGICAL APPLICATION FEATURES OF BRICKWORK BONDING TYPES

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ABSTRACT

Purpose of research: investigation of aspects affected application of different brickwork bonding types, description of using traditional bonds in Russia and offering more effective analogues for them. They are many different brickwork bonding types now that have different characteristics: constructive, technological and architectural. But they are using just a few of them in Russia, despite the fact that some types are more technologic than others. Principal cause of this problem – lack of researching of this theme. It is necessary to analyze technologic features of different brickwork bonding types and determinate their characteristics including the technical-and-economic indexes. Results of that research: constructions that have been built using English bond have lower longitudinal stiffness than if it raised with using Flemish bond because Flemish bond have square of bonded section larger than English bond. Professor Onishik's bond is more technologic than Scottish bond because Scottish needs a half bats and Onishik's not. It excludes brick splitting that makes bricklaying process less labour-consuming; Using a Rat-trap bond for building a self-supporting constructions more effective, than using English or Scottish bonds – economically, cause it needs a smaller quantity of bricks end technologically – cause it needs less time to get finished constructions. Major conclusions: Lack of information about different types of brickwork bonding makes process of choosing optimal decision. Possibility of using non-typical brickwork bonding types allows to correct technical-and-economic indexes (labour hours and materials intensity) with saving all functions and quality of construction. Continuation of the researching of brickwork bonding types is necessary cause using unexplored bonds can make building processes more effective.

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DESIGN OF WOODEN FORMWORK FOR BRICK VAULTS

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ABSTRACT

The questions of design and preparation of non-prefabricated formwork for the vault structural construction from masonry units are considered in the present article. The authors aim to optimize the process of non-prefabricated formwork design and to develop a useful normative base of typical technical decisions. The base should reduce to a minimum the necessity of calculations in carrying capacity of wooden parts in formwork. The article starts with a short description of technical aspects in constructing the brick vault and particularly the formwork. Then, the present standard base is analyzed, considering its limitations. In order to load the gaps in the normative base, authors show the calculation model of brick vault with changeable geometric parameters. The summary loading from different vaults is calculated and their following analyses in program complex “Lira sapr ^{tm} “. The model helps to estimate the several sizes of the vault formwork and, as a result, to select the cross sections of materials. Moreover, the technological solutions of wooden lagging jack joint in formwork are presented. Consequently, authors provide a table showing the relation between thickness of the course, breadth of span and various types of formwork. In article are given indicators of labour and material inputs which is necessary for construction planning. Introduce the relation between labour inputs, span of the vault and thickness of course. Base on this relation present diagrams which is useful for intermediate quantity calculation. There are some examples of the obtained results usage and the necessary argumentation of the following base sprawling of the typical formwork project decisions for the bicurved vault structures in the article conclusion.

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FACTORS DETERMINING TECHNICAL WEAR ON THE EXAMPLE OF THE ANALYSIS OF THE TECHNICAL CONDITION OF BALCONIES IN MULTI-FAMILY HOUSING

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ABSTRACT

Problem related to technical wear of the building affecting state of the structure is crucial from the end user perspective. It influences the maintenance phase in the life-cycle of the object. Researchers agree that knowledge about factors influencing technical state of the construction important in terms of cost estimation of works needed for keeping object in appropriate condition. The article presents the idea of determining technical wear of the construction, based on the detail analysis of the technical condition of balconies. Authors focus their attention to present possible aspects of technical wear of the building, especially considering external conditions influence on the construction. For this purpose, investigation was performed on the set of 74 balconies located in the block of flats in city of Poznań, Poland, where modernization is planned to be done within the next 12 months. Authors prepared detailed analysis taking into account current technical state of among others: handrails, balustrades, walls, upper plate, bottom plate, floor surface, flanks, plasters etc. From the analysis report was prepared showing what are the most intensive technical factors influencing state of the building and how they affect visual and constructional aspects of balconies. Based on those information, authors came to the conclusions that due to different errors committed on the phase of executing construction works, as well as adverse and aggressive weather conditions, state of the structure can show faster tendencies to destruction, which from the end-user point of view can cause problems and results in the need of costly repairs.

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SPORTS FACILITIES: THE TRANSITION FROM THE "COST SYSTEM" MODEL TO THE "REVENUE SYSTEM" MODEL

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ABSTRACT

The sports facility represents the home of the fan, the symbolic place that connects citizenship to sport.
The function of the stadiums is therefore of primary importance, representing the point of reference for millions of people who dedicate their time to their favourite team every week. It is essential to adapt these systems to the needs of the fan, focusing on the services dedicated to him. Every citizen should have, in fact, the right to watch sports performances in modern, usable, comfortable and above all safe environments. The ability to be able to guarantee such a scenario, especially in an extremely delicate economic moment, is closely connected to the creation of state-of-the-art sports facilities or the modernization of existing facilities, which often appear obsolete and crumbling in the Italian scenario. The planning, construction and management of a new generation of sports infrastructures for football can allow the growth of the business linked to the revenues from tenders, thus succeeding in diversifying the revenues of Italian clubs currently too tied to the revenues deriving from television rights. The transition from the "cost system" model to that of the "revenue system" is one of the main goals still to be achieved by the Italian sports system. In recent years, there have been many factors that have slowed down this transition phase, starting with the complexity and length of the bureaucratic procedures required for implementing the various projects, as well as the actual difficulty for private and public stakeholders to invest in sports facilities. This article is a summary of the most important experiences in Italy with regard to the development and construction of sports facilities resulting from the encounter between the world of Real Estate and sports clubs in the various disciplines. In particular, the article analyses the technical, economic and financial arrangements that have made it possible to implement the projects, and the main problems that have been encountered. The article focuses on the comparison of some of the most important initiatives carried out at the European level in the field of improving sports facilities, with particular regard to the revenues generated by the stadium (subscriptions, catering, etc.) and the regulatory aspects (Stability Law 2014).

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MODIFICATIONS OF EPOXY RESINS AND THEIR INFLUENCE ON THEIR VISCOSITY

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ABSTRACT

The composites' material engineering is currently one of the fastest growing fields of the technology. Research in this discipline currently focuses on two basic directions: a search for completely new materials and methods of modifying the properties of already known materials. Among the study belonging to the second group, research on the properties and modifications of polymers is a particularly dynamically developing field. Commonly, the most often used polymers types in construction engineering are: construction, coating, and adhesive polymers. The last group includes the so-called resins, e.g., epoxy, phenol, polyester, formaldehyde, and mixtures of these polymers. Their use is focused at combining construction materials, e.g., to strengthen structural elements. Their hardening process can be caused by two factors – the hardener (chemohardening polymers) or higher temperature (thermohardening polymers). These processes cause its cross-linking that is, the production of a crystallized resin structure to a permanent form. The conditions in which the resin was prepared have a big impact on its adhesion to the substrate during its application on the glued surfaces (early resin adhesion) This parameter largely depends on two important factors: the chemical composition of the resin and its viscosity. Changes of viscosity can have a measurable effect on the final effect of gluing. The following elaboration includes the results of an epoxy resin modification tests with the addition of two inorganic fillers: microsilica (in the amount of 0.5% of resin weight) and carbon nanotubes (in the amount of 0.1% of resin mass). The epoxy resin commonly used in engineering for joining steel, concrete, carbon fiber, and glass elements was used. In addition, the ultrasound energy was used as a factor, which disintegrated the initial structure of the resin in liquid form and allowed to efficient mixingthe resin with the filler. The influence of sonication and filler additives on the viscosity of the resin at temperature of 22°C was determined. On the basis of the results obtained and observation of the ultrasound effect, the phenomena occurring at the interface of the liquid phase of the resin and the phase of individual fillers were explained. The increase of temperature of the resin under the influence of a dynamic action occurring during sonication was taken into account. The study conducted were the preliminary phase before investigating the influence of the modifications applied on the physical and mechanical parameters of the hardened resin.

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COST EFFECTIVE ALTERNATIVE SOLUTION FOR THE RENOVATION OF CONCRETE PAVEMENTS

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ABSTRACT

The renovation of concrete pavements (typically motorways) is commonly done by deep replacement of the existing damaged concrete layers including under laying basal layers with newly installed layers with a new surfacing. This technology is rather expensive and time consuming. New alternative solution based on including of intermediate mechanically stabilised layer into road structure is presented. Full scale laboratory model of this structure has been realised. Results and observations are presented. Main contribution of new approach is possibility to remain old concrete layers on place and cover them by new pavement. Standard road structures where concrete layers are overlaid by new pavement in combination with long-term intensive dynamic loading and temperature changes are prone to reflective cracking. Proposed technology avoids that problem and enables cost effective reconstruction of damaged road.

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THE RELATIONSHIP BETWEEN BIM IMPLEMENTATION AND INDIVIDUAL LEVEL COLLABORATION IN THE CONSTRUCTION PROJECTS

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ABSTRACT

Collaboration is a vital requisite in a multi-participant and multi-disciplinary working environment such as in building design with BIM in the fragmented building construction industry. The design professionals in a project team need to closely collaborate with each other to obtain integrated and high performance design outcomes. However, it is not always possible for construction professionals to achieve a high level of collaboration under the usually chaotic circumstances prevalent in the construction projects. Divergent perceptions at individual, team, and firm levels and the divergent interests of the parties inhibit effective collaboration. The main purpose of this paper is to evaluate the relationship between individual level collaboration and BIM implementation. An extensive literature review was conducted to investigate the characteristics of BIM implementation and to research the factors that affect collaboration at individual level. Metrics were developed to quantify the characteristics of the collaboration between the members of project team and the characteristics of BIM implementation. A questionnaire survey was administered to 256 building design professionals including architects, structural engineers, electrical engineers, mechanical engineers, and the like. The results were analysed and the relationship between BIM implementation and individual level collaboration between the members of the project team was evaluated. The paper comments on the characteristics of the collaboration, and discusses the factors that affect this collaboration in BIM implementation. It was found that all suggested observed variables well explain the individual level collaboration and BIM implementation. The hypothesized model is significant at $p \leq 0.001$ level. The model fit is good. There is a positive relationship between individual level collaboration and BIM implementation. In future studies, it is recommended that the analysis will be carried out on the other levels of collaboration to assess the relationship with BIM implementation and collaboration in construction projects.

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A CONCEPTUAL MODEL OF BUILDING INFORMATION MODELING (BIM) USAGE FOR KNOWLEDGE MANAGEMENT IN CONSTRUCTION PROJECTS

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ABSTRACT

The highly participatory and diversified working environment of construction projects places a vital role in knowledge management in construction projects. Knowledge keeps construction firms competitive and boosts high performance in future work. However, a chaotic project requires knowledge management, technological support thorough the project life cycle. BIM has a wide range of interaction between researchers and practitioners as a new and promising area of technological research and application in construction. In the last decade, many researchers have worked on the use of BIM in the construction industry. Collaboration is one of the most important promises of BIM. Collaboration between construction professionals can be improved by firmly managed project knowledge. With BIM solutions, it can be easier to externalize, integrate, internalize and socialize knowledge. Operational knowledge and strategic knowledge can be managed through interactive BIM models. This study aims suggesting a conceptual model representing the knowledge management process through BIM. A comprehensive literature review on knowledge management and BIM was established to construct the theoretical framework for the assignment of a conceptual model for BIM implementation in the knowledge management processes of construction projects. The proposed conceptual model is a road map for adapting the knowledge management processes with BIM as a new tool. The ability of BIM to manage knowledge is determined. Knowledge management processes are identified in construction projects. Existing processes are reviewed and modified for the BIM implementation. In future studies, more detailed research will be conducted to strengthen the validation of the proposed model.

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CLUSTERING ANALYSIS: ENVELOPE ENERGY PERFORMANCE, MOISTURE CONTROL AND THERMAL BRIDGE OF MILITARY B-HUTS

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ABSTRACT

The Engineering Research Development Center's Construction Engineering Research Laboratory (CERL) in Champaign, Illinois is preparing to upgrade the construction and construction process of the b-huts and unaccompanied enlisted personnel housing (UEPH) or barracks. As of right now, the military branches are using plywood and concrete masonry unit (CMU) constructions. Although the construction of these types of barracks can be completed by military personnel, there are several inconsistencies and uncertainties about the energy consumption, and resources the bases are using for the barracks in occupied and unoccupied modes. With the advancement in technology and the race to have sustainable structures, our contribution, as well as CERL's effort are concentrating on analyzing the existing bases to quantify the amount of energy consumption needed to keep the indoor environment at relatively comfort conditions, to quantify the indoor air-quality problems, and to study the thermal bridges at the level of the envelope imperfections. The main objective is to understand the building behavior and to determine the most significant parameters that affect the energy consumption, to help design 3-D concrete printed model through multiple building simulation software for a more efficient and sustainable military barrack.

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ARCHITECTURE AS A CONSEQUENCE OF PERCEPTION

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ABSTRACT

Usually it is assumed that the architectural form is fully dependant on its designer's vision. In fact, architecture, and the form it takes, depends on its recipient, for the creator is always the recipient as well. The shape of the building is determined indirectly and directly due to the uniqueness of the recipient, which is a human being. The process of perceiving architecture is specific. The presented studies objective is defining the relationship between the process of perception and the form of architecture. This dependence – determined by the subject and the object of perception – brings attention to the reception process. The current research is focused on searching for determinants influencing this process. They are specific for each recipient; due to both - the anatomical structure, common for the species Homo Sapiens, as well as cultural conditions – unique for each individual. The research was supported by the assumption that the sensuality of this process is distinctive for the perception of architecture in relation to other arts. Consequently, in the case of painting, the basic sense participating in the perception is vision, in the case of music - hearing, in the case of architecture all senses are involved. The aim of the research was to describe the relationship between the use of particular senses and the shape of architecture. The scope of research was limited to contemporary architecture, with particular emphasis on the buildings, which were constructed at the turn of the 20th and 21st century. The research is a case study of selected developments allowing the presentation of the features of the architectural form in relation to perception by each of the human senses and the specificity of space and building resulting from this dependence. To reveal the multidimensionality and complexity of this process, the scope of research has also been expanded to include some additional findings in field of psychology and aesthetics. At the same time, the study was limited to physiological conditions only, assuming that cultural conditions require independent, more thorough approach. The presented research leads to conclusions that can be summarized with the following statement: the shape of architecture depends on factors affecting the perception process. The language of contemporary architecture is constantly changing in relation to the one describing historical heritage, it introduces new dependencies, new processes, and changes the way we perceive the surrounding space.

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BEARING REINFORCEMENT EXPERIENCE OF APPLICATION OF INCREASED RIGIDITY IN MONOLITHIC LIGHTWEIGHT CONCRETE SLABS

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ABSTRACT

The article describes the experience of erecting lightweight concrete monolithic slabs with the use of reinforcing bars of increased rigidity. As a result, a reduction in costs of 25 ... 30%, compared with the floors of heavy concrete without pre-stressed reinforcement is reached.

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TECHNICAL EXPERTISE: SUBSTANTIATION OF DISMANTLING OF BUILDINGS AND STRUCTURES

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ABSTRACT

In work on the basis of own experience at carrying out of technical examination of conditions of buildings and constructions problems and ways of their decision at performance of inspection are specified. A mechanism is being developed to decommission and remove from the balance of buildings and structures that have worked their technical resources. The main objectives of the technical expertise to justify the dismantling (assessment of the technical condition of building structures, calculation of the remaining resource of the building, the possibility and feasibility of reconstruction, an assessment of the feasibility and profitability of major repairs) are identified. To achieve these goals, an algorithm for performing a survey of building structures in the form of technical expertise to substantiate the dismantling (liquidation) of buildings and structures is provided: the conclusion of a contract with a municipal entity; the evaluation of available design and operational documentation; visual inspection of building structures; instrumental inspection; laboratory tests of building materials (if necessary); carrying out verification calculations on the bearing capacity; drawing up a report on the results of the examination; drawing up an act on the state of the building (structure). Each stage of the examination is examined in detail. Recommendations are given for the content of the final conclusion (information about the customer, the executor, the experts in the commission, the information on the object of examination, the technical task, the description of all constructions with indication of defects, acts of laboratory tests, necessary calculations, copies of certificates, verifications; inventory of materials and equipment, recommendations for further operation) and the composition of the expert commission (only experts who have the necessary qualifications in the survey of construction governmental structures). A technique is proposed for determining the general assessment of the damage to building structures and their physical deterioration (taking into account the relative assessment of their damageability, permanent wear and the service life of the building structures from the beginning of operation to the overhaul and to the emergency condition). Recommendations are given for further actions after technical expertise. Real examples of technical expertise of structures (in different states: workable, limited operational, emergency) are given, conducted by the authors in the framework of performing contractual works.

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ESTABLISHMENT OF BIM-BASED COLLABORATION MANAGEMENT SYSTEM FOR RAILWAY CONSTRUCTION PROJECT

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ABSTRACT

In order to successfully perform civil engineering projects such as railway and road construction projects, a collaborative management system that enables quick and accurate information management of construction site and communication among the participants at the construction stage are needed. This study proposes a method to develop a collaborative tool that utilizes on-site image management system by BIM (Building Information Modeling) function. For this purpose, this study builds an operating system that simulates real scene image of telepresence method and BIM object. The use of BIM in building project has high utility in the interference management of the design stage. On the other hand, the use of BIM in civil engineering project has relatively few interferences compared to the building project, so it is more usable in the construction phase than in the design phase. The BIM-based collaborative management system suggested in this study can increase the usability of BIM objects in civil engineering project. In particular, the research establishes a methodology for managing the schedule progress of the project in a collaborative system. To do this, 4D CAD-based schedule simulation is implemented, and the 4D object image is compared with the actual completion of the actual field so that the progress of the actual completion level can be intuitively expressed. The site image uses the web camera installed on the site and utilizes the image of the construction site photographed in real time for interlocking with the VR simulation image. Since the webcam is installed in the most construction sites, there is no need for additional site acquisition equipment. The site image stored in the web camera is transmitted to the project manager via the wireless transceiver. In this way, the project manager can manage the work situation of the construction site in real time by comparing the site image with the 4D simulation object.

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MICROSTRUCTURE AND MECHANICAL PROPERTIES OF STEEL-CEMENT MORTAR INTERFACE IN MODIFIEG CONCRETE

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ABSTRACT

In technical literature Zimbelmann's model presenting contact layer of aggregate and cement paste is often published. Is also known the border zone of steel fiber and cement concrete presented by A. Bentur, S. Diamond, S. Mindess in 1985 and W. Kurdowski in 1991. The authors of this article and book have undertaken wide research of the contact layer of steel and cement mortar in reinforced concrete. Fivteen variants of compositions with various cements have been analysed, also those modified with additives and chemical admixtures. Adhesive forces of mortar to steel as well as the contact microstructure have been specified. The microstructure was tested on specially prepared samples made of steel pipes filled in with cement mortar. Fractures of the samples were made in the atmosphere of liquid nitrogen and the contact of steel and paste was estimated under a scanning microscope at magnification of 1000-10000. A contemporary model of cement interface was developed, comprising a preliminary phase of CSH, crystalline phase of Ca $(OH)_2$ and ettringite phase. The pull on strength, thickness of CSH layer and its porosity depend on the composition of cement in a specific phase and the use of kind of cement, w/c and additives and admixtures.

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VALORIZATIOIN OF FOUNDRY GREEN SAND IN PAVEMENT LAYERS

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ABSTRACT

In foundry industry, there are two important processes used to manufacture metallic parts: in the first one, permanent molds, typically metallic, are used to produce simple form of parts; in the second one, sands are used as lost molds and cores to produce complicated forms of parts which make their use very adaptable for large applications. However, the last process generates significant quantities of waste sand because only small ones are recycled in factory, that is why it is very interesting to valorize these spent foundry sands (SFS) in several other industrial areas. The objectives of the present work are to valorize the foundry sands in road construction projects. It has been found that the sand with natural minerals, such as green sand, gives, after treatment with hydraulic binders (cement or lime), an interesting mechanical performance (Proctor and CBR Tests) for its use in road construction, as well as pavement layers or embankments. It has been observed that the addition of hydraulic binders, leads to a significant increase of the CBR index up to 135% with the addition of 2% of lime and up to 75% with the addition of 2% of cement. It should also be noted that the proposed solution fits very well sustainable development.

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DURABILITY OF PAINT AND VARNISH COATINGS DEPENDING ON THE QUALITY OF THEIR APPEARANCE

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ABSTRACT

The aim of the work is to study the regularities of the influence of the quality of the appearance of coatings on their durability during the operation. Object of research - paint and varnish coatings of building products and construction. Information on the effect on the longevity of coatings of the quality of their appearance is given. It is shown, that coatings with a high roughness index are characterized by low durability during exploitation. Are revealed the influence of the rheological properties of the paint, the porosity of the substrate on the surface roughness of the coatings. Determined, that regardless of the type of paint composition, the strength and relative deformations are reduced, the plastic deformation is increased and the elastic deformation are reduced with increasing roughness of surfaces. A mathematical model is obtained of the dependence of the tensile strength on the roughness of the surface of the films. It is established, that during the moistening of the coatings in the first stage (up to 30 days), the roughness of the surface is reduced, i.e, the surface micro relief is leveled due to the plasticizing effect of moisture (swelling of the coatings). In the future, due to the destructive effect of moisture, the surface roughness increases, caused by the appearance of micro cracks, rashes, and bubbles. It is established, that in the process of cyclic freezing-thawing the cracks appear locally and are formed near defects on the surface of the coating. The researches allow to develop recommendations for increasing the resistance of coatings and to select the optimum rheological properties of paints depending on the porosity of the substrate.

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USING A WASTE IN ASPAHLT MIXTURE-A LABORATORY INVESTIGATION

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ABSTRACT

Waste management is an actual problem that involves a lot of participants. Road safety and maintenance is a permanent preoccupation for road administrators. The idea of incorporating a waste came out after we fund a powder obtained after a recycle process of electrical equipments. Our preoccupations are orientated over asphalt pavement performance and new raw materials that can be use with success in road asphalt pavements. The idea of incorporate a waste like a substitute of filler is not a new one, because are a lot of researchers that publish interesting papers with different type of additional materials instead of limestone filler. We have made a serial of laboratory investigation over two different asphalt concrete BA16 and BAD22.4- that are standard asphalt mixture in Romania, according AND605/2014 and SR EN 12697. We obtained in the first stage interesting results that we will describe in particular in the final paper. Tests that were performed: indirect tensile test, rutting test, fatigue test, Marshall Stability and flow and the rest of laboratory pre determinations (grain particle size, humidity, blue value etc.). On the additional waste that substitutes limestone filler we also made some laboratory analysis to see if it is or not compatible with the bitumen from asphalt concrete. The conclusion after the first experimental stage is that the mixture is softer that the control/witness mixture and is proper to use in cold geographical regions or for pedestrian areas. For this article we present our first results that now are in a second process of investigation with a different approach that will be published after this one.

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MODIFICATION OF AUTOCLAVED AERATED CONCRETE WITH MATERIAL RECYCLED WASTE

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ABSTRACT

In order to attention to protection of the environment and improving the quality of life lead to proper waste management. This reduce to waste management through, inter alia the simplest way that is the reuse by using recycle. The building sector and the production of building materials is a branch of the economy with the greatest potential use of waste materials. In the construction industry it is possible to waste disposal through the use of waste materials as additives in the production of new building elements. One of the most popular materials for building walls is autoclaved aerated concrete, production of which in Poland is about 40% of the total wall materials and delivers on European market one-third of demand. The material on its own is pro-ecological due to the fact that is produced from readily available raw materials, the need for small amounts of energy for of its generation and is entirely used as a secondary raw material. Its aerated structure produce in 10 times higher energy efficiency compared to concrete aggregate and 2 - 3 times higher than the bricks of clay. The article discusses the effect of the addition in the form of plastic waste on the microstructure and physical and mechanical properties of autoclaved aerated concrete products. Process for the preparation of samples was conducted in the technology SW at the production of aerated concrete, based on the blend made in the same plant. The modified product was analysed X-ray examination and bulk density and acoustic insulation. The results research show that the use of this type of waste to modify autoclaved aerated concrete has a positive effect on improving its properties and helping to protect the environment.

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ASSESSMENT OF GRANITE, QUARTZ AND SYENITE AGGREGATE SUITABILITY INTENDED FOR THE APPLICATION IN CASE OF TRANSPORT PAVEMENT CONCRETE

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ABSTRACT

Based on the analysis of the obtained laboratory test results, the article presents the suggestion concerning the use of quartz and syenite aggregate as granite aggregate alternative, in the composition of cement concrete intended for airfield pavements. The scope of laboratory tests with regard to rock materials included the assessment of basic properties of the applied aggregates and their influence on the change of parameters of internal structure of hardened cement concrete. The analyses included evaluation of the selected aggregate parameters, i.e. bulk density, absorbability, sand equivalent, abrasion, crushing and polishing resistance. The influence of the applied materials on the change of the basic physical properties (bulk density and absorbability) was specified and mechanical parameters (compressive, splitting tensile strength and bending strength) of the curing concrete within diversified periods. According to the observed changes in the internal structure of concretes, the influence of the aggregate type on the obtained parameters of hardened concretes and their airfield pavement application were determined.

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THE DISPERSION DEGREE AND ITS INFLUENCE ON STRUCTURE OF BUILDING MATERIALS

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ABSTRACT

The main basic characteristic of building materials which determines physical and technical properties of composites is structure. However it is difficult to provide certain conditions for structure formation. For this purpose it is possible to create space-limited environment for coagulation of submicroscopic crystals. Generally, this effect is caused by addition of high-dispersed components, usually carbon nanotubes, graphens and etc are used. The results show that the more effective way is to use the combination of ultra- and nanofine additives and in this case nanofine additives should have specific chemical relation to the binder. Fume silica, surfactants ("Ethacryl HF","DC-5» including multiwall carbon nanotubes) were used for modification of building materials. In order to replace multiwall carbon nanotubes water suspension of furnace black (trade mark Palizh, Izhevsk) was added into cement matrix. When the ultrafine additive (silica fume) combines to nanofine components there is great increase of material performances. 0.5% "Ethacryl HF" and "DC-5" with 3% silica fume allow achieving compressive strength to 79.2 % and flexural strength to 94,6% accordingly (compare to test sample). To establish effect from additives and its generality gypsum binder was used. Additionally, the dispersion degrees, mineral chemistry, nature of microfine components are found to be important for modification of building materials. Nanofine additives which have chemical relation to the binder in mineral matrix also have active surfaces and on these surfaces are formed layers of new crystals. The high surface energy of nanofines reduces re-crystallization and allows creating high density and freeing from defects matrixes. Generality of this effect which include all mineral binders is proved.

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PROPERTY MODELING AND DURABILITY OF COMPOSITE MATERIALS

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ABSTRACT

Composite materials are considered as complex systems with corresponding system attributes. The necessity of studying the properties and structure of composite materials as a whole as systems connected by relationships that generate integrative qualities is pointed out. When synthesizing a composite, it is proposed to use the principle of simulability: a complex system is represented by a finite set of models reflecting a certain facet of its essence. This makes it possible to investigate a certain property or group of properties of a building material using one or several simplified (narrowly-oriented) models. Identification of new properties and entities is done on the basis of building up a set of simplified models (the reflection of a complex system as a whole is provided by the interaction of simplified models). Using the principle of purposefulness makes it possible to describe the quality of the material by some functionality for an integrated system. Internal causal relationships, the existence and function of the composite material (system) are based on the principle described physicality (any system regardless of the inherent physical laws of nature, possibly unique); no other laws are required to describe the operation of the system. The study of material properties is made on the basis of parametric identification of kinetic processes of formation of physical and mechanical characteristics of composite materials. For special purpose building materials, a number of particular criteria (properties) are determined, and their description is formalized using the principal component method (reducing the dimensionality of problems in assessing the quality of a material with simultaneous determination of a set of independent partial criteria). The results of the practical application of the method for evaluating the quality of composite materials with special properties are presented. Among the priority criteria were: strength, density and porosity of the material. Their dependences on the coded volume fractions of aggregate and filler were obtained by methods of mathematical experiment planning. It is shown that for most properties one can confine oneself to second-order differential models; each of the properties of the composite is considered as one of the particular criteria. Appendices are given to the development of composite materials for various purposes. Using the methods of control theory, an analytical description of the durability of the composite material is given; parametric identification is reduced to the determination of time constants in a second-order differential model, taking into account their dependencies on the prescription and technological parameters. Assessment of durability of a radiation protective composite taking into account dependences of the main properties on the prescription and technological parameters received on the basis of the generalized model is made.

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COMPOSITE MATERIALS: IDENTIFICATION, CONTROL, SYNTHESIS

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ABSTRACT

A new methodology for research into the development of composites is analyzed as a set of methods designed to study the properties and structure of the material as a whole. It is noted that in the traditional approach the composite is considered as an unstructured medium, and in the case of a system approach, it is structured: in essence, a paradigm shift takes place in construction materials science. It is shown that the main feature of the system approach is the presence of the dominant role of the whole over the particular, complex over the simple; the more complex the system, the greater the effect of applying a systemic holistic approach. The properties of a composite material as a system object are given. It is assumed that there is a complete, integrative property of the system. The synthesis of composites takes into account the paradoxes of integrity (evaluation and analysis of composite materials should be based on the consideration of the material as an integral and unified system, on the other hand - the study of the material is impossible without analyzing its parts) and hierarchy (description of the composite material as a system is possible only if its description as an element of the super-system and vice versa). In accordance with the poly-structural theory, a hierarchical structure of the radiation-protective composite is developed. It is shown that with strictly ordered criteria, the synthesis of the material reduces to a lexicographic optimization problem with the possibility of obtaining not only optimal strategies (the choice of prescription and technological parameters), but also the ordering of all strategies according to the degree of their preference. In the lexicographic optimization problem, an arbitrarily small increment of a more important criterion is assumed, due to any losses with respect to the remaining less important criteria. With conflicting criteria, the direct reduction of the optimization problem to lexicographic is not possible or not expedient. Here we use a not so rigorous ranking of criteria, as in the lexicographical case. One of the possible ways of synthesizing the material is given - the method of successive concessions. Realization of a method at synthesis of a composite of a special purpose is given. An approach is proposed for solving multi-criteria problems on the basis of constructing Pareto sets (in informal analysis, those solutions that are obviously bad are excluded); is realized at multi-criteria synthesis of epoxy composite of increased density for protection from radiation. High mobility of the obtained concrete mixes makes it possible to make piece products, building structures of any configuration and containers for transportation of radioactive materials. The dense structure of super-heavy concrete allows it to be used for lining the enclosing structures of underground and ground bunkers, cemeteries and storage facilities for radioactive solid, liquid and gaseous wastes. Low porosity guarantees high values of brands for frost resistance, water and gas tightness.

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MODEL UNCERTAINTIES IN F.E.M. ANALYSES OF PUNCHING FAILURES OF CONCRETE SLABS

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ABSTRACT

Punching shear is a type of failure of reinforced concrete slabs subjected to localized forces. This failure has been examined by many researchers both experimentally, analytically or numerically. Empirical equations based on tests observations are nowadays the basis of the existing design codes. The work described herein, presents 3D f.e.m. analysis of three slab-column connections also tested experimentally to investigate the three fundamental geometries: central, side and corner column. The sensitivity of the f.e.m. response to input parameters such as material constitutive laws is studied. Concrete constitutive models are described in detail, including their effects on the accuracy of f.e.m. analysis. The comparison between f.e.m. results, experimental tests, code provisions and a new model for punching based on the compression chord capacity model is presented. As a conclusion an estimation of the model uncertainties related to f.e.m analyses of punching failures without shear reinforcement is discussed.

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ULTRA-HIGH PERFORMANCE CONCRETE OVERLAYS FOR CONCRETE BRIDGE DECKS

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ABSTRACT

With much of the world's infrastructure needing rehabilitation, new and more effective methods of repair are required to ensure that concrete structures can continue to perform adequately. This work investigates the potential for using locally produced ultra-high performance concrete (UHPC) as an overlay material to rehabilitate existing normal strength concrete (NSC) bridge decks. Previous research at New Mexico State University has shown that UHPC produced with local materials has excellent strength and durability properties. UHPC's properties provide the potential to improve sustainability and lengthen service lives of existing infrastructure without requiring new construction of elements built entirely with UHPC. UHPC's remarkable mechanical and durability properties make it an excellent alternative to traditional overlay materials. This paper presents results from bond strength tests that included direct tension, slant shear, and split tensile strength testing. Rapid chloride permeability testing for fiber reinforced and non-fiber reinforced specimens was also performed. Results for free shrinkage testing in both the fluid and hardened states are presented, as well as coefficient of thermal expansion results to assess compatibility of UHPC with common bridge deck substrate concrete. Bond strength tests were conducted using NSC substrate with four different textures seven days after casting the UHPC overlay. Average depths of the different textures were determined in accordance with ASTM E965 and ranged from 0.05 mm to 2.8 mm. Results from slant shear, split cylinder, and split prism tests indicate a good bond according to ACI's Guide for the Selection of Materials for the Repair of Concrete, even when inadequate texturing was provided. Average bond strengths for slant shear (ASTM C882) specimens were 23.4 MPa and 8.4 MPa for the 2.8 mm and 0.05 mm textures, respectively. Bond strength for split cylinder (ASTM C496) specimens were 2.4 MPa and 1.8 MPa for the 2.8 mm and 0.05 mm textures, respectively. Bond strength testing of split prisms specimens was conducted using a modified version of ASTM C496 and showed results of 1.5 MPa for the 0.05 mm texture and 2.7 MPa for a horizontally grooved texture with an average depth of 0.9 mm. Testing of direct tensile strength across the bond is currently being performed in accordance with ASTM C1583. Testing of chloride permeability (ASTM C1202) of the UHPC indicated negligible charge passing through the specimens. Free shrinkage measurements initiated 90 minutes after placement indicated a total shrinkage of 1800 micro-strain in the UHPC after seven days. This shrinkage causes shear stress at the bonded interface that can affect the ability of the overlay to remain bonded to the substrate. Longer term shrinkage testing and assessment of combined shrinkage and thermal effects are currently being performed. Results from these ongoing tests are expected by March 1, 2018 and will be included in the full paper.

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EFFECT OF AGGREGATES ON THE TECHNOLOGICAL AND MECHANICAL PROPERTIES OF GLASS AND BASALT FIBERS REINFORCED CONCRETE

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ABSTRACT

Reinforcement of high performance concrete (HPC) with glass and basalt fibers is becoming more widely used due to their high mechanical properties, sustainable manufacturing process and wide range of application in architectural and urban design. Properties of HPC composites are mainly determined by fiber type, volume and distribution in the concrete matrix. Granulometry and shape of aggregates has a major impact on the technological properties of concrete mix, such as water bleeding and slump size. Current study is focused on investigation of HPC reinforced by glass and basalt fibers with aggregates of different types. Quartz sand and crushed granite were used as aggregates. Two matrix compositions were used, both having proportion 1:1 of ordinary Portland cement (OPC) and total amount of aggregate. In first case whole aggregate was fine quartz sand, and for the second- 50% quartz sand and 50% crushed granite. For matrix reinforcement, 3% of alkali resistant glass fibers and 1,5% chopped basalt from total weight of dry materials were used. 1% from cement mass of polycarboxylate ether superplasticizer was used to increase workability of concrete mix. The consistency of mixtures decreased and flexural strength increased approximately by 13% when 50% of fine quartz sand was replaced with crushed granite for concrete with both types of fibers.

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UAV-BASED APPROACH FOR ESTIMATION OF TIMBER POTENTIAL FOR STRUCTURAL ELEMENTS OF CONSTRUCTION

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ABSTRACT

The advent of technological advances in the field of digital photogrammetry and the development of UAVs with high resolution cameras, it has become recurrent the use of these aircraft in the field of forest inventories for the determination of dendrometric characteristics, including height, basal area, and volume, through remote sensing techniques. According to FAO figures, forests cover an area of more than 30% of the world's surface, but only a small percentage has the required properties for use in construction industry. As the plantations of timber can cover extensive areas, their characterization for exploitation purposes can take a great amount of time and resources for the obtaining of structural information of the arboreal individuals. However, recent remote sensing technologies through UAVs allow the optimization of resources in forest characterization with the precision required for the estimation of timber potential. In this work we use UAV high resolution imagery of a southwest zone in the Medellín City-Colombia for the estimation of the tree heights and crown diameters using a Structure from Motion process, through the generation of digital surface models and orthophotomosaics of 4cm-pixel. The study area is characterized by an irregular topography with an average gradient of slope of 30°, having about of 28% of forest cover of total area, consisting predominantly of coniferous forests. The proposed workflow was implemented on a GIS platform, and considers the extraction of the heights of the tree individuals by generating a Canopy Height Model and determining the local maxima, while for the extraction of the crown diameters a process of segmentation was developed. Once these variables were obtained, using allometric equations, trunk diameter at breast height was obtained and correlated with the data cited in the literature, to determine its maturity and use condition for the manufacture of structural elements in the construction of buildings, according to the type of species considered. The diameter estimation process was a different way to use allometric equations to obtain a good prediction of timber conditions. The results indicate that the proposed workflow allows to obtain good dendrometric indicators for the estimation of timber potential, and that this remote sensing technique allows to save resources in the characterization of a forest fragment with these purposes.

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HEAT-INSULATING FINISHING COMPOSITION OF THE OPTIMAL STRUCTURE WITH MICROSPHERES

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ABSTRACT

As fillers in most heat-insulating finishing compounds, various highly porous materials with high open microporosity and moisture capacity are used - expanded vermiculite sand and expanded perlite sand. In composites based on such compositions in the pore structure, open pores predominate, which is why the performance properties deteriorate, the strength and water resistance of the resulting coatings decrease. Of great interest is the use as fillers of materials with closed microporosity - glass hollow microspheres and ash microspheres of aluminosilicate. The aim of the work is the development of a model for the heat-insulating composite of the optimal structure, which allows to minimize the consumption of the binding agent by achieving the maximally dense packing of the microspheres. On the basis of the developed model, the optimal content of hollow glass microspheres and ash microspheres of aluminosilicate, in the case of cement and lime as binding agent, was calculated in heat-insulating composites. The average density of composites of the optimal structure for each pair of "binder-filler" is predicted. It has been established that the composites of the optimal structure obtained with the use as binder of lime will have a lower density in comparison with composites obtained using binder cement. As a result of the conducted studies, the possibility of effective use of lime as a binder in heat-insulating composites obtained with the use of microspheres was identified. When it is used, it is possible to significantly reduce the density of the resulting thermal insulation coatings, thereby increasing their thermal insulation properties and vapor permeability.

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WETTABILITY AND SURFACE FREE ENERGY OF MINERAL-ASPHALT MIXTURES WITH DOLOMITE AND RECYCLED AGGREGATE

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ABSTRACT

The study of wetting properties and surface free energy (SEP) of mineral-asphalt mixtures was presented in the paper. The composition of the two mineral-asphalt mixtures was prepared: mixtures with dolomite and mixtures with dolomite and recycled ceramic aggregate. The use of different aggregate results in different wetting properties in porous bituminous surface of mixture. Based on the SEM study, the microstructure was shown. Wetting properties of mineral-asphalt mixtures were determined by measuring the contact angle of their surface using water as measuring liquid. Many factors influence the contact angle, including physical and chemical homogeneity, roughness and surface contamination, type of measuring liquid, drop size of measuring liquid, humidity, ambient temperature, etc. Measurements were carried out 0 minutes after the time of application of the drops. The total surface free energy (SEP) was determined using the Neumann method. Analysing examination results it can be noticed that the values of contact angles depends on the type of aggregate used in mixtures and smoothness of mineral-asphalt mixtures surface. The results of contact angle measurements proved that all contact angles for mineral-asphalt mixtures with dolomite aggregate were higher than contact angles for mineral-asphalt mixtures with dolomite and ceramic aggregate. That causes the total surface free energy for mineral-asphalt mixtures with dolomite and recycled ceramic aggregate were higher than SEP for mineral-asphalt mixtures with dolomite aggregate. The highest contact angle was noticed for bituminous mixture with dolomite aggregate on flat surface. The smallest contact angle with water was obtained by mineral-asphalt mixture with dolomite and recycled ceramic aggregate on rough surface. This is due to physical characteristics of this aggregate. Ceramic aggregate is characteristic of the high absorbability. This indicates an increased wettability and increased adhesion properties.

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ROUGHNESS AND SURFACE FREE ENERGY OF SILICATE BRICK HYDROPHOBISED WITH EMULSIONS OF LOW VOC CONTENT

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ABSTRACT

The aim of the research presented in the paper was to evaluate the feasibility of using hydrophobising agents based on organosilicon compounds for impregnation of silicate bricks. The process of surface hydrophobisation both using solvents and water substances was analyzed. The effectiveness of four preparations which differed in terms of hydrolytic polycondensation degree, viscosity and concentration, as these are the factors that are decisive as far as the end result of hydrophobisation is concerned. The following laboratory tests were performed: the analysis of physical properties of the tested materials, water absorption coefficient of the hydrophobized samples, water vapour diffusion, frost resistance, contact angle, surface free energy, roughness and the analysis of silica gel properties in electron microscopy. Based on the results of the above mentioned, the analysis of effectiveness and desirability of hydrophobization using organosilicon compounds was carried out. The agent with small molecule oligomers makes hydrophobic properties of the silicate brick increase by 99%. Application of these emulsion resulted in a decrease in mass equal to 0.12% after 50 cycles of freeze-thaw actions. The SFE is the smallest for this agent and is 20.3 mJ/mm^2, the highest SFE value and the highest wettability obtained with methyl silicone resin of low VOC content. The roughness of a brick with a methyl silicone resin is the smallest, because the polysilicone gel did not form a thin film in the brick structure, it filled the free pores and formed a thicker layer than the other preparations used as shown in the SEM pictures. The research conducted so far have shown that low molecule alkylo-alkoxy-siloxane oligomers penetrate the most deeply into the structure of porous brick, the weakest penetration are those of water-diluted polymer preparations. However, in many cases, modern emulsions with a low VOC content are as effective as the products containing organic solvents.

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POTENTIAL USE OF LOCALLY AND TRADITIONALLY PRODUCED BENDING CONSTRUCTION MATERIAL

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ABSTRACT

The use of various mineral admixtures, natural or artificial pozzolan as well as any alternative construction material that could partially or fully replace the conventional Portland cement concrete/mortar with quite similar or even improved performances is receiving nowadays more attention and highly encouraging practice. Back to nature and to ancient and traditional materials that are locally available is not a new approach but it is a strategy largely accepted and adopted to lower the environmental impact of construction sector. Using some locally available materials such as natural pozzolana may require an additional activation process such a calcination at relatively high temperature or a chemical activation by some known activators. Sarooj is a popular name given to a locally produced traditional or artificial pozzolana that has been extensively used as traditional construction material in several countries such Oman and some neighboring countries like Iran. In modern days however; the usage of Sarooj material is limited to the plastering work and restoration of ancient castles and forts. Sarooj has large variety of chemical composition depending on the location from where it has been extracted and thus, the reactivity and the resulted mechanical performances vary to a large extent. This paper investigates the chemical and physical properties of a sample of Sarooj traditionally prepared and extracted from Wadi AL-Mawal region. The chemical analysis and XRD results indicate a great reactivity potential of this material if properly treated and designed. The traditional heat treatment applied seems to be not the appropriate way to reach the full activation of this clayey material. Although traditionally designed, the results of thermal conductivity showed a net decrease compared to normal Portland cement mortar. Combining the use of a locally produced material with an enhanced engineering properties could further promote sustainability in construction industry.

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DESIGN OF PERVIOUS CONCRETE WITH LOCAL RECYCLED MATERIALS

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ABSTRACT

Portland Cement Pervious Concrete (PCPC) is a special type of concrete characterized by a highly connected pore system that allows water from precipitation and other different sources, hence reducing runoff and the need for stormwater management systems as well as recharging the ground water levels. This water infiltration through soil allow a natural treatment of the polluted water. In addition, the high porosity of PCPC may offer other important properties such as thermal and acoustical insulation for walls of buildings. Pervious concrete is mostly designed with Portland cement and coarse aggregate with no fines or a very little amount. Nowadays, the concept of sustainability in construction is widely recognized and implemented. Enhancing the sustainability of pervious concrete with a partial replacement of natural coarse by various recycled and waste solid materials would make PCPC more environmentally friendly material. This paper present selected results on the key mechanical and hydrological performances of pervious concrete designed with different recycled aggregates from various sources and materials types. Seven pervious concrete mixes containing different recycled materials in addition to a control mix, were optimized and tested in terms their mechanical and hydrological properties. The results obtained indicate acceptable mechanical properties of the designed PCPC with an appropriate water penetrability depending on the granular system and compaction effort employed. Among these optimized mixes, selected mixes meeting strength and permeability requirement for a PCPC could be used in some common flat applications as an efficient drainage system. Potential use of these pervious concrete optimized mixes based on recycled materials includes but not limited to sidewalk, pavement in low traffic area, parking lots in regions known by heavy rainfall, floor for car washing stations, etc.

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RHEOLOGICAL PROPERTIES OF A MINERAL-CEMENT MIXTURE WITH FOAMED BITUMEN AND ADDITION OF THE REDISPERSIBLE POLYMER POWDER

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ABSTRACT

The main purpose of the research presented in the article was to find a response in the field of the impact of redispersible polymer powder on rheological properties (o the basis of complex module and phase angle shift) of the recycled mineral-cement base with foamed bitumen. Polymer powders dispersed in construction are used as a compound in mortar, plasters, cement concrete, adhesives and adhesives for tiles. However, there is no references that relate to the analysis of the effect of redispersible polymer powders on binder properties intended for the recycled base course. The aim of the research was achieved throughout the use of well known methods for rheological properties identification. The complex modulus tests in the linear visco-elastic range for small strain equaled to 25 μstrain according to PN-EN 12697-24 Annex D were performed. The complex modulus E* and phase angle φ were calculated for induced sinusoidal load (tension and compression) on cylindrical samples (DTC-CY). The addition of a redispersible powder to the binder composition may also contribute to the increase in stiffness and hydrophobic properties in the mineral-cement mixture with foamed bitumen (FB-RCM). The increase in the elasticity of the FB-RCM mixture can be caused by the modification of the mineral matrix and the interaction between the aggregate, cement and polymer. In the case of the recycled base layer, this phenomenon is important due to the location of the foundation in a structural layer's system (moisture sensitive).

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THE IMPACT OF AN EDGE SOUND REDUCER BUILT INTO THE UPPER EDGE OF THE ACOUSTIC SCREEN ON THE DISTRIBUTION OF ACOUSTIC FIELD ON THE RECEIVER'S SIDE

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ABSTRACT

The article presents the problem of acoustic shielding, allowing for the influence of an edge sound reducer built into the upper surface of acoustic screens. The impact of the analyzed solutions was evaluated on the basis of model tests carried out in laboratory conditions. For the purpose of the planned tests, the reverberation chamber was appropriately modified, ensuring in it the so-called free field conditions. On such a research stand, the propagation of sound wave was investigated as a function of distance, at different heights, for situations without the acoustic screen and after its installation, testing various solutions on its upper edge. On the basis of the conducted tests, the shielding effectiveness of the analyzed test samples was determined. In the second part of the article, a computational model was made, which corresponded to laboratory conditions so that it was possible to carry out the simulation of acoustic field distribution in the same configuration as in the laboratory tests. In the final part of the article, the results were compared and the effectiveness of acoustic screens containing an edge sound reducer was evaluated.

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DEVELOPMENT OF AUTOGENOUS DEFORMATION AND STRENGHT PARAMETERS IN SELF-CONSOLIDATING CONCRETES WITH LIGHT AND NATURAL AGGREGATE

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ABSTRACT

The concrete during the curing exhibits volume changes caused by different factors: chemical reactions during hydration, surface drying, external temperature or carbonatation. Each aforementioned factor imposes different type of shrinkage that constitutes to the overall shrinkage of concrete. In case of the concretes with a low water/cement ratio significant influence on the overall shrinkage has the autogenous shrinkage. This type of shrinkage is a result of self-desiccation, that sucks out the water from capillary pores during the hydration. The article presents the results of the test on the autogenous shrinkage performer in accordance with modified ASTM C1581. To reduce the autogenous deformations caused by the shrinkage, the authors implemented internal curing by using presoaked lightweight aggregate. The tests were performed on cement mortars and self-consolidating concretes with water/cement ratio of w/c=0.28. The mortars were made with use of fine natural aggregate 0-2 mm and fly ash lightweight aggregate 0-4mm. To produce concrete authors used natural aggregate 0-2 mm and 2-8 mm and fly ash lightweight aggregates 0-4 mm and 4-8 mm. Designed self-consolidating mixes were tested to determine their rheological properties. The concrete compressive strength and tensile splitting strength was determined after 1, 3, 7 and 28 days. The autogenous deformations were registered every 500 s during 28 days. The shrinkage was determined on slab samples 35x150x1100 mm. The samples simulated linear expansion of ring specimen used in ASTM method. Study analyses the influence of the type of aggregate on the development of autogenous deformations and strength properties of young self-consolidating concretes. Study have shown that presoaking of the light aggregate changes the development of deformation. Internal curing caused swelling instead of shrinkage during the hydration stage, reducing the overall autogenous shrinkage.

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THERMAL-HUMIDITY PARAMETERS OF 3D PRINTED CONCRETE WALL

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ABSTRACT

The purpose of the external walls is to secure the internal microclimate of the building. External walls not only must have proper strength and durability but also prevent heat escape, overheating during summer, protect from noise and increase of humidity. The main parameter that describes the thermal properties of external walls is the heat transmission coefficient U [W/(m^2·K)] determined in accordance with PN-EN ISO 6946:2008. One of most recent technology of constructing walls is the additive manufacturing. Additive manufacturing is one of the several methods of 3D concrete printing. This technology shows potential for fast and cost efficient constructing. The aim of the study is to determine the thermal properties of wall printed with use of High Performance Concrete and insulated with mineral wool. The study determines the temperature and vapor pressure inside the wall and presents calculations of thermal factor. The study determined that proposed solution meets the thermal-humidity requirements. The tests have shown that insulating printed structures does not pose any difficulty. Corrugated structure of printed walls increases the adhesion of adhesive mortar. Proposed tests are the starting point for further studies on the thermal-humidity of 3D printed structures. Further studies will take into consideration different cross-sections of printed walls. The main goal is to propose a solution for cheap, efficient insulation technology for 3D printed structures.

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THE IMPACT OF CELLULOSE ETHERS ON CONSISTENCY, WATER RETENTION AND ADHESION OF THE RENOVATION PLASTERS

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ABSTRACT

Cellulose ethers such as hydroxypropylmethyl cellulose (HPMC), hydroxyethylmethyl cellulose (HEMC), hydroxyethyl (HEC) are currently used admixtures in the production of factory-made mortars. They improve such properties as water retention, workability, adhesion to the substrate, open time etc. in the cement-based mortars. The article investigates the impact of physicochemical properties (molecular weight, methods of modification, viscosity) on water retention, rheological properties and the adhesion to the substrates of renovation plasters. The research was conducted on original recipe. The research showed that the cellulose viscosity and its amount in the recipe has a greater impact on water retention despite diversified effects of various derivatives of cellulose. The influence of viscosity of cellulose ethers is uneven. The greatest growth of retention was observed with the change of viscosity from 100 mPa·s to 15000 mPa·s. The further growth of viscosity of cellulose admixtures influenced the change of water retention with lower and lower intensity. It was also stated that cellulose ethers improve the adhesion of renovation plasters to the substrates. Particularly beneficial results were obtained in the case of plasters consisting HPMC-based admixtures. The principle research result is that for mortars which do not consist cellulose, the value of water retention was 75%, and for the mortars with viscosity of ~ 6000 mPa·s, the water retention was up to ~85 %, in case of viscosity above ~ 15000 mPa·s, the value of water retention increased to over 95 %. The main conclusion is that the kind of cellulose and its viscosity impacts the consistency of fresh mortars and this influence progresses with various intensity. The greates impact was observed with HPMC-based admixtures, and the lowest with HEMC-based admixtures. Also, the adhesion of mortars consisting of cellulose ethers were higher in unmodified mortars. The most beneficial results were obtained in the case of HPMC. In comparison with the samples of unmodified renovation plasters, the viscosity increased from 36 to 40%.

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RESULTS AND CONCLUSIONS OF LABORATORY CHARACTERISTICS OF SOFT LIMESTONE FROM CENTRAL POLAND AS CONSTRUCTION MATERIAL

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ABSTRACT

The paper presents the physical and mechanical characteristics of the Cretaceous soft limestone from Poland. For several decades, since the end of the XIXth century, this stone had been widespread as a common building material in Koło Basin (Kotlina Kolska) - a lowland region in the central part of the country. The popularity of this material in the mentioned period resulted in the emergence of a unique architecture in the region's landscape. Despite the decline of its use, as was replaced by more modern construction materials, over 2000 of these traditional structures have been preserved to this day. The recent years have seen the rising of a vivid discussion over the cultural value they hold, as well as of the efforts aimed at thee protection and restoration of these structures, as they may be seen as an important element of the region's cultural heritage. Particularly, it is being explored if the local limestone could be used once again, as the trend to return to the use of traditional, natural construction materials develops. In the present situation, the including the soft limestone into the mentioned trend as a raw material or product would require certain marketing steps. For this reason, an analysis of its functional characteristics in relation to the modern technical standards would serve as a solid support to the already proven durability of the structures erected at golden period of its use, decades ago. Therefore, a series of tests was conducted, obtaining a petrographic description and determining its mineralogical composition. Furthermore, measures were made of its physical and mechanical properties i.e. bulk density, open porosity, water absorption at atmospheric pressure, frost resistance and compression strength. These tests were based primarily on the methodology recommended by the harmonized EU standards and exceptionally older national standards. The parameters obtained during the laboratory, with the frost resistance in particular, were deemed not entirely satisfactory. However, the fact the good condition of numerous structures erected using the examined material indicate that, amongst other conclusions, choosing a proper construction technique, developed by practice, plays a key role in the accurate assessment of the durability of traditional construction materials.

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THE 2D CONCRETE COMPOSITION ANALYSIS IN THE CONTEXT OF AIR VOID STRUCTURE PARAMETERS DETERMINATION

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ABSTRACT

The quality of the air-entrained concrete is assessed by the results of microscopic measurements according to EN 480-11 procedure. One of the basic parameters used to estimate, evaluate the quality of concrete is the spatial spacing of voids, for which it is necessary to enter the P/A ratio (paste/air). In practice, the volume of cement paste is usually based on the composition of the concrete mix, because the determination of cement paste content by means of microscopic measurements is very complicated and time consuming and carried out in special situations using, for example, the counting points method. Under field conditions, fluctuations in the air content are often observed, which directly affects the composition of the concrete and hence the P/A ratio and, consequently, the results of the calculated distribution of air pores L. The purpose of the research was to determine how variation of air content influences the results of the spacing of voids L. The subject of the research was a pavement concrete with an air content of about 5% and paste volume P = 26%. The standard tests of three samples of each concrete were carried out, the air content ranged from 3.6% to 8%. First, the results of the pore structure parameters were determined using the standard method. In the second stage, 2D measurements were taken to determine the content of cement paste. An innovative method of illuminating the samples was applied here, which allowed to determine the actual content of individual phases (aggregate, air, cement paste). The results of standard method with results obtained from 2D analysis were compared. The difference in obtained values of the parameter L resulting from the change in the content of the cement paste used for calculations vary between from 0.003 to 0.015 mm.

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THE FREEZE-THAW RESISTANCE OF CONCRETE KERB UNITS

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ABSTRACT

The paper presents the results of testing two-layer concrete kerb units, which surfaces cracked after 3 years after installation. The aim of the research was to determine the reasons for such rapid destruction of concrete. A visual assessment of the damage condition of the kerbs at the place of installation was made, then 7 kerbs with different degree of damage were removed and transported to the laboratory. It was found that on some kerbs the surface layer was damaged, while the construction layer of the concrete in all kerbs was in very good condition showing no signs of damage. The research program included determination of such properties as: core compressive strength, water absorption and capillary suction, frost resistance determined in two ways - resistance to internal cracking (polish standard method) and surface scaling (slab method). It was found that the results of determination of compressive strength of concrete, absorbability, capillary suction or freeze-thaw resistance (to internal fracture), referring to the volume properties of concrete, are of little use to determine surface damage of kerbs. The examinations conducted with the use of optical microscopy have shown that the concrete texture layer was uncompacted. The conducted research shows that the absorption of concrete (50 mm thick samples, cut from the top surface of the kerb) best correlates with the results of tests of resistance to surface scaling of concrete kerbs in the presence of de-icing salts. This confirms the observation that the cause of surface damage is the lack of consolidation of the concrete texture layer.

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SURFACE SCALING RESISTANCE OF CONCRETE MADE WITH FLY ASH CEMENT

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ABSTRACT

The paper presents the results of testing of 11 series of concretes with three various levels of the water-binder ratio= 0.35, 0.40, 0.45, made with the CEM II/B-V cement. The aim of the testing was to determine the impact of the water-binder ratio and air-entrainment on the freezing and de-icing salt resistance of concrete made with fly ash cement. The tests were conducted on samples of non-air-entrained and air-entrained concretes using an air-entraining admixture and polymer microspheres. The scope of tests for the concrete mixture embraced the determination of the consistency using the concrete slump method, bulk density and air content using the pressure method. The scope of testing of hardened concrete included the determination of: compressive strength, water absorption, freezing and de-icing salt resistance, air-pores structure characteristics (A, A_{300}, α, L). The surface scaling resistance was determined using the slab test method according to PKN-CEN/TS 12390-9:2007. The test uses a qualitative evaluation of the mass of scaling from the surface of the sample after 7, 14, 28, 42 and 56 cycles of freezing and thawing at the presence of 3% NaCl solution. Four 50x150x150 mm slabs were tested in each of the eleven series. The tests were conducted on the natural finished surface of the concrete, perpendicular to the moulding direction. Then, the specimens were stored, prepared and tested following the standard methods. The mass of the scaled material after 56 cycles, in kg/m2, relative to the surface of the specimen is taken as the test result. Regardless of the water-binder ratio (from 0.35 to 0.45), the samples of non-air-entrained concretes demonstrated no surface scaling resistance in the presence of 3% NaCl. The tests of air-entrained concretes demonstrated that concrete air-entraining using polymer microspheres and an air-entraining admixture protects the concrete made with fly ash cement against surface scaling. The concrete air-entrainment using an air-entraining admixture causes a substantially higher drop in compressive strength than using polymer microspheres.

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ANALYSIS OF THE IMPACT OF FLY ASHES ON THE STRUCTURE OF SCC CONCRETE AERATION

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ABSTRACT

The article presents the results of tests of the impact of fly ash admixture on the structure of aeration and on selected physical and mechanical properties of SCC concrete mix. The effects were compared to those obtained for SCC concrete made solely with the use of Portland cement. Tests were performed on fresh concrete mix (spread, viscosity and air content by pressure method). The aeration parameters of fresh concrete mix were determined by AVA (Air Void Analyzer) method (total air content A, microspores content A_{300} and spacing factor). For hardened concretes the following characteristics were determined: compressive strength (after 2, 7, 28 and 56 days), water absorption, water tightness and frost resistance. Unit prices were also calculated (for prices in Poland) for SCC concrete made solely with the use of Portland cement and separately with the use of fly ash admixture. The analysis of the results demonstrated that the addition of a large amount of fly ashes to SCC concrete has a clearly negative impact on the stability and quality of its aeration characteristics and, as a consequence, significantly reduces its frost resistance and thus durability. The unit price calculated for SCC concretes made with the use of fly ash is clearly lower than of concretes made solely with the use of Portland cement, but in many cases this does not justify the use of fly ash.

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INFLUENCE OF LOW TEMPERATURE ON CONCRETE PROPERTIES

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ABSTRACT

The aim of this article is to show the negative effect of the reduced ripening temperature on the increase in compressive strength. Laboratory tests were performed on a concrete mix with a w/c ratio of 0.54. The samples were reformed for 2, 5, 8 hours at +18°C, and then were frozen once to -3°C and -8°C for 24 hours. After this time, the samples matured at +18°C. The greater the early strength, the lower the drop in compressive strength with a single freeze. The greatest decrease in strength was noted for concrete maturing 2 hours and once frozen to -8°C is 52.3%. The greatest impact on durability drops is: freezing temperature, pre-ripening time, type of cement used. Additionally, the methods of protecting concrete against the influence of negative temperatures are described. Laboratory tests carried out indicate a negative effect of the reduced temperature on the increase of compressive strength. The largest decrease in compressive strength in relation to the reference concrete was noted for concrete made of cement CEM II / BV 32.5R maturing for 2 hours in water at +18°C and once frozen in air to -8°C, a fall of 52.3 %. After analysing the test results, it was found that the drop in compression strength depends on the type of cement, the level of freezing temperature and the time of initial maturation. It was found that the lower the freezing temperature and the shorter the pre-ripening time, the greater the drop in compressive strength. The influence of negative temperatures on young concrete is harmful in every case, although this harmfulness has a different degree. It is therefore necessary to protect young concrete against this type of weather conditions. Concrete works under conditions of reduced temperatures are only possible if contractors take appropriate measures to enable binding and hardening of the concrete mix, e.g. by providing thermal protection, so that the young concrete in the element does not freeze. The reduced air temperatures have a negative effect on the setting and hardening of the concrete. The lower the ambient temperature of the concrete structure being made, the lower the concrete temperature and the younger the maturing process of the concrete is slower.

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POROUS CONCRETE AS A ANTI–AQUAPLANING BUILDING MATERIAL

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ABSTRACT

The paper considers the use of porous concrete for the needs of communication construction. For comparison, two sets of concrete, ordinary blend have been developed, which is currently used in Poland as road and porous concrete, which is used by Americans in the United States. After concrete testing, molding and care of the samples under laboratory conditions, compressive strength tests were started after 7, 14, 28, 56 and 90 days. Absorption and capillarity were investigated after 28, 56 and 90 days. In addition, fragments of cubic samples were examined by scanning electron microscopy. Samples measuring 10x10x10 cm were ripened in water at + 18 degrees Celsius. Plain concrete has a higher percentage increase in compressive strength than porous concrete. After 90 days, plain concrete had 60.8 MPa strength and porous concrete 22.8 MPa. The carried out tests on absorbability show that the mass increase of porous concrete samples is larger compared to ordinary concrete. It can be concluded from the capillary rising tests that ordinary concrete absorbs less water than porous concrete. Based on the laboratory tests carried out, it was found that porous concrete has a lower compressive strength compared to ordinary road concrete. It is too low due to the use of concrete in the top layer of the road surface. Concrete used for the lowest category of roads, which are municipal roads have a strength of 25-30 MPa after 28 days, while the strength of porous concrete after such time is only 12.5 MPa. In the case of domestic roads, it is 35 MPa, so the only solution is to redesign the composition of the concrete mix. Despite the fact that porous concrete has excellent features for draining water from the surface and can be used as a drainage system in road surfaces (where there is the so-called aquaplaning phenomenon), on parking lots, large flat surfaces it cannot be used due to the very low durability at squeezing, which does not meet the requirements of municipal roads.

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THE INFLUENCE OF HYDRATED LIME ON IT-CY STIFFNESS MODULUS OF FOAM-BASED ASPHALT CONCRETE COMPACTED AT 95 °C

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ABSTRACT

For a number of years worldwide, the road construction industry has been seeking new technologies for producing energy-saving asphalt mixtures in order to meet new environmental requirements and laws. Some of these techniques include new classes of mixtures characterized by reduced processing temperatures compared to the conventional Hot Mix Asphalt (HMA) production temperature of 165°C and paving temperature of approximately 145°C. These techniques include Half Warm Mix Asphalt (HWMA) mineral mixtures produced with the use of foamed bitumen as a binder at temperatures of about 100°C and paved at 95°C. Although generally HWMA mixes are comparable to HMA, depending on the mix, they may suffer from decreased mechanical parameters resulting in a reduced service life of the asphalt pavement. The implemented research program investigated asphalt concrete (AC 8) with foamed bitumen (HWMA) compacted at 95°C and the control HMA sample produced and compacted at a regular temperature. A typical 50/70 road paving bitumen modified with 0.6% surface active agent SAA (fatty acid amide) was used as the foamed binder, dosed at 5.6% and 6.2% by weight to the mixture. Mineral filler replacement with hydrated lime at 15% and 30% by weight was evaluated. The content of voids in the asphalt mixture was examined. The indirect tensile stiffness modulus (IT-CY) characterizing the durability of the mixture was measured at -10ºC, 0ºC, 10ºC, 20ºC and 25°C. The results of statistical analysis showed significant correlations between the mix production technology used and the content of foamed bitumen and hydrated lime in terms of the temperature of stiffness modulus testing. As confirmed by the stiffness modulus values, the application of hydrated lime provided the half-warm mix asphalt concrete AC8 produced with foamed bitumen with mechanical properties comparable to those of the HMA mix.

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PROPERTIES OF BITUMINOUS BINDERS EXPOSED TO AGEING PROCESS

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ABSTRACT

During the production technology of asphalt mixture and built-in the road pavement the bitumen binder is exposed to the influence of oxygen, and the oxidative aging of bitumen occurs. Changes of bitumen by result of phenomena associated with evaporation and oxidation changes express in hardening. To improve the quality of bitumen and asphalt mixtures, an organic and inorganic additives are added. The paper reviews the change in the properties of two paveing grade and two polymer modified birumen by the effect of aging and the change of bitumen properties with the Licomont BS100 and Wetfix BE additives. Additive Wetfix BE, improving adhesion between bitumen and aggregate, changed the tested bitumen properties in the minimum. The Licomont BS100 additive caused an increase the softening point and reduced the viscosity at higher temperatures of 120 to 180 °C, which allows to reduce the working temperatures during the production, laying and compaction of the asphalt mixtures. The results confirmed the hardening of the binder after both short and long-term aging, which was reflected by a decrease in penetration and an increase in the softening point. The effect of aging by RTFOT generally showed an increase in bitumen viscosity without and with the additives. The greatest increase in viscosity was for bitumen PmB 45/80-75, the smallest change in values was for bitumen 50/70. Additives added to bitumen decreased the viscosity, except for Wetfix BE in bitumen 35/50. By comparing the bitumen viscosity results after aging without and with additives, the effects of additives on the bitumen viscosity are less than that of bitumen without aging. Only with the Wetfix BE additive in bitumen 50/70 the viscosity change of the aged binder was greater than that of the unaged one.

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MICROSTRUCTURE CERAMIC CHANGES RESULTING FROM SODIUM SULPHATE SUBFLORESCENCE

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ABSTRACT

In this article the influence of sodium sulphate crystallization was discussed on microstructure changes in traditional ceramic. The tested elements in form of brick halves underwent capillary moistening in sodium sulphate solution with concentration of 5, 10, 15, 20, and 25%, and then their bottom walls were protected with polyethylene covers in order to ensure drying only through side walls. After drying, samples were taken from face walls (5mm) and 2 subsequent lower layers (each 10mm thick). So prepared samples were used for comparative analysis of ceramic microstructure changes caused by salt crystallization and material damage visible after salt extraction. In the tests mercury porosimetry and confocal microscopy were used. Because of necessity to dry the samples to solid mass, the temperature of 80°±5°C was defined which enabled removing free water without damaging of crystallized salt structure. Based on ceramic analysis there was found the initial salt concentration when macroscopic damage starts as a result of sub-florescence (face layer delamination). The analysis of pictures from a confocal microscope enabled to define the mechanism for ceramic material damage. There was observed characteristic granular diffusion which is the effect of pushing out ceramic by building out the sulphate crystals.

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PROTECTION AGAINST DEGRADATION OF CONTEMPORARY FACE WALLS

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ABSTRACT

The face wall is a construction element which is exploited in difficult environmental conditions. Its material solutions should effectively protect against environment influence. But often the desired effect is not obtained – on most objects there are efflorescence and damages appearing with various intensity, as a result of corrosion processes. Their dynamics depends on various factors. The most important include the environment quality and wall structural integrity. In case of face walls the basic environmental factors are driving rain, long term snow cover, and changing temperatures oscillating about the level of 0°C. The structural integrity of the wall depends mainly on mortar which aside from obvious supporting function should also protect against water penetration into the wall and thus creating subflorescence. In the article there is a systematic approach to forming of humidity conditions of the wall and its maintenance in a proper technical state during exploitation.

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INFLUENCE OF WOOD MOISTURE ON STRENGTH AND ELASTIC MODULUS FOR PINE AND FIR WOOD SUBJECTED TO 4-POINT BENDING TESTS

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ABSTRACT

In civil engineering wood is still an important constructional material. due to two main reasons. Firstly, because of the growing interest of architects in the use of today's fashionable, natural materials. Secondly, due to the need of restoration of wooden historical buildings, especially of the heritage value. The old buildings often require the rehabilitation, restoration of old structures by the repair or reinforcement of existing elements to ensure the safety of the wooden structure. On the other hand, wood due to its heterogeneity, is more difficult to analyze comparing to steel or concrete. The heterogeneity of wood as a natural material comes also from defects such as knots, slope of grain, shakes decay, biological defects due to insects. It is known that wood is very sensitive to moisture and temperature. Thus its mechanical properties like the stiffness and elasticity limit also depend on these physical factors. The main purpose of this research is to determine the influence of the wood moisture on the strength and elastic modulus of pine and fir wood specimens subjected to the 4-point bending tests. Six bending tests for each wood species and for two different moisture level has been performed. Then, the advanced statistical analysis of the results has been carried out. On the basis of the obtained results, it has been noted that growth of the wood moisture significantly affects the reduction of the tested strength and elastic modulus. The values of the elastic modulus are similar for two wood species (pine and fir wood) for the moisture approximately 10%. It has been also noted that the value of elastic modulus has been decreased by approximately 30% for twice as much the wood moisture (circa 20%).

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CHARACTERISATION OF BAISIC PROPERTIES OF MINERAL BINDERS WITH CALCINED WATER TREATMENT SLUDGE

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ABSTRACT

The paper discusses basic properties of mineral binders containing calcined water treatment sludge (WTS). The supplementary waste material was dried at 105°C and subjected to calcination at high temperatures of 400, 600 and 800°C for a constant time. Chemical composition was determined and pozzolanic activity was measured using the Chapelle test. Moreover, standard consistency, setting time and mechanical properties of cementitious binders containing 25% and 50% of calcined sludge were determined. The test results presented indicate that water treatment sludge calcined at 800°C exhibits high pozzolanic activity and can be considered a promising ingredient of cement-based mineral binders.

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CHARACTERISTICS OF MATERIALS USED IN ADDITIVE PRINTING IN CONSTRUCTION

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ABSTRACT

Three dimensional printing is a promising new technology to make construction object. Around the world in every moment new prototypes constructions are made by using this method. Three dimensional printing is taken into account as technology which can use to build constructions in automated way on the Moon or Mars. Substances which can be used with three dimensional printing have to full fill basic requirements for materials which are used in construction. That means substances are made from ingredients easily accessible in area nearby construction site and reusable. The cost of making building object due to that requirements is comparable to costs of building object according to traditional way of making, which are currently available. Although substances usage for additive techniques requires dedicated machine to supply it. Characteristic for such substance is: speed of concrete setting, compressing strength, followability in the system, buildability upon pouring, maintain appropriate setting rate so as to ensure bonding with the subsequent layer, reusable capabilities, easily accessible of subtracts, making cost for such mixture shouldn't be too high in order to keep 3D printing competitive for traditional ways, substance should be recyclable and way of making material should not has negative influence on environment and people. All substances dependencies are determined by device used for additive substance usage. In this paper review of available substances used for three dimensional printing technology at construction site is presented. Used sources were analysed against requirements for substances used in construction industry. Due to lack of publications regarding substances, this analyse can be use in designing new concrete mixtures to use them in three dimensional printing technologies in construction.

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BEHAVIOR OF COATED MACADAM REALIZED WITH DIFFERENT TYPES OF FILLER

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ABSTRACT

A particular importance in the behaviour of asphalt mixes is given by the behaviour of the mastic formed by the mixture of filler and bitumen. Depending on the type of filler, the mixture has a different behaviour in taking over traffic loads and temperature variations. At the same time, an inappropriate dosage of this mixture may adversely affect the behaviour of the asphalt mixture in operation. This paper presents the behaviour of the MAS 16 stabilized asphalt mixture with different types of filler (limestone filler and burnt clay), both in terms of the behaviour of the mastic (mixture made from filler and bitumen) and comparatively the behaviour of the whole mixture of aggregates, filler and bitumen, namely the asphalt mixture itself. This paper deals with the fatigue behaviour at different temperatures and frequencies of the asphalt mixture obtained with the two types of filler.

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COLORED ASPHALT PAVEMENTS

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ABSTRACT

The use of coloured asphalt pavements plays an important role in answering the environment requirements, the operational aspects and visibility and road safety requirements. In this context, the paper deals with the possibilities of realizing coloured asphalt mixtures corroborated with the ordinary tests to determine the physical and mechanical characteristics. Meanwhile, the article presents the advantages of using colored asphalt mixtures in different cases for improving road safety.

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CONSIDERATIONS CONCERNING THE IMPORTANCE OF THE CAPPING LAYER IN THE DESIGH OF SUSTAINABLE ROAD PAVEMENTS

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ABSTRACT

In all designs of road complexes, the capping layer represents the upper layer of the earthworks and carries on several roles during the construction (short term roles) and ensures a constant and uniform bearing capacity at the bottom of the road pavement during the entire operation period (long term role). As to its practical realization, there are different standardized and applied technologies, and the experience acquired in different countries has taken the form of technical norms differing significantly from a country to another. The paper presents the theoretical analysis concerning the realization conditions of the capping layer in Romania, in comparison with the stipulations of other technical norms, especially the French ones. The authors aim at emphasizing the technical solutions which can be applied in different situations to obtain a high bearing capacity at the bottom of the pavement, with beneficial effects on the reduction of the road layer thickness and a better operational behaviour. The comparative analysis will show that several bearing capacity values of the bearing capacity at the earthworks level can coexist in the pavement dimensioning. It is important that the value taken into consideration in the calculation does not decrease during operation. On the other hand, the site verification of the quality conditions designed for the upper level of the earthworks bears a significant importance before the realization of the pavement. The paper also presents the technical solutions favoured by the specialist in the south-west Romania for the realization of the capping layer, pointing out the advantages and drawbacks which can lead to changes in the today outlook.

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RHEOLOGICAL PROPERTIES OF MASTIC WITH THE ADDITION OF SYNTHETIC WAX AND HYDRATED LIME WITHIN THE VISCOELASTIC REGION

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ABSTRACT

Mastic has a significant effect on the properties of bituminous mixtures and acts as a real binder. It determines the resistance of the asphalt mixture to the formation of plastic deformation, the sensitivity to the effects of water and the low temperature cracking as well. In the article was presented advanced rheological research using the mastic with virgin bitumen 50/70. Mastic has been enriched by addition of the hydrated lime together with synthetic wax modified bitumen. The experiment design was based on the Box-Behnken plan. This experiment plan consisted of three controlled factors: the amount of synthetic wax, the amount of hydrated lime and the amount of filler in the asphalt mastic composition. The work highlights the interaction between synthetic wax and the amount of hydrated lime. The assessment of the influence of controlled factors was determined within the viscoelastic region performed by means of a dynamic shear rheometer. The experiment used the determination of viscoelastic properties of the mastic, i.e. complex dynamic viscosity η *, dynamic shear modulus G*, phase shift angle δ at temperatures 40°C, 60°C and 80°C.In addition, the influence of controlled factors was determined using MSCR tests in the 100Pa and 3200 Pa range. As a result, creep compliance and elastic recovery were determined at 60°C. The tests showed a diversified increase in the stiffness of the asphalt mastic with wax and hydrated lime additive, at given high test temperatures, in relation to the mastic with a traditional filler. It should be noted that the presence of crystallites of a synthetic wax also caused a significant increase in the stiffness of the mastic. Additionally, considering the conceptual model an initial optimization of the amount of synthetic wax and hydrated lime in its composition was made.

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EVOLUTION OF SALT EFFLORESCENCE ON CLINKER FACE WALLS

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ABSTRACT

The lowering of building element aesthetics caused by salt efflorescence can have various characters. It depends mostly on types of wall component types, external environment conditions, and on-going physical and chemical processes. The active salts responsible for efflorescence appearance do not only worsen the wall look. They can also lead to lower durability because of microstructure destruction both in ceramic as well as in mortar. The type of mortar used for face clinker walls in essential way influences the limitation of efflorescence and discolorations which appear. Additionally, the way how wall is formed on the subsoil is a factor determining the character of salts appearing. In this work there is an analysis of the evolution of efflorescence appearing on two exemplary face walls made with various mortars. The walls were built with solid clinker bricks of traditional size 250x120x65mm in connection with two mortars: cement mortar based on Portland cement CEM I 42.5, and cement-lime one. Additionally, during the research three different contacts of the wall with subsoil were tested: gravel layer, humus with lawn, and tight concrete band. The analysis lasted for ten years of wall exploitation in external environment. In the tested walls there were made chemical analyses for the quality and quantity of the appearing salts. There is also a raster picture of appearing efflorescence evolution made with AutoCad program during the research time period.

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TECHNICAL EVALUATION OF CONSTRUCTION MORTARS WITH VARIOUS LIME QUANTITY ADDITIONS

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ABSTRACT

Construction mortars are materials for common use. The broad range of their usage results from their technical parameters and consequently from possibilities of various material and technological solutions. They can be used in various solutions both in existing objects as well as new-built ones. The history of using mortars reaches very old times. Lime as a binder was applied already about 3000 BC for building pyramids, decoration and finishing of building walls. Over time lime was added with pozzolan thanks to which the mixture gained better technical parameters. Currently, for design of mortar with necessary physical and strength properties it is needed proper component selection, their dosing and mixing. Essential role is played here by correct proportions and quality of components. Too low or high contents of particular components can significantly influence their technical properties. This article concerns the evaluation of influence for various quantities of hydrated lime (10, 20 and 30% in relation to cement amount) added to mortars on their basic technical parameters and microstructure defined with mercury porosimetry method. Microscopic tests were performed according to the Polish standards. They include evaluation of permeability, compression and flexural strength. During the microstructure tests the cumulative curve of pore volume in relation to their diameters was obtained. On its base the percentage contents of mezzo- and macro-pores was defined depending on type of mortar sample types. It was found that lime addition essentially influences technical parameters obtained.

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MICROSTRUCTURAL ANALYSIS OF INTERNAL SULPHATE DAMAGE IN MICROWAVE CURED NANO AL_2O_3 REINFORCED WHITE CEMENT

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ABSTRACT

Two types of sulphate attack occur in concrete as external sulphate attack (ESA) and internal sulphate attack (ISA). The main difference between these two attacks is the location of the sulphate source. ISA damages the Portland cement matrix by means of sulphates in the concrete mix (such as a high percentage of SO_3 in the cement used, aggregates which contains sulphate or sulphide minerals). Another internal sulphate attack that occurs in concrete is the delayed ettringite formation (DEF). The curing of concrete products at elevated temperatures causes the formation of DEF and allows the mono sulfoaluminate (Afm) phase convert to the trisulphoaluminate (Aft) phase. DEF usually occurs as a result of improper curing of the concrete at temperatures exceeding 65°C. This type of damage generally occurs in prefabricated concrete elements (steam cure or autoclave cure). Curing methods applied in prefabrication are aimed to increase early age strength of concrete and shorten the duration of formwork striking. Nowadays, alternative curing methods are being investigated to be able to increase the strength development and shorten the process. Microwave curing technique can be stated as one of these methods. High-frequency electromagnetic heating technique, which is reinforced with microwaves, reduces heterogeneity in the curing process due to its superior depth of penetration. Microwave energy produces heat quickly in the concrete texture. The released heat energy gives a positive contribution to the early age pressure strength of the concrete. In this study, microstructure will be investigated in order to analyse internal sulphate damage in white cement pastes that is reinforced with nano Al_2O_3. As white cement is generally preferred in the production of architectural concrete, 52,5 R type white cement is used in the scope of the tests in this study. Nano Al_2O_3 will be placed in cement paste at %0, %5 ratios in the tests. 3 different methods will be used for microwave curing as 120 minutes 100 Watt application, 75 minutes 100 Watt-30 minutes 150 Watt-15 minutes 200 Watt application, and 90 minutes 100 Watt-15 minutes 150 Watt-15 minutes 200 Watt application. Na_2SO_4 will be added to cement paste at 2%, 5% ratios in order to accelerate the formation of DEF damage. The w/c ratios of the cement pastes will be kept constant at the value of 0.50. Three different microwave curing methods will be used and the occurrence of DEF damage will be investigated in nano architectural concretes that are reinforced with Al_2O_3. For this purpose, SEM-EDS analyzes will be carried out on the pastes produced. It is envisaged that the results of this study will be a guide to prevent the occurrence of DEF damage in architectural concrete.

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MECHANICAL PROPERTIES OF SOIL-CEMENT COMPOSITES MADE WITH COHESIVE OR NON-COHESIVE SOIL

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ABSTRACT

The paper deals with mechanical and technological tests results of soil-cement composites made with cohesive or non-cohesive soil. The compositions of analysed soil-cement mixtures were diversified in terms of cement paste volume fraction and water-cement ratio. The limiting values of these technological properties, which enable the application of received soil-cement mixtures in real conditions for Deep Soil Mixing i.e. DSM method, were determined. Based on the obtained test results, one could find that mechanical properties of analysed materials were very sensitive to the changes in their compositions. The volume fraction of cement paste in the analysed range causes changes in mechanical properties even by the order of magnitude.

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INITIAL RESEARCH ON MECHANICAL RESPONSE OF UNBOUND GRANULAR MATERIALS UNDER STATIC LOAD WITH VARIOUS MOISTURE CONTENT

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ABSTRACT

Every civil engineering construction, including also linear infrastructure, can work properly only when having a solid foundation. This function is complied with subsoil characterized by high bearing capacity and its retention in detrimental conditions such as variations of moisture content or influence of low temperatures. In road engineering similar role is performed by base and sub-base layers which are often made of unbound materials. Cohesive and non-cohesive soils as well as unbound materials used in lower road pavement construction layers show significant sensitivity to alterations of moisture content. Susceptibility to changing moisture conditions can be observed in variations of mechanical properties of cohesive or non-cohesive medium which describe material's behavior under applied load. Observation of parameters such as internal friction angle (ϕ), cohesion (c) and modulus of elasticity (E) allows to notice clear connection between mechanical parameters of granular material and changeable moisture content. In this article authors presented the results of initial laboratory tests consisting of trial loadings of non-cohesive granular medium with different graining and moisture content and a numerical analysis of the problem. Research program was divided into three parts: materials testing, trial loadings of non-cohesive soils - medium sand and dolomite executed on a special laboratory test stand and a back calculation analysis using finite element method (FEM). Firstly both materials were recognized by obtaining grain composition to form graining curve, optimum moisture content and dry density in Proctor apparatus and values of internal friction angles and cohesion. Trial loadings were performed in small scale in test cylinder using static load transferred to a steel plate with a diameter of 10 cm. Diameter of the loading plate was chosen in accordance to model similarity principles. Attained vertical displacements were used to execute the back calculation analysis of granular layers for which parameters of Coulomb-Mohr model were obtained using finite element method (FEM). The results shown in this article are the part of wider research program in which main aim is to evaluate the influence of variable moisture content of materials used in road pavement structures on their fatigue life and costs of maintenance in full life cycle of pavement structure (LCA – Life-cycle Assessment).

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APPLICATION OF THE ACOUSTIC EMISSION METHOD IN THE ASSESSMENT OF THE TECHNICAL CONDITION OF STEEL STRUCTURES

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ABSTRACT

In accordance with applicable international regulations, construction products and elements should have appropriate physical and strength features to meet the required limit states of load-bearing capacity and serviceability in the construction objects designed by them throughout their entire lifetime. The non-destructive methods should be used to assess physical and strength features at various stages of implementation and operation. The complexity of security problems, reliability and durability in the conditions of use of modern building structures therefore requires the development and improvement of specialized research methods. Diagnostics and assessment of building objects requires the use of optimal "in situ" research methods that allow for the assessment of the boundary states of buildings with sufficient accuracy over the entire lifetime. The article presents application the acoustic emission signal (AE) in the diagnosis of technical facilities. The equipment used for signal acquisition is described. An example area of application of the AE method in technology is presented - monitoring of the technical condition of steel structures. Recording and analyzing the AE signal proved to be an effective tool in the diagnosis of this type of construction.

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ASSESSMENT OF DESTRUCTION PROCESSES IN FIBER-CEMENT COMPOSITES USING THE ACOUSTIC EMISSION METHOD AND WAVELET ANALYSIS

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ABSTRACT

In recent years, there has been a growing interest in fibre-cement boards as a finishing material for facades, internal walls and roofs. These panels, used in construction for over one hundred years, are made of natural ingredients such as cement, cellulose fibres and polyvinyl alcohol fibres (PVA), water and mineral fillers. It should be emphasized that due to the method of use, these elements carry loads of significant value as a result of wind pressure and suction. In addition, the boards are exposed to long-lasting atmospheric conditions such as rainfall, significant temperature fluctuations. The threatening factors also include the possibility of exceptional conditions, including fire. Long-term exposure to various types of conditions results in a significant reduction of the material's durability after only a few years of use. In connection with the above, it is considered that it is recommended to conduct research to assess the state of fibrous - cement elements exposed to the conditions for which they will be exposed during operation. The article presents the possibility of using the acoustic emission method (AE) and time-frequency analysis as tools for monitoring the state of cement-fibre boards. Three-point bending tests were carried out on air and dry samples and soaked for 1 h and 24 h. Acoustic emission signals were acquired during the tests. The obtained results allowed to follow the mechanisms of destroying the examined elements and to observe the influence of the conditions and their duration on changing the way of destroying the elements.

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COMPARISON OF EFFICIENCY OF ACCELERATING ADMIXTURES FOR CONCRETE USING MULTIPLE-CRITERIA DECISION ANALYSIS (MCDA)

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ABSTRACT

A lot of different types of accelerating admixtures for concrete are used nowadays. The aim of this paper is to determine efficiency relations between several accelerating admixtures for concrete with usage of multiple-criteria decision analysis (MCDA). Tests of cements' initial setting time, consistency and compressive strength of mortars were made. Tests of cements and fresh mortars were conducted in temperature 8°C and 20°C. Compressive strength were tested after 12, 24, 48 hours and 7, 28 days of curing. Specimens for those tests were cured in temperature 8°C in water and 20°C in climatic chamber with relative humidity 60%. Mortars were made of Portland cement (CEM I 52,5R), Portland-slag cement (CEM II/B S) and two kinds of blast furnace cement (CEM III/A, CEM III/C). Examined admixtures were based on calcium format, crystal seeds and calcium nitrate. All of them are described as both set and hardening accelerators for concrete. Admixtures were added in maximum dosage allowed by producer. All of admixtures caused decrease of initial setting time and increase of early compressive strength (12-48 hours) with varying degrees. Decrease of 28 days compressive strength was not noted in case of any admixture. In order to determination of efficiency relations the multiple-criteria decision analysis (MCDA) was made for every kind of cement separately. Criteria were defined on the basis of conducted tests and were divided accordingly to environmental conditions. Weights of criteria were evaluated with pair analysis method. Values of tests' results were converted with usage of Neuman-Morgenstern method. Result of analysis is sum of criteria evaluations according to their weights. Accelerating admixture based on crystal seeds in proven to be the most efficient one, while the one based on calcium format is the least efficient of tested admixtures.

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THE RELATIONSHIPS BETWEEN AIR-CONTENT IN FRESH CEMENT PASTE, MORTAR, MIX AND HARDENED CONCRETE ACC. PN-EN 480-1 WITH AIR-ENTRAINING CEM II/B-V

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ABSTRACT

The research results of the relationships between air-volume in air-entrained cement paste, mortar and concrete, all designed according PN-EN 480-1 guidelines are presented in the paper. The cement paste, mortar and concrete, with w/c=0,5 ratio, were prepared using innovate air-entraining cement CEM II/B-V. The air-entraining cement CEM II/B-V was produced using two methods: mixed together with natural or synthetic aerated admixture. The air volume test of the volumetric method was carried out in case of fresh cement paste, mortar and concrete mix. Fresh pastes, mortars and concretes were evaluated in terms of stability of air entrainment and consistency of mortar for 5, 20 and 40 min. The porosity structure parameters, like summarized air-content, specific surface of air voids, air-voids spacing factor and micropores content of hardened concrete, were estimated using computer tomography with a resolution of 2-5 μm. The aim of the research was to determine the dependence between air-content of cement paste, mortar and concrete on the measurement of air-entrainment of cement paste or mortar with the same w/c ratio and type of cement, all designed according to PN-EN 480-1 guidelines. The test results proved that there is a good correlation between the measured air-content of the cement paste, mortar and concrete. Therefore, it is possible to predict the aeration of concrete on the air-entrainment of the mortar. Moreover, the porosity parameters research results indicated, that the air-entrainment of concrete is very stable. The research results indicated that the porosity of hardened concrete meets the European standards for frost-resistant concrete. Research results of influence of air-entraining admixture type proved, that a greater amount of micro pores in concrete is the effect of a synthetic air-entraining admixture. In concrete with synthetic entraining admixtures the air pores have smaller diameters than in concrete with natural air-entraining admixture, which are being transferred into their specific surface. The synthetic admixture is more recommended than the natural one also because of the value of the air-voids spacing factor of concrete.

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KINETIC PARAMETERS OF SMOKE AEROSOLS DURING COMBUSTION OF MODIFIED WOOD

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ABSTRACT

The most dangerous factors of fire are formation of smoke and thermal decomposition toxic products. In case of fire, smoke spreads to evacuation routes. In this case, a person may be disoriented and feel panic. Smoke is an aerosol produced by the thermal decomposition of materials. The study object is the wood, which is widely used in construction. Up to date, the influence of wood species and wood surface layer modifiers on the smoke-forming ability has been studied. The effect of wood surface layer modifiers on the properties of aerosols remains little studied. The objective is to evaluate the effect of the wood surface layer modifiers on the formation and stability of smoke aerosols. In the course of work, the ultimate analysis method was used to assess the modifying effect of selected phosphoric acid esters. It is known that these compounds constitute effective flame retardants and are able to provide biological stability of the wood. Granulometric analysis was additionally performed to evaluate the aerosol's properties. To evaluate the energy characteristics of the modified wood surface, the "neutral drop" method was used. As a result of the studies, a percentage phosphorous content was obtained in the surface layer of the wood before and after thermal decomposition. This data made it possible to conclude that the thermal effect of diethyl phosphite is very effective and stable when it is used as a modifier. Based on the granulometric analysis, the size distribution of solid aerosol particles was obtained. When using the selected modifiers, the maximum particle size of the aerosol is reduced, which in turn reduces the optical density of the smoke. Phosphoric acid esters affect the kinetic parameters of the aerosol, which were obtained on the basis of mathematical calculation. Diethyl phosphite produces the greatest effect on the decrease in the aerosol's stability. The formation of an aerosol having a smaller particle size occurs during thermal decomposition of the modified wood having a thermally stable surface. Therefore, the modification of wood by phosphoric acid esters reduces its propensity to smoke-generating ability, which determines the reduction in death rate of humans in the event of fire.

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RECEARCH OF BIOPROOF MATERIALS AT SUPERFICIAL MODIFICATION OF WOOD

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ABSTRACT

The mechanism and conditions of surface modification of wood by phosphorous-containing and siliceous organic compounds have been studied. Wood has the ability to absorb moisture from the air, and the moisture content of wood produces a significant effect on the physical and mechanical properties of wood. Traditional water-repellent agents of lignocellulosic materials are Organic Silicon Compounds (OSC). Our research is aimed at developing a "soft" silylation technology, in which the degree of chemical modification is negligible, and the content of chemically bound Si amounts to ~ 1%. As silylating agents, alkylhydride siloxanes, alkoxysilanes were used. From alkylhydride siloxanes, polyethylhydride siloxane (PEHS) and polymethylhydride siloxane (PMS) with different n-polymerization degrees were used. Activating hydrophilic additives were ammonium fluoride, potassium fluoride and titanates. The treatment of wood with salts, with the subsequent treatment with OSCs facilitated the penetration of OSCs into the wood while the processes of "soft" silylation proceeded. "Soft" silylation of wood with polyalkylhydride siloxanes proceeds in the presence of catalyst additives, the degree of silylation is low and depends on the nature of the additives. The dependence of distribution of OSCs in the wood on the nature of the additives is evidenced by the method of scanning electron microscopy. Phosphorous-containing organic compounds (FOC) have a high penetrating ability, while completely filling the intercellular structure of the wood. With the sequential impregnation of the wood with FOCs and OSCs, organic silicon compounds enter the intercellular space of the wood, with dense spongy OSC deposits, which in some places completely fill the internal cavities of cellular tubes of the wood. As FOC, for example, a 40% solution of trichloroethylphosphate (TCEP) was used. Decaying of wood over time starts from the surface, since there are no diffusive limitations in the sorption process. Surface modification of wood can increase its durability due to increased biological stability and hydrophobic behavior, which will ensure a long-lasting protection. Long-lasting protection is due to the formation of covalent bonds of wood (cellulose) with a modifier. Wood samples after surface "soft" modification with FOCs and OSCs were tested for hydrophobic behavior and biological stability. The samples were tested in the climate chamber with irrigation of the samples with water in a mode of -30°C to +40°C. To determine the hydrophobic behavior, the limiting wetting angle was determined. The biological stability was determined by the growth of testing cultures of the fungi *Aspergillus, Penicillium, Trihoderma* and some others according to GOST 9.048-89. The amount of the data obtained allows to make a conclusion about the non-durable decrease in water absorption capacity during surface modification of wood with OSCs. Long-lasting biological and water resistance is achieved only in cases when surface application of OSCs is carried out on the pre-phosphorylated wood. Phosphorylation thus leads to the formation of covalent bonds. The compounds developed were successfully used for 10-15 years to preserve the monuments both of wooden architecture and the buildings and structures made of stone, bricks, and concrete.

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USE OF RICE HUSK ASH AS STRENGTH-ENHANCING ADDITIVE IN LIGHTWEIGHT CEMENTITIOUS COMPOSITE MORTAR

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ABSTRACT

This paper investigates the properties of rice husk ash (RHA) produced by using a ferro-cement furnace. The effect of RHA percentage on lightweight composite mortar consistency, initial and final setting time, plastic and dry set density, flexural and compressive strength were investigated. Incorporation of RHA in lightweight mortar increased water demand. The effect of early (7 and 14 days) and long term curing ages (90 and 120 days) on the mechanical strength properties of lightweight composite mortars with RHA were also analysed. Mortar samples show strength reduction of 10.6% and 8.57% compared to the control mix at early curing ages of 7 and 14 days, respectively. RHA mortar gave excellent improvement in strength for 20% replacement (18.85% and 21.69% increment compared to the control mix at long term curing of 90 and 120 days), and up to 25% of cement by weight be valuably replaced with RHA without adversely affecting the strength. Increasing replacement ratio of RHA enhanced the strength of blended mortar compared to low utilization ratio of RHA and control OPC mixtures.

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IMPACT OF ENVIRONMENT CONDITIONS ON THE DEGRADATION PROCESS OF SELECTED REINFORCED CONCRETE ELEMENTS

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ABSTRACT

The environment negative impact on concrete can lead to deterioration its properties and the same to durability reduction of reinforced concrete structures. The main reasons of reinforced concrete elements destruction are carbonation of concrete, chemical corrosion, frost as well as mechanical defects that can damage the concrete cover and initiate the corrosion process on reinforcement. The intensity of destructive processes is closely linked with the intensity of environment factors action. Therefore, it can be assumed that the impact of CO2, humidity changes and temperature will be much bigger in case of outdoor elements than the interior elements. The paper presents result of experimental test that was carried out on two kinds of reinforced concrete columns: outdoor power pylons and columns of frame construction in the public utility building. The examined elements were exploited on the same location in the same time – fifty years, but in different environment conditions. The semi-nondestructive electrochemical method was used to measure of reinforcement corrosion intensity in both kinds of columns. The results allowed to evaluate the corrosion activity of reinforced rods and to predict the corrosion progress in time. At the same time the samples of cover concrete were taken from the columns to carry out the phase composition by X-ray diffraction and thermal analysis. The results allowed to assess the effect of environment conditions on the degree of destruction two kinds of reinforced concrete columns. The electrochemical test showed differences of the reinforcement corrosion activity as well as the research of concrete samples, however the differences were not so significant as should be suppose.

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IMPACT OF SELECTED ENVIRONMENT CONDITIONS ON THE SHRINKAGE STRAINS IN RESPECT TO STANDARD RECOMMENDATIONS

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ABSTRACT

The article discusses the issues related to concrete shrinkage. The basic information on the phenomenon is presented as well as the factors that determine the shrinkage are described. Under laboratory conditions, these factors can be imposed and controlled, but in the field it is not possible to maintain stable environmental conditions. The paper describes the experimental research that allows to determine the effect of changes of humidity and ambient temperature on the values of shrinkage strains in concrete samples and verify the obtained results based on the theoretical model included in the Eurocode 2 standard. The shrinkage strains were measured on samples with dimensions 150x150x600 mm, made of C30/37 concrete with Portland cement and limestone aggregate and with water/cement ratio of 0.43. The samples were divided into two groups - the first group of samples was stored in a chamber with set and controlled values of temperature and humidity, and the second group was left in the laboratory hall with freely changing environmental conditions. The shrinkage strains were measured on samples in accordance with the ITB 194/98 for 175 days. A 20 cm base extensometer was used for the strain measurements. The studies of experimental results of the concrete shrinkage strain are presented with a comparative analysis of the results estimated by the guidelines of the standard according to PN-EN 1992-1-1:2008. The obtained results confirmed that the unstable humidity as well as temperature have a significant impact on the course of shrinkage strains in concrete and they both should be taken into consideration during performing concrete elements.

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THE IMPACT OF MIXTURE – PROPORTIONING OF HIGH – PERFORMANCE CEMENTITIOUS – LIMESTONE COMPOSITES ON COMPRESSIVE STRENGTH

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ABSTRACT

The focus of this work is on comparing the compression strength of the cementitious - limestone composite samples made according to different recipes. The study includes the results of own experimental research of the high performance cementitious - limestone composites as well as an analytical calculations of the mixture proportioning and designed compressive strength. Mixture proportioning based on the formulas of Funk and Dinger was determined. In the following step compressive strength based on the modified formulas Larrard was designed. Three test samples with dimensions of 100 x 100 x 100 mm were made for each recipe B1, B2 and B3. Informations on the curing of research samples, cement, microsilica, limestone powder and limestone sand was presented. On the basis of experimental results after curing 7 days with using the amount of superplasticizer, the following section of the paper presents results after 28 days. Then a reference sample for the comparative analysis of the mixture proportioning was made and marked as B4. Based on the reference sample, samples with removed fractions (B5 < 0,063mm; B6 < 0,063mm and 0,063-0,125mm) were made. The last sample marked B7 with a different amount of cement in relation to samples B6 was made. Results of compressive strength for samples B1-B7 was compared. Direct measurements allowed us to observe that B1 - B3 samples with different amounts of superplasticizer have compressive strengths differing by up to 3% both after 7 and 28 days. Samples marked B5 and B6 shown increased compressive strength by 6 and 12%, respectively in relation to the sample B4. The sample B7. The results demonstrated that sample B7 indicates reduced compressive strength in comparison to sample B6. The results of the experiments have been collected in tables and shown in graphs.

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DESIGNING OF MIXTURE – PROPORTIONING OF THE HIGH – PERFORMANCE CEMENTITIOUS – LIMESTONE COMPOSITES

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ABSTRACT

The paper presents the results of a comparative analysis of the compressive strength of a cement-lime composite with very high strengths compared to the results of predicted strength according to the Larrard formula and its modified versions. The study includes the results of own experimental research of the high performance cementitious - limestone composites as well as an analytical calculations of the mixture proportioning and designed compressive strength. Mixture proportioning based on the formulas of Funk and Dinger was determined. In the following step compressive strength based on the Larrard formula and its modified versions: a) Franczyk and Pokropski, b) Larrard, Gorse and Puch, c) Siwiński and Stolarski d) Glinicki, Kasperkiewicz and Potrzebowski. Three test samples with dimensions of 100 x 100 x 100 mm were made for each recipe G1, G2, G3 and G4. Informations on the curing of research samples, cement, microsilica, limestone powder and limestone sand was presented. On the basis of experimental results after 28 days curing with using the amount of superplasticizer, the following section of the paper presents results analytical analysis. Results of compressive strength for samples G1-G4 was compared. The results of the designed compressive strength with the conversion results of 150 150 150mm were compared. Direct measurements allowed us to observe that G1 – G4 samples with different amounts of superplasticizer have compressive strengths differing by up to 22% after 28 days of curing. The results of the experiments have been collected in tables and shown in graphs. The study includes the results of own experimental research as well as data from other authors.

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DAMAGING MINERAL TRANSFORMATION OF GREYWACKE AGGREGATE IN SMA 11 AND AC 11 WEARING COURSES USED IN A1 MOTORWAY PAVEMENT IN SILESIA POLAND

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ABSTRACT

The paper covers the issues of mineral transformations in the natural aggregate made of greywacke rock used in A1 Motorway asphalt wearing courses under hypergenic conditions, typical for pavements. The results of these transformations have an appearance of rusty efflorescences on surfaces, which denote destruction process of some grains of the aggregate. This process can next initiate local damage to the wearing course. The research was focused on the experimental tests and mineralogical studies aimed at greywacke grains isolated from A1 Motorway pavement. Experimental tests in laboratory conditions allowed to simulate the process leading to arising of the efflorescences, which finally adopted an evaporite form. Precipitates recreated in laboratory conditions, acquired for mineralogical research, were similarly coloured to those observed on the pavements. Mineralogical studies – performed using optical microscopy and a scanning electron microscope (SEM), for grains which were the sources of rusty efflorescences and the received precipitates – allowed to identify minerals involved in the transformations (primary minerals) and the minerals subsequently produced (secondary minerals). The most important primary mineral involved in the process leading to arising of efflorescences was pyrite, while the most important secondary minerals were gypsum, halotrichite and copiapite. What was noticed was that mechanism of mineral transformations leading to creation of hydrated sulphates on the surface and in the pores of the grains can be accompanied by the exudation process. The work is closed by short description of the proposal procedure according to PN-EN 1744-1 method modified for pavements applications, which allows to predict the tendency of natural aggregates to the mineral transformations. The modification involves activation of aggregate susceptible to mineral transformation using different than standard lime water factor which can imitate accurately hypergenic conditions typical for pavements.

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THE STABILITY OF THICK-WALLED ELASTIC ANISOTROPIC THREE-DIMENSIONAL CYLINDRICAL SHELLS UNDER AXIAL PRESSURE LOAD

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ABSTRACT

The possibilities of creating, for instance, optimal multilayer composite structures and their use in aviation and space industries, mechanical engineering, etc., when using fibrous reinforced materials in layered composite cylindrical shells, are considerably expanded. The effectiveness of the introduction of thin-walled layered structures made of advanced composite materials greatly depends on the experimental and theoretical study of issues related to determining the bearing capacity of such structures. It is known that its exhaustion is often associated with the stability loss. Analyzing the latest achievements in mechanics of thin-walled structures, we can assert, that there is a large number of directions to study the stability of composite shell structures. One of them is thoroughly analyzed in the monograph (Bazhenov et al., 2010) that deals with the methods of calculation within the geometrically nonlinear and Kirchhoff-Love plate theory, and results of study of thin-walled anisotropic shells stability of zero, positive and negative Gaussian curvatures made of composite materials with one plane of elastic symmetry. However, there are a lot of unsolved problems regarding the stability of thick-walled anisotropic shells. It is generally well known that refined higher-order theories to calculate the stability of thick-walled anisotropic shells should be applied. The paper presents an approach to calculate the stability of thick-walled anisotropic cylindrical shells using the refined Timoshenko beam theory. The above-mentioned constructions are made of materials having one plane of elastic symmetry. Parameters for a nonlinear subcritical stress-strain state of the shell are established by using a system of ordinary non-uniform differential equations, taking into account the conditions of its fixation. The problem of static stability of symmetrically loaded cylindrical shells involves the system of ten homogeneous differential equations in the normal Cauchy form and homogeneous boundary conditions. The methods of the considered boundary value problems solutions are based on a numerical discrete orthogonalization method implemented in a software packages for PC. The obtained results of stability calculations were confirmed by comparing the received critical loads with numerical calculations according to the method (Bazhenov et al., 2010) and theoretical solutions and experimental data of the other authors (Bazhenov et al., 2010). The problem of calculating the stability of a three-layer hinged cylindrical shell made of boron fiber reinforced plastic with the bearing of different thickness h under axial pressure load is analyzed in order to present the possibilities of the proposed method. Influences of layers' thicknesses increase and change of angle of fibrous composite stacking on magnitude of critical values of axial compression are investigated. The calculations on the stability of cylindrical anisotropic shells allowed to formulate the following: the increase in the relative thickness of the bearing layers of a cylindrical three-layer anisotropic shell with $h/R = 0,01$ up to $h/R = 0,2$ causes the difference between the values of the critical axial pressure loads that reaches 103%, where R is the radius of its median surface.

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SPATIAL PREFABRICATION IN TIMBER STRUCTURES

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ABSTRACT

The term “timber structures” is considered to mean buildings whose horizontal and vertical structures are fabricated from wood-based elements. With timber structures, prefabrication can take the form of planar prefabrication, spatial prefabrication, or a combination of the two. Planar prefabricated sections are delivered to the construction site in the form of variously completed panels. These are used as vertical and horizontal supporting structures, as well as inclined supporting structures (sloping roofs). In comparison with planar prefabrication, spatial prefabrication represents a higher level of sophistication. Spatial prefabricated units mainly consist of panel elements that are connected to form completed functional units. The creation of the resultant rooms as 3D units (3D prefabricated sections) in a factory allows them to be delivered to the construction site in as complete a state as possible, meaning that surface finishes and fixtures are already in place. Planar prefabrication using structural insulated panels (SIPs) enables the production of large-format panels with prepared openings for windows and doors. The advantage of the system is that buildings can be assembled quickly at the construction site. In contrast, spatial prefabrication means a significant increase in effectiveness through the use of building units that are assembled at a manufacturing plant before being transported to the building site and added to the structure under construction. These 3D sections have usually already been provided with their final surface finish and fittings at the factory, so all that is required at the construction site is for such units to be incorporated into the rest of the building. The amount of onsite finishing work is eliminated to a maximum degree and transferred to the production plant, where it must be carried out using certified materials and procedures while respecting the requirements of SIP technology. It is undeniable that timber structures are used for a large proportion of constructed low-energy and passive houses. For this reason, efforts should be also be made to maximise the use of these types of timber structures in combination with the highest possible degree of prefabrication in the construction of apartment buildings. Such use brings considerable savings as regards the life cycle of buildings and the lowering of ecological load during the production of building materials as well as the construction process itself.

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EXPERIMENTAL STUDY ON THE USE OF GRANITE AS FINE AGGREGATE IN VERY-HIGH-STRENGTH CONCRETE

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ABSTRACT

The aim of the study is to assess the usefulness of using granite aggregate to make very-high-strength concrete. The paper presents a comparative analysis of the results that are obtained for three types of concrete mixtures. The main components of the analysed concretes are sand or granite aggregates and cement CEM I 52,5 with the addition of microsilica and fly ash. The first, basic concrete mixture is made using sand as aggregate. The main assumption for the basic concrete mixture is to obtain a compressive strength of not less than 100 MPa in normal conditions of curing in water. Furthermore, using the aggregate fractions up to 2 mm and the semi-liquid consistency (i.e. ≥S3) of the concrete mixture are assumed. The second concrete mixture contains granite aggregate added in the same proportion as sand in the basic mixture. While in the third concrete mixture, the granite aggregate is used taking into account density factor. Laboratory tests are carried out in range of compressive and flexural strength of concrete. Furthermore, the investigations of the concrete mixtures consistency and the water absorption by the hardened concrete are presented in the paper. Comparative analysis of the obtained results indicates that the exchange of sand to granite aggregate improves the compressive and flexural strength of concrete. Compressive strength of concrete based on granite aggregate is 10% higher than that of concrete based on sand. The test results indicate that both concrete made of sand and concrete made of granite aggregate can be qualified as very-high-strength.

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EFFECT OF BASALT AGGREGATE ON PROPERTIES OF ULTRA-HIGH-STRENGTH CONCRETE

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ABSTRACT

In this paper, an analysis of the properties of concrete made on the basis of sand and basalt aggregates are presented. The aim of the study is the examination how application of basalt aggregate influences on concrete strength. Researches are carried out for three types of the concrete mixtures made using sand and basalt aggregates. For preparing of the concrete mixtures are using cement CEM I 52,5 with additive of microsilica and fly ash. The basic concrete mixture contains sand as aggregate. The main assumption for the basic concrete mixture is to obtain a compressive strength of not less than 100 MPa in normal conditions of curing in water. In addition, a semi-liquid consistency (i.e. ≥S3) of the concrete mixture and the use of an aggregates fraction up to 2 mm is assumed. Two other concrete mixtures contain basalt aggregate added in the same proportion as sand in the basic mixture and taking into account the aggregate density factor. Laboratory tests of the concrete specimens are carried out in range of the compressive strength and flexural strength. Moreover, the investigations of consistency of concrete mixtures and water absorption by the hardened concrete are carried out. Comparative analysis of the obtained results indicates a significant improvement of the compressive and flexural strength of concrete after application of basalt aggregates. Compressive strength of concrete based on basalt aggregate is 29% higher than that of concrete based on sand. Concrete made using sand is qualified as high-strength concrete while after converting sand to basalt aggregate it can be classified as ultra-high-strength concrete.

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USE OF CONTAMINATED SAND BLASTING GRIT FOR PRODUCTION OF CEMENT MORTARS

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ABSTRACT

The influence of the industrial waste on the surrounding environment is under surveillance of scholars from many years. Various industrial wastes that need to be stored and disposed of can contaminate water and soil. One on the industrial wastes that has to be disposed is the sand blasting grit or sand blasting residue. Sand blasting is a process of removing outer layers, paint or rust from steel elements such as bridge lattice or warehouse frames. Safe disposal of waste products is costly and time consuming. The study analyses the suitability of contaminated sand blasting grit for production of cement mortars. The waste material was acquired from a local company. The waste material was used as a non-reactive aggregate. The study focuses on the influence of the amount of the waste material on the rheological and strength properties of produced mortars. The sand blasting grit was added as a partial or full replacement of natural sand. Results of performed tests show potential possibility of using the contaminated sand blasting grit for production of mortars. However, increase in the overall amount of waste product in the mortars was followed by decrease of the strength. The addition of the grit also decreased the flowability of the mortar. Use of contaminated sand blasting grit for production of mortars allows to reduce the high costs of waste disposal and storage.

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STRESS ANALYSIS OF SLABS REINFORCED WITH GFRP REBAR

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ABSTRACT

Designed constructions must meet certain level of safety and durability. The should also be designed in accordance to Ultimate Limit State and Serviceability Limit State with respect to profitability for the contractor. During designing stage of reinforced concrete it is important to remember that the values in static and strength calculations are assumed as ideal. In reality, material properties of steel and particularly concrete are biased with certain degree of random. Modern technologies allow to utilize construction materials with strictly determined deformation and mechanical parameters. Significant development of concrete technology in recent years poses new challenges. In the study authors used Glass Fiber Reinforced Polymer rebar as a replacement for standard steel rebar. The article presents the results of the destruction tests of concrete slabs reinforced with steel and GFRP rebar. The tests were performed on 14 slabs with length-to-width ratio of 4. The thickness of slabs ranged from 6 to 10 cm. In nine slabs authors replaced the standard rebar with GFRP rebar. The tests involved stress analysis in rebar and concrete. The secondary goal was to determine the bearing capacity and deflection of slabs and asses the cracking of the sections during load application. Composite rebar has many advantages over standard rebar. However, due to relatively low elasticity modulus in comparison to steel, the slabs exhibit excessive deflection and cracking of bended elements.

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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 % MFA was put in and mixed with water up to normal thickness paste. Research results showed that by changing the cement part with micro-fillers W/C ratio rises, normal thickness cement paste 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% MFA) 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 38-42%, bending strength is lower 15 %) when comparing with mixture made using natural fillers.

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EVALUATING THE EFFECT OF MIX DESIGN PARAMETERS AND COMPACTION ON THE PROPERTIES OF PERVIOUS CONCRETE MIXES FOR ENVIRONMENT-FRIENDLY ROAD PAVEMENTS: A STATISTICAL APPROACH

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ABSTRACT

Pervious concrete is an innovative cementitious material that permits water to percolate through its rigid matrix. Its permeability is consequence of a network of interconnected macroscopic pores, which is obtained by substantially reducing the finer aggregates content and using lower water to cement ratios. This material is quite appreciated by the several environmental benefits derived from its perviousness, such as reducing storm water runoff, enabling the natural recharge of groundwater reservoirs, filtering contaminants in water, and increasing roads safety by removing the standing water that could lessen their skid resistance, among others. Despite the promising environmental advantages of this material, there is no standardized, widely accepted mix design guidelines. The current study aims at systematically investigating the effect of water proportion, cement amount and compaction energy on the strength and volumetric properties of pervious concrete mixtures. The influence of these variables were statistically analyzed, and modeled through robust regressions in order to develop a primal procedure to adequately proportioning pervious concrete mixtures to reach an optimal balance between structural performance and hydrological characteristics for different solicitations. Due to the scarcity of laboratory testing standards especially intended for pervious concrete, indirect tensile strength, total porosity and elastic modulus were evaluated in compliance with EN standards for bituminous mixtures. ITS and porosity investigation was designed as a three-level full factorial experiment, and elastic modulus was briefer analyzed through a two-level experiment. Outcomes from the Analyses of Variance showed that all three studied factors contribute significantly to variability of both ITS and porosity, being cement to aggregate ratio and compaction energy level the most influential. The resulting models from the robust regressions had fair-to-good coefficients of determination; models were used to generate contour graphs of various properties that plotted simultaneously in order to develop user-friendly mix proportioning schemes that can be used visual optimization.

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PERFORMANCE AND APPLICATIONS OF PERVIOUS CONCRETE PAVEMENT MATERIAL AS AN OVERLAY ON EXISTENT CONCRETE SLABS

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ABSTRACT

Portland cement pervious concrete (PCPC) is a quite innovative type of concrete that has woken up the interest of the academy and construction field due to its economic, social and environmental advantages. PCPC is composed by coarse aggregates, little or no fine aggregates, a reduced water/cement ratio and additives. In consequence to its lack of fine aggregates, PCPC has high porosity and lower strength in comparison with traditional concrete, thus its main applications are in low traffic areas such as parking lots, sidewalks, residential streets, path in natural areas. Within its benefits stand out the simplification of drain system, the management of storm water runoff and the reduction of pavement infrastructure costs. Pervious concrete pavement is worldwide recognized for its environmental benefits; the use of pervious concrete for urban pavements produce a reduction of traffic noise, as well as the water and soil pollution, it allows the natural recharge of the groundwater and helps in limiting the heat island effect, due to its clear surface and permitting the soil transpiration. IN the very few years a new application of this material has been implemented: pervious concrete layer as an overlay over existing concrete slab. The resulting pavement structure can be used for high traffic volume roads, thanks to the support of the stiff concrete slab, with the addition of the benefits of the optimal pervious concrete surface characteristics. In the present investigation work, design methodologies, construction techniques, laboratory measurements and long term evaluations of this innovative material are presented. Pervious concrete has proven to have a broad scope and a promising future for the research of eco-friendly materials for the construction of pavements throughout the world. In conclusion, the case of study of the application of a pervious concrete overlay in an airport infrastructure is presented. In particular, the pavement structural behaviour was studied and verified for determining the suitability for solving drainage problems in an aircraft parking lot.

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SEMI-FLEXIBLE MATERIAL: A SOLUTION FOR HIGH-PERFORMANCE PAVEMENT INFRASTRUCTURES

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ABSTRACT

Asphalt pavement technology has been widely adopted due its good mechanical performance, its excellent surface properties, the ease of construction and driving comfort. Nevertheless, asphalt pavements, commonly also known as “flexible pavements” have demonstrated to present high moisture susceptibility, low resistance to several chemical agents and poor long term performance. Moreover, both high and low temperatures can produce different damages in flexible pavement such as rutting and cracking. On the other hand, rigid pavements have been losing popularity mainly due to the presence of transversal joints, required to consider the expansion of concrete slabs, that produce a reduction of user-confort and safety. In addition, Concrete pavement need longer construction procedure and a curing time before opening to traffic. Hence, a new technology has been developed in the last years in order to gather the essential properties that characterize rigid and flexible pavements. This technology, usually called semi-flexible pavements, or grouted macadams, consist in producing a highly open porous asphalt mix (voids around 25-30%) and filling the voids with selected cementous grout. Thus, the ease and speed of construction of flexible pavement, joint with the optimal surface properties is combined with the concrete good mechanical behaviour, resistance to chemical agents and limited temperature susceptibility. The final product is a high performance pavement material, particularly indicated to high traffic volume roads, airports, ports, and industrial areas. However, the fact that this type of pavement is still innovative, compared to rigid and flexible pavement, has made that there is no standard procedure to produce this type of mixture. For this reason, the characteristics of the mixtures vary with authors and in the different real scale applications. In this manner, this paper aims at studying the most significant advances in the area of semi-flexible pavements, describing, comparing and statistically analysing the different investigation and practical experiences. Mix-design details, i.e., asphalt binder characteristics, aggregate properties and cementitious grout composition are deeply investigated, as well as mixing and compacting procedures, lab testing and real application performance of this innovative and promising pavement material.

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CORROSION BEHAVIOR OF GALVANIZED STEEL SUBJECT TO ATMOSPHERIC CORROSION IN AN INDUSTRIAL-MARINE AREA

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ABSTRACT

Galvanized steel has greatly contributed to improve the corrosion resistance of steel under atmospheric corrosion with an increase in the lifetime for steel products usually used in the construction industry. The corrosion rate of galvanized steel under certain environments is of significant interest to determine the adequate coating thickness, as well as the frequency of maintenance or any protective measures for the extension of the useful life of galvanized steel. This investigation aims to evaluate the corrosion behavior of galvanized steel from continuous hot dipped process subject to atmospheric corrosion in an industrial-marine area in Barranquilla-Colombia in order to characterize the aggressiveness of the environment. Experiments includes exposure racks with galvanized steel sheets of four different coating weights (90 g/m^2, 120 g/m^2, 180 g/m^2, 275 g/m$^{2)}$. Samples were first characterized to verify coating thickness, chemical composition (%Fe) and then were analyzed each month during a year of exposure in the racks to measure weight loss and white rust formation. The corrosion rate of galvanized steel under this environment was evaluated and used to determine the corrosivity of the test site. Results indicate that the highest corrosion rate was found for the Z120 specimens corresponding to 0.56 µm / y, and then for the Z275, Z90 and Z180, with corrosion rate values of 0.3548, 0.3490 and 0.3463 µm / y respectively. All group of specimens with a high percentage of thickness loss at the beginning of the test, and then the values tends to decrease slightly over time. White rust was observed on the specimens after 864 hours of exposure and continues growing on the surface of the galvanized steel sheet over the exposure time. According to the classification by ISO 9223, the corrosivity of the site can be established between C2 and C3.

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CORRELATIONS BETWEEN THE PROPERTIES OF THE BITUMEN AND ASPHALT CONCRETE PERFORMANCE IN WATER AND FROST SUSCEPTIBILITY TESTS

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ABSTRACT

The ongoing advances in testing equipment and the use of statistical methods enabled that on the basis of preliminary studies the service performance of road construction materials can be foreseen. Such a possibility is highly desired as in the future it may reduce the amount of resources spent on testing and design. Therefore the article presents the results of a study where the basic parameters of Fischer Tropsch (F-T) synthetic wax modified asphalt, including: penetration, softening point and Fraass breaking point, were tested for correlations with the performance in resistance to water and frost tests of asphalt concrete. A 35/50 road paving bitumen was selected for the study, which was then modified with a viscosity modifying agent (F-T) in an amounts of 1.0%, 1.5%, 2.0% and 2.5% per bitumen mass. After the bitumen testing, the next stage of the research was to design and fabricate the asphalt concrete mix and determine its resistance to water and frost. An important factor was the fact that the mix was produced in a „half-warm" process using foamed bitumen modified with the synthetic F-T wax. For deeper analysis of the amount of the binder in the mixture, concentrations from 4.2% to 5.1% in steps of 0.3%. were considered The final stage of the experiment was to assess the degree of correlation between the parameters of bitumen and the resistance to water and frost of the asphalt concrete mix.

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BEARING CAPACITY OF ASPHALT MIXTURES PRODUCED IN LOWERED TEMPERATURES

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ABSTRACT

The paper showcases the performance of asphalt concrete mixtures produced in “half-warm” technology for binder course with F-T wax modified foamed bitumen. The mixtures were based on limestone mineral mix with bitumen contents ranging from 4.2% to 5.1%. The bitumen was modified with F-T wax in amounts varying from 1.0% to 2.5%. Both physical and mechanical properties of the mixes were established, including: air void content (Vm), indirect tensile strength in dry state and after conditioning in water (ITSdry, ITSwet), indirect tensile strength ratio (ITSR), wheel tracking in air – wheel tracking slope (WTSAIR), indirect tensile stiffness modulus at 20°C (ITSM). The performed tests allowed to compare two techniques of producing asphalt concrete mixes: the commonly practiced “hot mix” asphalt and “half-warm” mix asphalt. Using the mechanistic-empirical design approach, it was possible to demonstrate that the F-T wax modification of bituminous binder allows for a decrease in asphalt layers thickness without sacrificing the pavement fatigue life. On the other hand, the fatigue life of pavements could be significantly increased if the typical layer thicknesses were maintained, leading to decreased maintenance and repair work costs. This leads to significant economic and environmental benefits due to decreased emissions and energy consumption.

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ASSEMBLY OF CERAMIC TILES ON GYPSUM SURFACES

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ABSTRACT

Ceramic claddings in the buildings are often tiled on gypsum surfaces, which mainly consist of plasters made of ready dry mixes and walls made of gypsum blocks. Plasters and gypsum blocks are usually even, stable and adequately durable substrates for ceramic cladding. However, one should remember about their specific properties, such as absorbency, smoothness and lack of chemical bonding with cement based adhesive mortars. This paper discusses the subject of assembly of ceramic claddings on such substrates and shows examples of damages caused by executive errors. The first part of the paper describes methods of preparing the surface before assembly of ceramic claddings, with particular emphasis on the proper surface priming. The principles of choosing the right mortar for tiling works are also presented. In the second part of the paper examples of manufacturing errors are presented, as a result of which the ceramic claddings become detached from the gypsum surfaces. The results of measurements and observations have been described and the reasons for failure of wall claddings have been given. The cause of first example of tile de-bonding turned out to be improper gypsum surface preparation. Their mounting was carried out on the layer of a weak gypsum finish without priming agent, which was delaminated. In the second case, splitting occurred due to the formation of a large amount of thaumasite ($CaSiO_3 \cdot CaCO_3 \cdot CaSO_4 \cdot 15\ H_2O$) in the contact zone of the cement adhesive with the gypsum substrate. This compound is formed by the reaction of calcium, silicate, carbonate and sulphate ions in an aqueous solution. The conditions conducive to its formation is low temperature (around 5 °C) and high humidity. The thaumasite, which quickly forms, causes the structure of the cement paste to break, which results in damage to the adhesive bridge formed at the interface of the cement and gypsum adhesive. Ceramic tiling on gypsum substrates requires prudent choice of primers and thin-layer adhesive mortars. It is not allowed to use any preparations uncritically, which according to their technical description are intended for gypsum substrates. The actual absorbency of the material and the purpose of priming must be taken into account.

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INFLUENCE OF GLASS COMPONENTS ON THE QUALITY AND STRENGTH OF SILICATE MATERIALS

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ABSTRACT

Glass Compressive strength is the starting point, which is important in the process of researching new or modified building materials. The article contains the characteristics of traditional material (sand-SiO_2, lime-CaO, H_2O-water) and the results of research on modifications of composite silicate materials and the same products with using glass fiber. The paper contains information on modification of this kind of materials using glass fiber, because it is a lightweight and durable component made of boroglinosilicate glass containing less than 1% alkali. This type of fibres is characterized by a good degree of gluing the bundle, and so-called "strand integrity". Glass fibre (WS) cut strips are mainly intended for reinforcing thermoplastics and this fibre can have a good application in silicate composite materials, which arise under hydrothermal conditions (around 200^{o}C). This paper also presents the results of the conducted compression tests, which were focused on: microstructure, compressive strength, water absorption, and bulk density. The Scanning Electron Microscope with spectrum EDS analysis helped to define the microstructural changes of modified materials. The interpretation of the materials structure revealed the existence of diversified phases i.e. tobermorite and C-S-H phase. CaO-SiO_2-H_2O system is the object of intensive research due to its meaning in chemistry and technologies of mineral binding materials. The dimensions and precision of the modified material were also analysed. Silicate products are known for their almost perfect proportions and exact dimensions (+/- 1mm.) Obtained during production. Glass due to its amorphousness in hydrothermal conditions affects the behaviour of the mass in the mold during the autoclaving of the modified material, and glass fibres (WS) spread unevenly in the mass, and this factor should be taken into account especially. The sample with 50% glass fibre (WS) content cracked along its length during the first strength test and fell apart, making the second measurement impossible. Glass fibre content decreased the compressive strength of the final product. These type of fibres acted as a filler not as a modifier.

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MICROSTRUCTURE OF AIR-ENTRAINED CEMENT MORTARS EXPOSED TO SULPHATE ATTACK

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ABSTRACT

The properties of cementitious composites depend mainly on the microstructure of the cement paste. In the context of air-entrained cement mortars, changes in the microstructure resulting from the introduction of air voids are an important issue. Attention should be paid to the formation of the air void shell envelope, as well as the formation of a transition zone between the air void and the cement paste. The consequences of changes in the microstructure of cement paste resulting from the introduction of air are important in the context of sulphate attack. In order to determine changes in the microstructure related to the introduction of air and the place of occurrence of sulphate attack products, investigations of air-entrained microstructure (3 series of mortars with air content: 7%, 10% and 13%) and non-air-entrained cement mortars (1 series) from Portland cement were performed. All series of mortars were treated with a 5% solution of sodium sulphate and a 5% solution of magnesium sulphate. The tests were carried out after 80 weeks of immersion of cement mortars in sulphate solutions. The analysis of the microstructure of the samples was performed using the scanning electron microscope. A spot test of the elemental composition was also used using the EDAX (Energy Dispersive X-ray Analysis). Structural investigations also included phase composition analysis using X-ray diffractometry (XRD). Investigations of the microstructure of air-entrained cement mortars immersed in the solution of sodium sulphate and magnesium sulphate allowed to observe the air void shell around the air pore, which looks like a compact structure with high density. Ettringite needles were observed on the inside of air void shell. In turn, the structure around the air void of the air void-paste interfacial transition zone is more porous. Observations of air entrained mortars also showed that the air pores are partially filled with ettringite crystals. In addition, ettringite crystals were visible, which were embedded in the compact C-S-H phase. In the microstructure of non-air-entrained mortars immersed in two different sulphate solutions, ettringite crystals were also observed, mainly in close proximity to the sample surface. Analysis of the phase composition of air-entrained and non-air-entrained samples showed that as a result of the attack of sulphate attack a significant amount of typical sulphate attack products was formed: ettringite and gypsum.

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MODERN MATERIALS USED IN THE HORIZONTAL ROAD MARKINGS

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ABSTRACT

In the article were presented current problems associated with marking horizontal roadways. The low adhesion of the marking, short lifetime, low visibility are discussed, which in turn leads to a deterioration of road users' road safety. There werepProposed applications of new materials for road markings. There were presented information on horizontal markings on the behavior of autonomous cars.

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SELECTED PROBLEMS OF IMPLEMENTATION OF STANDARDS FOR UNIFIED SYSTEM OF TOUCHING MARKINGS

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ABSTRACT

The Convention on the Rights of Persons with Disabilities which is intended to allow all the persons with disabilities independent functioning and full access to all to all life spheres. The Convention imposes on the state an obligation to ensure all the persons with disabilities on the equality basis access to physical environment, means of transport, information and communication, including ICT technologies and systems, as well as other tools and services, commonly accessible or assured, both in the cities and in the countryside. Having this in mind, together with the voice of the persons with blindness or having greatly reduced vision and taking into account the chaos in the markings in public space that supposed to improve the way the persons with disabilities move, it is necessary to design and implement the adequate standards on the roads and in the streets. In Poland estimated that about 5% of the total country population are persons with disabilities. About 1,8 million of them are people affected by blindness, persons sand-blind or with low vision, who at the same time are active participants of the public space and of the vehicular traffic. However, the lack of any regulated in legal provisions systemic solutions that improve the safety in the vehicular traffic is a serious problem in enabling the persons with poor vision access to the culture goods, as well as free and safe movement. The article presents the design failures, executive errors and an impact of the usage of the unified warning system that is obligatory throughout the country for persons with disabilities for their safety in public space.

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APPLICATION ACTIVE CROSSINGS FOR PEDESTRIANS AS A WAY TO IMPROVE THEIR SAFETY

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ABSTRACT

Pedestrians, as a group of road users, are directly most exposed to contact with vehicles. Mostly in every EU country 50% of accidents occurred with pedestrians is caused by the wrong behaviour of the driver towards the pedestrian. 70 % of these accidents occur directly on the crosswalk and the result of which is more than 200 fatal victims every year. Each self-government strives to eliminate the fatal victims within the area of its region voivodship, municipality or community. Since years the pedestrians have been main victims of the vehicular traffic and most of them losing their lives on the crosswalks, which are supposed to be the safest location to cross across the flow of vehicular traffic. According to the latest enumeration data the unit cost of the fatal victim is about 8 500 000 EUR, the unit cost of a seriously injured is 9 700 000 EUR, and the unit cost of a slightly injured in an accident is 113 000 EUR. The enumeration data presented above show that the cost of construction even 30 the most innovative crosswalks that will contribute to save at least one pedestrian is in terms of the costs a very good investment (if you could convert safety into money). The article aims to analyse an impact of usage the active crosswalks for pedestrians as an improvement for pedestrians' safety. The article includes exemplary design solutions from technical point of view as well as the design guidelines for the crosswalks location.

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NOVEL GREEN HYBRID BINDERS BASED ON VOLCANIC MATERIAL

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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 promising route towards the replacement of PC is by using supplementary cementitious materials from by-products or natural resources. Volcanic ash (VA) is a pozzolan used worldwide to replace PC, although it is used in relatively low amounts (e.g. 20%) since it reduces the mechanical properties. This paper presents results on a study on novel low emissions hybrid cements based on the combined chemical activation of VA by Na_2SO_4, $Ca(OH)_2$ and PC; this combination creates a hybrid chemical activation scheme, in which the VA reacts with alkalis and sulphates, towards the formation of cementitious products. Pastes were prepared in formulations with variable contents of VA in ratios VA:PC from 20:80 to 75:25; these were activated with 6-12% Na_2SO_4 and 3.1 to 6.2% $Ca(OH)_2$. The hybrid binders showed hydraulic behaviour and developed higher strength since the early ages compared to the plain cements of VA:PC. In general terms, higher VA contents resulted in a reduction of strength; this is somehow expected as the VA particles are of porous nature and lower reactivity than Portland cement. Nonetheless, the results are promising and a summary of results of compressive strengths is described as follows in brackets (1 day, 28 days) for some formulations: the reference paste of 100% Portland (21, 46); hybrid binder with 20%VA (24, 38); hybrid binder with 40%VA (17,53); hybrid binder with 60%VA (12,45); hybrid binder with 75%VA (5,24). The use of an initial curing for 24h at 60°C increased the early strength, while did not benefit the late strength. Although the Na_2SO_4 and $Ca(OH)_2$ improved the early strength, higher amounts of activators did not necessarily favoured strength. The microstructures showed features corresponding to the strength observed with consumption of the $Ca(OH)_2$ and reaction of the VA by a dissolution-precipitation mechanism. Calcium silicate hydrates ($CaO\text{-}SiO_2\text{-}H_2O$ with no specific stoichiometry) and ettringite ($Ca_6Al_2(SO_4)_3(OH)_{12}\cdot 26H_2O$) were noted as the main hydration products.

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3D PRINTING OF CONCRETE: HIGH QUALIY AND SPEED FOR THE INDUSTRIALIZATION OF THE CONSTRUCTION

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ABSTRACT

3D printing of concrete has been demonstrated in large scales for years now. The control of the rheological and strength evolution of the concrete are however critical to able high quality and quick construction with 3D printing. We demonstrate that an extreme efficiency a flowable inks can be pumped and be rapidly hardened when placed with maximum precision. The control of the hardening is made with the “setting on demand” of concrete where the control of interactions between the concrete binder and high-grade concrete additives has been established. Not only the flow properties and the setting properties are controlled with precision, other properties such as the shrinkage and temperature are controlled to insure the best application and durability of the printed materials. The developed systems and formulations speeds up the printing process, reaching an application of the concrete at a continuous rate up to 4t/h with printing speed far above of 1m/s. Special new development tools have been developed to make a quantitative link between laboratory and field and to allow quick adaptations with any local raw materials for local manufacturing creating an unrivalled freedom of design with infinite architectural design possibilities.

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ANALYSIS OF RESEARCH PROCEDURES FOR TESTING CAPILLARY ABSORPTION PROPERTIES OF ROCK MATERIALS WITH RESPECT TO STANDARD REQUIREMENTS

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ABSTRACT

There are about twenty European standards concerning natural stone test methods. The standards determine measurements of density, porosity, frost-resistance or abrasion-resistance. The authors focused on testing capillary absorption properties of rock materials. The tests described in the article show a diversification of results while implementing all the possible methods of the research procedure indicated by a relevant European standard. Two samples in different sizes and shape have been analysed. The authors proposed an experimental method of testing capillary absorption, which is based on the isolation of samples in order to imitate the most natural environments for rock performance. Providing such controlled conditions in which the material will work is significant for indicating that the tests are carried out in real-world conditions. After becoming acquainted with all the standards and analyzing the research procedures, it can be concluded that rocks are treated as a homogeneous material. It is not true in reality. Rocks are the most diverse group of materials. Unlike ceramic materials or concrete products, for which we can easily prepare a satisfactory mix design, rocks are an unpredictable material that originated thousands and millions years ago and now we can not affect them. Here, we are dealing with diversified porosity properties and microstructures, as well as anisotropy All the factors influence test results. Therefore, while carrying out tests on stone materials, representative material samples should be selected. It is extremely important to consider it carefully in order to ensure that results are reliable and indicate real material properties. It is necessary to acquire proper knowledge about a particular rock, its deposits and origins.

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EVALUATION OF DEPENDENCIES BETWEEN PHYSICO-MECHANICAL PROPERTIES AND THE THERMAL CRACKS' GEOMETRY OF CEMENT PASTES MODIFIED WITH METAKAOLINITE USING THE LSM METHOD

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ABSTRACT

The paper presents the dependencies assessment that occur between physico-mechanical properties, and the parameters describing the geometry of thermal cracks of modified cement pastes. The subject of the research is cement paste modified with metakaolinite, which has been subjected to the influence of an elevated temperature. The pozzolanic additive was used as a substitute for 10% of the cement's mass. Four series of cement pastes were analyzed, which differed from each other with the class of Portland cement used and the metakaolinite content. Within each series, samples were made with 3 water/binder ratios equal to 0.4, 0.5, and 0.6, respectively. As part of the earlier research, the basic physical and mechanical features of the cement matrix were determined, such as: compressive strength, tensile strength at bending, and apparent density. The tests were carried out in accordance with EN standards on reference and thermally loaded samples. The elevated temperature load caused cracks on the surface of the cement matrix, which created a characteristic network of cracks referred to as the cluster cracks – the thermal cracks – the mapcracking. The computer image analysis tools were used to quantify the cracks' structure. The samples' surfaces were scanned and the following parameters were determined: the cluster average area, the cluster average perimeter, and the crack average width. The aim of the study conducted was to determine whether on the basis of the measurement of the geometrical characteristics of thermal cracks it is possible to estimate with a good accuracy selected physico-mechanical properties of modified cement pastes. The measurement of geometrical features of material's cracks is a non-destructive and non-invasive method, in contrast to tests aimed at determining, in particular, the mechanical properties. The statistical analysis tool, i.e., the least squares method (LSM) was used to define dependencies that occur between material properties and the geometry of thermal cracks. The quality of matching the calculated functional dependencies to the empirical data was evaluated using three diagnostic statistics: the determination coefficient, the standard error of estimation, and the coefficient of random variation. The results obtained indicated the existence of very strong correlations between the compressive strength, apparent density, and the cracks' geometrical parameters. This allows an accurate estimation of these two material characteristics based on the analysis of the cement paste surface cracks, which has been subjected to elevated temperatures. The analyzes carried out are also of great practical importance because the results obtained can be used to assess the degree of degradation of a cementitious material that has been damaged due to a thermal interaction.

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PORE SPACE ANALYSIS OF JURASSIC AND DEVONIAN LIMESTONES FROM HOLY CROSS REGION (POLAND) BASED ON MERCURY INTRUSION POROSIMETRY AND DIFFERENTIAL SCANNING CALORIMETRY

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ABSTRACT

The Holy Cross region is one of the most important region in Poland for the utilization of rock materials in construction, particularly limestone deposits from the geological Jura and Devonian periods. Quarry with the largest production of limestone are concentrated in this region. Geological rock processes over time affect technical properties such as irrigability, frost resistance, size of the pores, their volume and the diameter of the transition between them. The size of the pores and their connections determine the phase transformation of water into ice and the ability of the material to absorb water from the environment. This article presents the results of the pore space diversification studies of 10 limestone rocks from the Devonian and Jura periods. The pore size distribution was determined using mercury porosimetry and the amount of water undergoing phase change in the pore space was determined. The result of this research showed a good correlation between the genesis of the rock and its texture, in particular porosity. The Devonian limestones had good technical parameters in terms of porosity, within the range 1.24-1.77%, while Jura limestones varied significantly from 0.96-9.70 %. Based on these results, we concluded that the time and depth of limestones deposits are not essential conditions for achieving low porosity. Furthermore, the mercury porosity and low temperature calorimetry had the resolution to quantify total volume of pores for limestones with porosity only above 2%. Based on MIP method for limestones with a porosity below 2%, it was not possible to obtain crucial information about porosity properties, which significantly affect the water-ice phase transition.

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SULPHATE RESISTANCE OF CEMENT COMPOSITES WITH VARIOUS AIR CONTENTS

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ABSTRACT

The article presents the results of microstructure analyses and expansion of non-air-entrained (nAE) and air-entrained (AE) concretes made of Portland cement subjected to sulphate attack. The aim of the study was to determine the effect of air content in concrete on their sulphate resistance. After long-term studies of mortars immersed in a solution of sodium sulphate it was found that the air entrainment of mortar improves their sulphate resistance. In order to be able to determine the optimal amount of air in cement composites, it was decided to test five concrete series with different air contents. To compare the degree of concrete damage with different air content, long-term linear deformations (expansion) and compressive strength of concretes were investigated. The structure of air bubbles in concrete was also investigated to explain the complex damage process. Changes in the microstructure of concrete after storage in a solution of sodium sulphate were observed under a scanning electron microscope (SEM). The most suddenly deformed samples of concrete containing the largest amount of air. A similar value of deformations after 17 months of immersion in a sodium sulphate solution obtained samples of non-air-entrained concrete. However, in the case of non-air-entrained concrete, the deformation increased evenly over the entire test period. Optimum air entrainment increases the durability of concrete subjected to sulphate attack. Air contents of 4.19% and 6.66% were considered optimal for maintaining durability during sulphate attack. In samples of all concrete series, the products of corrosion were gypsum and ettringite. The largest amount of ettringite was observed in the air pores, where the crystals of ettringite are able to grow freely without causing pressure on the microstructure of the cement paste. For this reason, much less deformation of air-entrained concretes than non-air-entrained concretes has been observed. Concrete with too much air content shows increased water absorption. This leads to a greater possibility of the aggressive solution penetrating into the interior of the sample through numerous air pores.

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LM ANALYSIS OF GEOPOLYMERIC BINDER MADE OF TUNGSTEN MINE WASTE WITH GROUND GLASS ADDITION

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ABSTRACT

The major goal of this paper is to determine the impact of ground glass addition on strength parameters of geopolymeric binder based on waste mud derived from Portuguese tungsten mine named Panasqueira. The study also focused on finding the most effective and favourable composition of geopolymer mixture in terms of mechanical properties. Additionally, the microstructure and chemical analysis were carried out in order to determine the morphology and chemical composition of particles contained in the geopolymer matrix. Based on the defined thesis goals, the following scope of investigation was accepted: a. preparation of geopolymer samples with various proportions of starting materials, b. execution of three-point flexural test and uniaxial compression test, c. microstructure observations under the light microscope (LM). The microscope observations were carried out on various types of glass-based specimens (after compression testing) using Olympus GX-71 light microscope (LM). Depending on the analysis method, the samples were observed at different magnifications. The microscope observations indicated a large diversity of material particles in terms of shape, size, number and colour. Firstly, the numerous spherical particles with diameters between 50 to 150 μm were observed within the material matrix. Then, a large number of irregular elements of various shapes and sizes ranging from several μm to several hundred μm was detected. Moreover, it was observed that material matrix was contaminated with a small number of irregular white particles. Generally, all mentioned particles were uniformly distributed in the geopolymer matrix. While analysing greyscale images derived from backscattered electron (BSE) detector, it can be noticed that material matrix together with embedded particles are very diverse in chemical composition. Within geopolymer matrix, both very dark particles composed of light metals and extremely bright particles containing mainly heavy elements were observed. This was also confirmed by more detailed examination with EDS detector.

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THE EFFECT OF DIFFERENT MICRO METAL POWDERS ON THE ELECTRICAL RESISTIVITY OF CEMENTITIOUS COMPOSITES

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ABSTRACT

The electrical resistivity is an essential parameter describing materials' capacity to convey electric current. Normal cementitious materials display high estimation of the electrical resistivity because of their insulating nature. However, the high electrical resistivity of concrete can be reduced by a sufficient amount of electrically conductive admixture. Such an improvement is advantageous in self-sensing or self-heating concrete design. In this study, the effects of metal additives on the electrical resistivity of hardening cement paste were investigated. In the experiments, two different types of metal admixtures; copper powder and iron powder were used. Hybrid composition of copper and iron were also considered for comparisons of the electrical resistivity. A water to binder ratio of 0.35 was used. The metal powders were used in the mixtures by replacing the cement in ratio of 0%, 5%, 10%, 15% and 20% by weight. The total binder content (cement and metal additives) was always the same in the experiments. The measurements were carried out at room temperature by using two-electrode- AC method. The test results indicate that the hybrid composition of copper and iron with 20% of cement weight improved the lower electrical resistivity of the cement paste than copper or iron alone. In addition, composites with copper powders had less electrical resistivity than those with iron powders. Different frequency options 1 kHz, 10 kHz and 100 kHz were used to investigate the effect of impedance-frequency and phase angle-frequency of a sample test using the LCR meter. The highest current frequency available on the LCR meter, 100 kHz, was chosen to be used as the applied current frequency in all of the experiments which exhibit much lower phase angle values that can cancel the effect of change in electrical resisitivity measurements.

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INFLUENCE OF HEAVY AGGREGATES ON THE QUALITIES OF SILICATE MATERIALS

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ABSTRACT

The article is a part of the research devoted to modifications of autoclaved products, and it also refers to the theories widely researched by Harman Daly concerning balanced development and the problem of termination of aggregates and other components used in production of concrete and building materials as well as acoustics isolation and bulk density. The article discusses of the optimization of the composition of the mass and the effect of heavy aggregates on the microstructure of this elements. Heavy aggregates are important for designing of the bricks and for the right acoustics isolation of the material, and further for the construction wall. The studies conducted show that the utility parameters of the material reach the expected value of the additive in the amount of up to 25% of aggregate in relation to the mass of the product (basalt, barite aggregates) or up to 10% of diabase aggregate into the mass.

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INFLUENCE AND APPLICATION OF GLASS CULLET IN AUTOCLAVED MATERIALS

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ABSTRACT

Glass is a material commonly used in the world in virtually every economic sector. In the era of balanced development, care for the environment, overproduction, which is associated with the so-called economic and energy responsibility are sought for alternatives to solve the problem. A popular way to use glass cullet is to grind it to the micro fraction and to use the resulting component for the production of concretes. Another option of combating the surplus of glass being recycled is the use of milled glass for small fractions in autoclaved bricks. The article presents the method of using glass cullet in autoclaved materials (laboratory tests, cullet in the form of glass sand (GS)). The main attention was focused on changes occurring in the structure of the internal modified material and its microstructure. Artificial Neural Network (ANN), due to their mode of action, are very effective in the analysis of the problem of prediction. In the paper a Backpropagation Neural Network (BPNN) was applied. This type of network is often presented as a universal approximator capable of modelling of the function with any complexity law. Modelling using PBNN, is an iterative search of a non-linear relation in considered model, using the given data set, without the necessity to give assumptions of concerning the structure of model. The determining the properties of sand-lime materials will be predicted on this research by using neural networks. ANN method was chosen because this method can be used as a model to develop tools to predict the moisture and other properties of this kind of materials in each of the tests, 12 samples of the same composition and under the same conditions were made. The process and temperature of hydration of lime were controlled, the mass quality with the modifier and the conditions of autoclaving. Due to the potential of the autoclave, the autoclaving time was 5 hours each time. The graph below shows an example of the autoclave. Moisture of the material estimation errors are smaller when using a neural network. Research has shown that the increase in the share of glass cullet (GS) in mass, increases the moisture content of the material after autoclaving process.

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POSSIBILITIES OF PLASTIC WASTE APPLICATION IN EXPANDED CLAY CONCRETE

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ABSTRACT

The article analysis the application possibility of plastic waste and their impact on the properties of expanded clay concrete. Two plastic wastes are selected from SC “Plasta” (A and B types). A type waste has slimy and dense structure, B is more porous and has rough surface. Whereas the average size of waste is up to 1 cm and the bulk density is similar to that of expanded clay, these waste have replaced a part of expanded clay with the fraction of 4/8 (0%, 5%, 10%, 20%) in expanded clay concrete mixtures. Amounts of cement, fine aggregate (sand), 8/16 fraction expanded clay, water and superplasticizer in expanded clay concrete mixtures are constant. Properties of expanded clay concrete are determined and analysed as follows: density and slump of the mixture, density of the dried expanded clay concrete specimens, capillary rate, water absorption and compressive strength. Additionally, microstructure research is conducted. It is determined that using more waste (20%), by 4% denser and by 50% stronger expanded clay concrete may be obtained compared to the control specimens. To obtain expanded clay concrete with optimal properties, it is suggested to use 5% of A type waste instead of calculated amount of 4/8 fraction expanded clay. Then, the density of expanded clay concrete increases by 5% and it is equal to 1260 kg/m^3, and compressive strength is by approximately 70% greater than the one of the control specimens and it is equal to 17 MPa. Moreover, the capillary rate and water absorption decrease. When up to 10% of A type waste are used, mixture slump increases and workability improves, therefore, the obtained specimens are easy to form. Microstructure analysis shows that there is sufficient adhesion between aggregates, waste and cement stone. The microstructure of cement stone under different loadings of waste is different. The densest structure has specimens with 5% of A type waste. The same minerals, i.e. portlandite, ettringite, calcite and calcium hydro silicates are determined in specimens from all batches. After conducting statistical analysis of the obtained compressive strength results, mathematical second degree polynomial dependence is concluded. It allows prediction of expanded clay concrete’s compressive strength depending on the amount of waste. Determination coefficient of the equation is equal to 0.845. It can be seen from the obtained equation that the compressive strength of expanded clay concrete increases under a certain amount of waste and then, it decreases.

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

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ABSTRACT

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

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

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ABSTRACT

In this work, the influence of activation of calcareous fly ash by milling was investigated. In particular, the evolution of heat of hydration Portland cement with different amount of not activated and activated (by milling) calcareous fly ash was researched. Five different calcareous fly ashes were used for the study. Isothermal calorimeter was used to measure the heat evolution during the hydration process of Portland cement with calcareous fly ash pastes. Tests were conducted in 20°C. Water-binder ratio of cement pastes for hydration heat examinations was equal 0,5. Research had shown that the addition of calcareous fly ash showed a retardation of the hydration reactions and increasing the initial heat period. The replacement of Portland cement by calcareous fly ash resulted in a decreased hydration heat evolution rate and a decreased peak value of the second maximum. Portland cement with activated calcareous fly ash is characterized by a higher ending peak in the main period of hydration compared to Portland cement with not activated calcareous fly ash. Moreover, an increased in the total released heat in Portland cement with activated calcareous fly ash was observed.

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INFLUENCE OF ADMIXTURES ON HYDRATION HEAT OF BLENDED CEMENT WITH CALCAREOUS FLY ASH

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ABSTRACT

This study is dedicated to the contribution of a calcareous fly ash to the hydration of a blended cement in the presence of chemical admixtures. In general, the effect by chemical admixtures depends not only on their dosage, chemical nature, molecular architecture, and the time of admixture addition, but also on the characteristics of the cement, such as its mineralogical composition and fineness. To assess this contribution Portland cement and nine Blended cement with calcareous fly ash and admixtures (superplasticizer, plasticizer, retarding and accelerating admixtures) was chosen. The hydration of samples of Portland cement and blended cement with calcareous fly ash and admixtures was investigated by means of isothermal heat flow calorimetry. Calorimetric investigations were carried out with a TAM Air heat-flow calorimeter. Tests were conducted in 20°C. Water-binder ratio of cement pastes for hydration heat examinations was equal 0,5. Research had shown that the induction period of samples of Portland cement and Blended cements with calcareous fly ash in the presence of chemical admixtures (except accelerating admixture) is longer as in samples without admixtures. Some superplasticizers prolong the induction period almost as much as the retarding admixtures. The accelerating admixtures shortens the main period of hydration of blended cements.

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EXPERIMENTAL INVESTIGATION OF THE MATERIAL PERFORMANCE OF THE ULTRAHIGH EARLY STRENGTH CONCRETE

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ABSTRACT

Aiming at some special working condition, the high performance concrete (HPC) is investigated by combining the ordinary concrete with the chemical additive or the active mineral admixture. The ultrahigh early strength concrete is one of the most popular HPC which has been extensively used in the construction of roads and tunnels, owing to the advantage of setting in a shorter time. Therefore, there is a growing need to investigate the material performance of the ultrahigh early strength concrete. In this study, several sets of contrast tests are well designed and conducted in order to experimentally investigate the material performance difference between the capability of the ultrahigh early strength concrete with specific mix proportion and the ordinary concrete such as the setting time, the workability, the impermeability and the compressive strength. The experiment results show that the ultrahigh early strength concrete works better than the ordinary concrete in most of the above material characteristics. To be specific, the ultrahigh early strength concrete appears the extremely higher compressive strength in the same curing time, the better permeability resistance and the slightly lower workability. Obviously, this kind of concrete is more prone to the application in the rapid construction of roads and tunnels.

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ASSESSMENT OF GRANITE, QUARTZ AND SYENITE AGGREGATE SUITABILITY INTENDED FOR THE APPLICATION IN CASE OF TRANSPORT PAVEMENT CONCRETE

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ABSTRACT

Based on the analysis of the obtained laboratory test results, the article presents the suggestion concerning the use of quartz and syenite aggregate as granite aggregate alternative, in the composition of cement concrete intended for airfield pavements. The scope of laboratory tests with regard to rock materials included the assessment of basic properties of the applied aggregates and their influence on the change of parameters of internal structure of hardened cement concrete. The analyses included evaluation of the selected aggregate parameters, i.e. bulk density, absorbability, sand equivalent, abrasion, crushing and polishing resistance. The influence of the applied materials on the change of the basic physical properties (bulk density and absorbability) was specified and mechanical parameters (compressive, splitting tensile strength and bending strength) of the curing concrete within diversified periods. According to the observed changes in the internal structure of concretes, the influence of the aggregate type on the obtained parameters of hardened concretes and their airfield pavement application were determined.

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ANALYSIS OF THE CHEMICAL COMPOSITION OF THE RIND AND PITH OF TOTORA STEMS: A COMPARISON

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ABSTRACT

Totora (*Schoenoplectus californicus* (C.A. Mey.) Soják) is a sedge that grows in lakes and marshes in America and some of the Pacific Islands. This plant has been used by several traditional communities that have appreciated its fast-growing rate, versatility and resistance. Studies have shown the potential environmental benefits of this plant and its possibilities to be used in contemporary construction and industry. The physical and chemical characteristics of this plant have been studied and complemented. The rind and pith, which are the two main tissues of the plant stems, have different physiological characteristics that have been studied by several authors. However, the chemical characteristics of these two tissues have not been reported elsewhere. The pith and rind of totora stems were analysed using TAPPI and NREL methods. The main results showed a higher ash content on the pith than on the rind of the plant, which could be due to the bio-absorbent function of the plant; a significantly higher lignin content on the rind of the plant, which supports the idea of the structural and protective function of the epidermis tissues of the plant; and a higher holo-cellulose content on the pith of the plant, that combined with the low lignin content could be used to increase the efficiency of cellulose-extraction procedures. These characteristics are of interest to study additional uses of this plant in industrial processes. The data obtained are of interest to extend the current available information about this plant and its potential in a circular economy scheme in the industry and the construction sector.

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DIAMIDOAMINE SALT AS THE ADMIXTURE FOR CONCRETE INCREASING THE RESISTANCE TO THE FREEZE-THAW CYCLE

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ABSTRACT

Concrete freeze-thaw resistance, along with compressive strength, is one of its basic features, which have a significant impact on the durability of structures of buildings and engineering structures. Numerous studies presented in domestic and foreign literature showed that there is a relationship between the concrete mix's composition and the extent of frost damage. The frost durability of concrete depends on many factors. Therefore, cyclic changes of air temperature in winter conditions (over 100 freeze-thaw event cycles per year are estimated in Poland) must be taken into consideration as soon as in the phase of designing a concrete mix and structural elements. Proper designing of the concrete mix, optimal selecting of proportions and kinds of components, applying of appropriate kinds of additives and admixtures as well as proper maintenance of concrete can protect the investor against serious financial consequences. The paper discussed the influence of sub-zero temperatures' effect on cement concretes' properties. The requirements that are imposed on designers in terms of concrete's resistance to frost's cyclic effect by the currently applicable standards were presented. The paper also presents the results of an original research programme showing the effectiveness of diamidoamine salt as an admixture for concretes that increases their resistance to the freeze-thaw cycle. Within the preliminary tests, the influence of the diamidoamine salt on early and 28-day compressive strength was marked. The air content in fresh concrete, absorbability and water permeability were also specified. The freeze-thaw resistance of concretes with the addition of the diamidoamine salt after 50 freeze-thaw cycles was determined. The conducted preliminary laboratory tests showed that applying the diamidoamine salt causes the decrease in compressive strength. This decrease is proportional to the admixture content. The applied admixture significantly decreases the absorbability, improves waterproofness and freeze-thaw resistance of the concrete.

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INFLUENCE OF HEAVY AGGREGATES ON THE QUALITIES OF SILICATE MATERIALS

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ABSTRACT

The article is a part of the research devoted to modifications of autoclaved products, and it also refers to the theories widely researched by Harman Daly concerning balanced development and the problem of termination of aggregates and other components used in production of concrete and building materials as well as acoustics isolation and bulk density. The article discusses of the optimization of the composition of the mass and the effect of heavy aggregates on the microstructure of this elements. Heavy aggregates are important for designing of the bricks and for the right acoustics isolation of the material, and further for the construction wall. The studies conducted show that the utility parameters of the material reach the expected value of the additive in the amount of up to 25% of aggregate in relation to the mass of the product (basalt, barite aggregates) or up to 10% of diabase aggregate into the mass.

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UNCONFINED COMPRESSIVE STRENGTH TEST PROPERTIES OF CEMENT-ORGANIC SOIL COMPOSITE

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ABSTRACT

Laboratory strength tests of the mixtures are a necessary stage of any stabilization. They allow to assess the impact of binders to improve properties of the strengthened organic soil. Which is extremely useful for the verification and designing the correct composition of the soil-binder composite used in situ. The paper presents some of research results obtained to evaluate the effectiveness of the use of cement to strengthen the weak soil having different organic matter content. The study included 20 different mixture recipes, which independent variables were: organic matter content Iom and the ratio of added cement to the dry weight of soil mc/ms. Organic matter content Iom from 20 to 84,40% and mc/ms from 0,75 to 2,75. Measurements of uniaxial compressive strength were conducted on more than 150 cylindrical specimens after 7 and 28 days of curing. Analysis of the obtained strength tests results shows that there is a close physical relationship between the geotechnical properties of the components and the parameter of uniaxial compressive strength of the organic soil-cement binder mixture.

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VALIDATION OF ANALYTICAL APPROACHES BY ACTUAL MEASUREMENTS OF LONGITUDINAL DISPLACEMENT PROFILES AT THE BRENNER BASE TUNNEL

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ABSTRACT

Longitudinal displacement profiles represent the distribution of displacement along the longitudinal direction of a tunnel excavation. They include the entire displacement history, namely the ones occurring before the installation of the monitoring systems and also the ones ahead of the tunnel face. These so called predeformations have great impact on the design of the tunnel supports. Usually analytical approaches, eg. Panet (1995), Unulu and Gereck (2003) or Vlachopoulus and Diedrichs (2009) are used for a rough estimation of these deformations. However, as these approaches are based on simplifying assumptions, they have to be treated, especially for deep tunnels, with caution. Thus, field measurements of the displacement distribution are valuable data for an on-site validation of the analytical approaches. This work contributes to a better understanding of tunnel induced displacements and points out possible inaccuracies of the analytical approaches by evaluating the measurements carried out in the exploratory tunnel of the Brenner Base Tunnel. In this study, the entire longitudinal displacement distribution (even ahead of the tunnel face) has been measured by 40 m long horizontal chain inclinometers installed just above the tunnel crown prior to the beginning of the excavation. The displacements have been observed hourly at every two meters during the tunnel advance. The measured longitudinal displacement profile is analysed for every blast and is statistically evaluated. The resulting displacement profile is compared with the analytical approaches for validation and calibration of the analytical approaches. The measurement results show good accordance with the nominated analytical approaches.

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RELIABILITY ANALYSIS OF SEA CLIFF SLOPE STABILITY BY POINT ESTIMATE METHOD

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ABSTRACT

The paper presents a reliability analysis of the Jastrzębia Góra sea cliff slope. The cliff is a section of the southern Baltic coast of Poland. Its height reaches about 30 m, and it steeply descends to the beach. The morphology is a typical young glacial form created by inland glacier activity at the time of the last north-Polish continental glaciation of the Pomeranian phase. In the geological structure, two formations can be distinguished. The lower one is composed of relatively strong impermeable soils – clays and loams. Above this formation, a complex of sand-loam soils occurs. Since 2002, several landslides have developed here, causing the collapse of a pedestrian path and a building situated at the top of the cliff. The landslides and cliff erosion are the results of two processes. They are caused by the so-called "land factors," connected with the geological structure of the massif, its significant inclination and water presence, as well as the height difference between the cliff crown and the sea level. The landslide processes are also an effect of difficult hydrogeological conditions, namely, the temporarily rising ground water table. The layers are slightly inclined seawards, and this configuration causes a slow creeping movement, especially of the cohesive soils in the lower part of the slope. A detailed investigation of the last incident proved that the landslide had been initiated by a slide of the sand-loam complex over the lower-lying impermeable clays. Water played an important role in this process. After the last landslide, a programme of remedial works was undertaken. The colluvium was replaced with gravel reinforced by a geogrid. This support created a kind of "shelf" between the building and the cliff crown. However, despite this support, signs of a new landslide have recently appeared on the cliff surface, and a new stability analysis has therefore been performed. It showed that although currently stable, cliff slope stability is in fact close to the limit state. The objective of this paper is to present the point estimate method (PEM) of determining the mean value and standard deviation of the safety factor of the slope. Assuming its normal distribution, these statistical parameters make it possible to determine the probability of failure p_f and the reliability index □. It was assumed that only strength parameters were treated as random variables having a normal distribution. In total, fourteen variables were considered as random. In order to reduce the number of random variables, a sensitivity analysis was performed. The results were verified by the Monte Carlo simulation method. The convergence analysis, for both the average value and the standard deviation of the safety factor was carried out. The deterministic stability calculations of the safety factor (F) were performed by the two-dimensional explicit Finite Difference (FD) method included in the FLAC software. The main advantage of this approach is to minimize the number of sample calculations required to obtain estimators of the parameters investigated. It was shown that the PEM is suitable for analyzing such complicated geotechnical problem.

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STABILITY ANALYSIS OF A ROAD SCARP IN THE CARPATHIAN MOUNTAINS AND METHODS OF ITS PROTECTION

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ABSTRACT

The purpose of the paper is to present the results of the stability analysis of a road scarp endangered by a developing landslide and to consider some engineering measures for its stabilization. A potential landslide of the slope could threaten a religious sanctuary situated above. The history of the sanctuary began in the first years of the 20th century and nowadays, it is an important religious site, visited by numerous pilgrims. The signs of the initiation of the landslide on the scarp are visible in form of the cracks on the road asphalt mantle and irregularities on the scarp surface. The scarp is located in Zakopane (Poland), in the Carpathian Mountains. The Carpathians, built of flysch rock masses (composed mainly of clay shales and sandstones), are threatened by numerous landslides, developing both on natural slopes and on anthropogenic scarps. The main cause of the landslides are the properties of the flysch rock mass, and of clay shales in particular. The weathering of these rocks transforms them into weak soft soil (clay), which is very prone to sliding. The stability calculations of the safety factor (FOS) were performed in the plane strain state by the two-dimensional explicit Finite Difference (FD) method included in the FLAC2D software. The method is suitable for analysing of the complicated geotechnical problems. The presented research has resulted in suggestions of the possible protection methods. Four methods were analysed, namely drainage of the scarp (the rock mass is completely dry), nailing of the scarp surface, installation of piles and supporting the slope with a soil prism. Some advantages and limitations of particular solutions for the case under consideration were discussed. In each case the safety factor was determined allowing to compare the effectiveness of the method. The results proved, that only in the case of the drained slope, the safety factor does not reach the minimum acceptable value which is required by Polish regulations (i.e. FOS = 1.30). It means that drainage by itself, without any additional measures, does not ensure the required stability conditions. In other three cases, the safety factor is sufficient, but its value is approximately the same in each case. Therefore, the choice of the technical solution for scarp stabilization on the basis of FOS values alone can be arbitrary. Therefore, independently on other restrictions of technical nature, economic considerations have to play an auxiliary or even decisive role in choosing the optimal method of stabilizing the scarp. The cost of each option can be calculated to assist this choice.

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UNDRAINED SHEAR STRENGTH ANISOTROPY OF COHESIVE SOILS CAUSED BY THE PRINCIPAL STRESS ROTATION

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ABSTRACT

The construction of geotechnical structures, e.g. diaphragm walls, tunnels, pad foundations or embankments, on cohesive soils, requires assessing the bearing capacity in undrained conditions. For this purpose, it is necessary to determine the value of undrained shear strength. In practice, it is assumed that the undrained shear strength of cohesive soil has the same value in the geotechnical layer. However, the construction of any structure changes the stress state in the subsoil and thereby causes the principal stress rotation compared to the initial state. The effect of the change in stress directions is the creation of zones in the cohesive subsoil which have different values of the undrained shear strength and thus a different failure mechanism. A device that allows to determine the anisotropy of undrained shear strength in soils due to the principal stress rotation is the Torsional Shear Hollow Cylinder Apparatus. The paper presents test results performed in a Torsional Shear Hollow Cylinder Apparatus on undisturbed sandy silty clays (sasiCl) characterized by different values of index plasticity I_p and overconsolidation ratio OCR. The main objective of the tests was determining the undrained shear strength at wide range of angles of the principal stress rotation. The results of laboratory tests allow assessing the influence of the principal stress rotation on the value of undrained shear strength that should be used to determine the bearing capacity of the subsoil.

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RISK ANALYSIS OF THE MOTORWAY ROUTES IN LANDSLIDES AREA

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ABSTRACT

During monitoring measurements of the slope stability performed before construction of the D1 motorway in central Slovakia, a significant activation of landslides was observed in a motorway section long about 2 km. Such deep and active landslides were not taken into consideration during design stage. Therefore, it was decided to reassess the realization of the motorway in the originally designed route and to assess the possibility of choosing more favourable alternative route. To decide which alternative is the best one, a risk analysis of feasibility of the original (surface variant V1) and a newly proposed route (tunnel variant V2) were performed. In the article, the risks are assessed in detail - such as qualitatively or quantitatively expressed functions of probability of occurrence of certain hazards and magnitude of its adverse consequences on vulnerable motorway sections and objects (vulnerability) within a certain time period (exposure). The considered exposure is usually the construction period or the service life of the motorway and its objects. The analysis focused on geological, geotechnical and hydrogeological risks. However, the decisive risk was the interference of the motorway route with the landslide area. Risks of the variant V1 were evaluated for 10 sections and in the V2 variant four sections have been evaluated. The results of the risk analysis revealed that 35.5% of the V1 route was classified to the highest risk, grade 5. In variant V2 only 8% of the route was classified to grade 5. So, it was advisable to consider changing the original motorway route with the alternative one. In the present, works to begin building the motorway in the new route, which was also recommended by the risk analysis, are underway.

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DEFORMATION MODULUS DETERMINATION FROM PRESSUREMETER AND DILATOMETER TESTS FOR CRYSTALLINE ROCKS

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ABSTRACT

The deformation modulus is an important characteristic of rock mass mechanical behaviour. The deformation parameters of rock mass may be obtained by execution of in-situ tests. In situ testing are the most reliable and comprehensive methods to describe the mechanical behaviour of rock mass. Results of pressuremeter and dilatometer tests for crystalline rocks and their interpretation are presented in the paper. Ground investigation for new expressway R2 Krivan - Lovinobana – Tomasovce was used to compare two types of in-situ geotechnical tests results. In the evaluated section, an extensive part of a motorway is situated on bridges. During geological investigation 161 of dilatometer and 150 of pressuremeter tests were carried out to determine rock parameters. Logging measurements were conducted in each borehole in advance of geotechnical testing, what allowed to choose the best testing section of the borehole. Consequently, the pressuremeter and/or dilatometer tests were performed in selected boreholes. It was observed that the difference between deformation modulus determined by dilatometer and pressuremeter tests could be significant especially for intact rock with high RQD. A helpful correlation for estimating rock deformation parameters was derived based on analysis of the results from dilatometer and pressuremeter in-situ testing of crystalline rocks.

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CRITERIA AND MATHEMATICAL EXPRESSIONS FOR EVALUATING AN ILLUVIAL ACCUMULATION OF CLAY IN LUVISOLS

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ABSTRACT

One of the most important aspects of soil development is to establish the initial states of the parent material and of the soil material at each position of the soil profile. Luvisols have a higher clay content in the argic horizon than in the eluvial horizon, as a result of pedogenetic processes, especially clay migration. The illuvial nature of the argic horizon may be established using a lot of criteria and the quantity of migrated clay can be calculated with mathematical expressions. For Luvisols situated in the south-western zone of Romania, named region Banat, have been effectuated the next analysis: particle-size, chemical, mineralogical for index minerals present in the nonclay fraction, mineralogical for clay fraction – X-ray, differential thermal and infrared. Calculations for the amount of clay formed at each horizon or less at each horizon were made using some mathematical expressions. Luvisols cover in the south-west of Romania an area of 427779 ha, representing 26.51% from the total area of 1,613,538 ha. The scientific research was made on an Albic Luvisols – Lalasint, formed from a Cretaceous flisch, composed of conglomerate and silicolyte with pieces of quartzite. Calculation of the fine sand/coarse sand ratio, the quartz and feldspar content at each horizon, the change of index minerals with depth, and the eluviations index (k) calculated with the mathematical expressions, allowed to establish the quantities of clay migrated on the soil profiles and the uniformity of the soil material. In the soil type the soil materials were initially bistratified and during soil forming processes clay migrates down into an argic horizon.

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INFLUENCE OF RUBBER AND MINERAL ADMIXTURES ON SELECTED SWELLING PROPERTIES OF RED CLAY

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ABSTRACT

Swelling and shrinking of soils is considered to be one of the main reasons of building damages. This problem concerns practically all fine soils in plastic or semi-solid consistency and becomes very intense in the case of montmorillonite or smectite clays. Reduction of soil expansiveness can be obtained by various methods: e.g. surcharge greater than swelling pressure or stabilization with additives such as lime, cement or polymers. In the last decades, engineers have become interested in the use of waste materials in geotechnics, and thus such materials like fly ash, furnace slag or scrap tyre rubber are also now considered as valuable and eco-friendly admixtures that might be used to reduce expansiveness of soils. This paper presents a study on the influence of mineral and rubber admixtures on expansive properties of clay: swelling pressure ps and free swelling coefficient Vp. The experiments were conducted on red Triassic clay from Patoka in Poland mixed with rubber powder (0.1 – 1.0 mm) or granulate (1 – 5 mm). The rubber content applied was 10% by weight. Results revealed that admixture of rubber reduced the expansiveness of clay: ps decreased by 57% and 63% and Vp by 11% and 57% when coarser and finer rubber fraction was used, respectively. In order to check whether the observed decrease in swelling properties resulted from compressive characteristics of rubber, additional specimens were prepared in which the rubber grains were replaced by sand or gravelly sand in the same proportion by weight and by volume. It turned out that the mineral additives can reduce the expansiveness of Red Clay even more effectively than rubber, proving that in this method of stabilization the mechanism of replacement plays more important role than the lower stiffness of the added grains. However, independently of the type of the additive, better results can be obtained when grading of the admixed material is finer.

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IDENTIFICATION OF ELASTIC-PLASTIC PHENOMENA IN SOILS IN THE RANGE OF SMALL STRAINS

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ABSTRACT

Accurate modelling the phenomena occurring in loaded soil materials is the primary source of development of the current normative regulations as well as smarter and more efficient engineering practice. The aim of this research is to develop more accurate description of the complex nature of the soil material and thus more accurate evaluation of the subsoil-construction cooperation in the whole range of stress, not only in chosen limit states. Within two last decades there is noticeable the great progress in the development of laboratory and field dynamic test methods, which become routine research and analytical techniques of engineer practitioners. This creates the possibility of solving complex problems of the dynamic nature in the issue of construction-subsoil cooperation. The proper description of the behaviour of soil in the range of small strain is extremely important element to forecast displacements of construction cooperating with subsoil. Due to this fact, it has a huge influence on the quality of mapping the actual internal forces in the whole structure - including the foundation. Stiffness modules for small strains are actually recognized as ones of the most important properties of the soil. RC/TS is the reference apparatus in which they are determined. There were used a technique based on the analytical solutions which calculates the dynamic shear modulus, dynamic modulus of elasticity and the damping coefficient of soils and rocks. In theory, the movement of the tested soil particles resulting from the propagation of elastic waves is non-destructive. Despite the apparent differences in the behaviour of soil material under dynamic loads with significant frequency (approx. 60-160Hz - RC test) and quasi-static loads, characterized by very low frequency amplitude (below 10Hz, in practice 0.1Hz below - TS test), small strain conditions are modelled numerically using a combination of linear and non-linear laws of elasticity. The main drawback of standard RC/TS research methodology is the assumption that soil material is subject only to visco-elastic strain. This assumption is manifested, among others in the interpretation of the damping coefficient during TS test, which is defined as the proportion of the energy dissipated by the material during the cyclic torsional shearing to the potential energy accumulated in the material during elastic deformations. However, observations confirm the hypothesis that the behaviour of the soil, even in the range of small strains, should be considered as an elasto-plastic - including the generation of plastic, irreversible deformation. The research method involves executing multiple (repeated) torsional shear tests on natural and artificial (repeatable) structure samples of soil. Samples will be subjected to varying conditions of the amplitude and frequency of cyclic load. Using modified procedure of registration test results allows the observation of changes in viscoelastic strain of material and measurement of permanent deformation after the completion of the torque impact. Multiple repetition of tests on samples of the natural and artificial structure allows to identify the cause of any differences that may arise in the individual reactions of the material (phase elastic, viscous, plastic).

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RHEOLOGICAL BEHAVIOR IN THE CLAYEY SOILS

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ABSTRACT

Among soil functions, there are those as the spatial base for buildings, roads, technical and industrial structures, and also a source of raw materials. Site investigations for structures are concentrated on the mechanical properties of the subsoil at foundation levels and the corrosiveness of the groundwater. The type of foundation needed for a major structure is directly related to the strength of the underlying soils. Detailed site exploration may be required even at the preliminary design stage. The analytical data offers some values since are particle size distribution, compaction, compression, consistence, lower and upper plastic limit, shrinkage limit, resistance to penetration, shearing strength, deformation resistance, conventional pressure. The paper presents also some analytical data obtained in an experimental field, situated on a similar type of soil, relative to the draft requirement for plowing and the influence of the degree compaction on the level of agricultural production. The type of external force applied, time dependency and number of ploughings, scarifyings or settlings and rollings can change properties down to deeper depths. The survey of soil indexes established for foundation indicated a normal consolidation, for building plot, a plastic-viscous consistence and a great plasticity. The consequences of soil deformation and agricultural production are minimum in the variant with a double scarifying at 80 cm depth. The main rheological characteristics in the clayey soil from the area of locality Sânnicolau are: clay content varies between 39,8 to 45,9%, lower plastic limit 22,2-23,5%, upper plastic limit 48,9-55,0%, plastic limit 25,4-34,6%, void ratio (e) 0,85-1,00%, resistance to penetration 10-18kg/cm^{-2}, consistency index 0,98-1,14, activity index 0,64-0,75%, shrinkage limit 22,7-15,4, deformation module 12,9-17,2 dan/cm^{-2}, shrinkage-swelling index 0,78-1,01%. The results of the soil technology, that means 6 variants, reveals than the best treatment is the double scarifying.

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A STUDY ON THE LATERALLY LOADED PILE BEHAVIOR IN LIQUEFIED SOIL USING P-Y METHOD

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ABSTRACT

Under repeated seismic loads during an earthquake, increase of pore water pressure in cohesionless, saturated and loose soils lead to decreased shear strength and therefore liquefaction occurs. Literature reports of numerous cases involving damage due to liquefied soil which makes the pile behaviour and performance in liquefied soil even more important. It is possible to investigate the behaviour of piles located in the liquefied soil under inertial loads using linear spring model, p-y method or numerical analyses and a suitable liquefaction constitutive model in time. This study investigates the behaviour of two piles, located in the foundation of the "Niigata Family" Courthouse which was damaged during the Niigata earthquake of 1964, under inertial loads in liquefied soil. The soil profile identified for this case and the piles are analysed using p-y method and linear spring approach. Pile deformations and bending moments calculated with these two methods were compared.

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AIRSTRIP GROUND IMPROVEMENT WORKS BY BLASTING CHARGE TECHNIQUE AND DREDGED-ASH MATERIAL MIXTURE

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ABSTRACT

Airstrips are the special places to landing and taking off small aircrafts. The concept functions in the world, especially where road transportation is limited. Small aircrafts usually up to 10000 kg start weight are used in tourism, medical care service, forest fire extinguishing, air patrol, small cargo transportation, fast connection charter flights of large airports with local district area. It can also support industry of leisure time activities. The remote location of the aviation objects may give a new stimulation for the surrounding area to the commercial development and may be profitable to the public. Airstrips are provided with minimum equipment and auxiliary facilities. The runway is relatively short it means about 800 m long and 80 m wide. The pavement is performed as natural resilient surface made of well graded soil. Airstrips are often placed on soft or loose soil underneth. The economical and fast mode of ground improvement and formation of a runway is benefitable and desirable. This effect can be obtained with using the blasting charge technique to weak soil improve and mixture of dredged material and coal combustion ashes to build the pavement of runways. Many years of practice in Poland confirms effectiveness of blast charge technique in loose sandy soil but also in cohesive soil. Mechanical phenomena in noncohesive and cohesive saturated soil differ when impulsed high energy affects. Cohesive soil including muds and peats are partially replaced but also processes of resedimentation and drainage of excess pore pressure are observed which are typical for noncohesive soil. Dredged materials dumped at sea or from river beds mixed with coal combustion ashes are used in road embankment constructions and even in dike construction. The material proves to have a good potential to be considered as a fully usable in many applications. Additionally, it is recovered material which matters in resource management and ecology.

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THE INFLUENCE OF MICRO AND NANOSILICA ON THE FROST–HEAVE PROCESS

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ABSTRACT

Frost-heave of soils is an important problem in engineering practice. Thus, it became necessary to find an adequate method that would reduce the negative effect of this phenomenon on building structures. The paper presents the preliminary tests results of microsilica and nanosilica influence on the water freezing process in frost-susceptible soils. The selection of stabilising additives also allowed for the analysis of changes that result from their transition from micro to nanoscale. For the purposes of the experiment a measurement site was constructed, that enables to analyse six samples at the same time, at inflow of water from the bottom and freezing direction from the top. The use of linear potentiometer displacement sensors allowed to measure the increase in the height of samples automatically. Additionally, the test site was equipped with digital semiconductor temperature sensors, so temperature could be measured at various heights of the samples. Moreover, an array of electrodes was applied to measure the electrical conductivity of soil at various levels of samples, which enabled the analysis of changes that occur in freezing soil. The tests were conducted according to the BS 812-124:1989 standard, in three variants: soil, soil + 5% microsilica, soil + 5% nanosilica. The obtained results demonstrated that the addition of microsilica reduces the occurrence of ice lenses, which in turn significantly decreases the growth in sample height. However, the addition of nanosilica completely stops the frost-heave process. Ice lens is not created, only a frost line is noticeable. Analysing the distribution of temperatures at different heights, it was noted that stabilised samples are characterised by higher temperature in comparison to the soil without additives. This means that the analysed stabilisers reduce the degree of freezing of the soil mixture. The highest temperatures were noted in samples stabilised with nanosilica. Conductivity tests also demonstrated that the smallest changes occurred in samples stabilised with nanosilica. This results from the fact that ice lenses did not occur in such samples. In order to analyse the obtained results and their interpretation thoroughly, it is necessary to perform a detailed analysis of the microstructure both of soil and of soil with stabilising additives.

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CUT-OFF WALLS AND DEWATERING SYSTEMS AS AN EFFECTIVE METHOD OF CONTAMINATED SITES RECLAMATION PROCESSES

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ABSTRACT

There are several engineering disciplines, where construction of cut-off walls is commonly used, these are mainly, foundations engineering, hydroengineering structures, deep dewatered excavation, land reclamation or landfill containment systems. The construction of vertical barriers is mainly based on cut-off wall mono or diphase technology with the use of bentonite and cement mixture as a filling material. The paper considers two case studies where vertical bentonite barriers were applied to prevent further pollution of the soil-water environment deriving from municipal landfills. The remedial works on site consisted of additional solutions like leachate collecting drainage, ditches restoration, as well as landfill's body engineering and bioengineering of landfill slopes. On the examples of two restored landfills it is proved that appropriate investigation of ground conditions and comprehensive earth works design are crucial for effective soil-water environment quality improvement. The construction and working condition of the proposed system is presented and analysed. The influence of proposed engineering methods on environment conditions was conducted on piezometric recording basis, laboratory tests and site investigation, which gave information on contamination level and direction of pollutants migration. Based on the groundwater monitoring results several maps of groundwater level changes were created. The monitoring data revealed improvement of water quality in almost every piezometer after only a few years since the soil and groundwater protection system was installed at the site. The system's effectiveness results are confirmed by long term monitoring of soil and groundwater samples of which such indicators as organic, nitrate and heavy metals concentration has decreased significantly over time. It is shown how combined civil and environmental engineering works can play a significant role in reclamation processes.

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SHEAR MODULUS OF COMPACTED SANDY CLAY FROM VARIOUS LABORATORY METHODS

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ABSTRACT

Nowadays, in geotechnical engineering, laboratory investigations are necessary in order to assess their engineering properties, like stiffness characteristics. Knowledge about soil shear modulus (G) in a strain range of 1.0□10-4□1% is very important to solve soil response subjected to dynamic loading. For purpose of that paper, shear modulus (G) of compacted sandy clay was measured in Water Centre – Laboratory, at Warsaw University of Life Sciences – SGGW by means of three different laboratory techniques, i.e., resonant column, bender element and torsional shear. Two methods of travel time identification in BE testing were applied: start to start (STS) and peak to peak (PTP). A brief description of these experimental techniques is given, with a special attention to strain level and excitation frequency they relate to. The main objective of this paper is to compare static against dynamic test results and monotonic against cyclic for cohesive compacted soil. In the next step, the behaviour of compacted sandy clay was compared with the behaviour of natural soil. The results suggest that in the case of BE measurements soil stiffness tends to be overestimated compared with stiffness obtained by RC and/or TS tests. The RC results are in good agreement with TS test results. The results received from the analysed techniques indicate significant change in shear modulus with frequency and strain. The comparison of the results from different tests should be done at similar frequencies and referred to the same strain level. It is also shown that natural material is characterized by a greater stiffness than a compacted one.

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THE FRICTION AND DILATANCY ANGLE OF RECYCLED CONCRETE AGGREGATE

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ABSTRACT

Developing of economy in Poland induce in recent years' deposits of construction and demolition (C&D) materials. Improving of road infrastructure in Poland lead engineers to construction pavements in various conditions. Request of construction materials in such situation enhance need of exploring new ways of reuse waste deposits. In the other way increasing of ecological awareness, lead to concentrate on recycle waste building materials to engineering constructions. Recycled Concrete Aggregate (RCA) is a construction and demolition material which in unbound state can be placed as subbase in road structures. Over last decades there was many investigations which highlighted physical and mechanical properties of this material. Nevertheless, successful application of RCA still needs more tests. In this article direct shear tests were performed to characterize mechanical properties of RCA. Direct shear tests were conducted with and without modification by adding metal frames to shear cubic shaped box with length of side equal 250mm. Material used in this paper was RCA in gradation with lead to recognize it as sandy gravel. Tests were performed for various moisture content material compacted with to respect of normal energy in Proctor method. Tests shows differences between direct shear with and without metal frames. For RCA tested in standard test conditions friction angle differs between 32.4° to 65.1°. Modification of test equipment results in friction angle equal 38.7° to 41.5°. Both tests indicated impact of moisture conditions during compaction. In this study, dilation angle analysis was also performed. Dilation angle values were in range from 5° to 10°. This value is greater than for natural aggregates. Brittle nature of RCA results in low value of the dilatancy index.

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GEOTECHNICAL CARTOGRAPHY APPLIED TO URBAN PLANNING: METHODOLOGICAL PROPOSAL USING DATA OBTAINED BY DRONES

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ABSTRACT

Geotechnical Cartography applied to Urban Planning deals with issues related to the criteria for selection of urban sites, susceptibility studies and risk analysis of environmental impacts arising from urbanization or not, under a preventive and guiding approach. However, the time scale of geotechnical maps often does not follow the speed of territorial dynamics, in this sense, Remotely Piloted Aircraft, also called Unmanned Aerial Vehicles or popularly drones, are devices that are increasingly used in the realization of various types of activities, from recreation to various monitoring services and the acquisition of aerial and photogrammetric data. In this context, the main hypothesis of this research is the possibility to improve the quality of the geotechnical maps with gains in the spatial and temporal details using data obtained by aerial survey carried out with drones and its application in the elaboration of guidelines for land use and occupation, as well as to evaluate the use of the data obtained for the susceptibility and risk zoning of landslides caused by rainfall. Therefore, the methodology adopted in the research seeks to comply with recent guidelines in accordance with federal legislation on disaster prevention and is based on the work of consecrated and established methodologies of National and International Geotechnical Cartography with innovation in the integration with a system of analysis of landslides caused by rainfall. Expected results include Erosion and Flood susceptibility maps, Urbanization Adequacy map and Hazard / Threat map using data obtained by aerial surveys conducted by drones, as well as data obtained from known satellites.

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IMPACT OF MINING SUBSIDENCE ON NATURAL GAS PIPELINE FAILURES

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ABSTRACT

The main goal of the paper is to present the influence of ground deformations, caused by mining subsidence, on natural gas pipelines. There are also presented characteristic examples of the gas pipelines failures in mining areas in Poland. Failures of buried natural gas pipelines pose a threat to people and the environment due to gas leaks. The main reasons of the leaks are corrosion of steel pipelines, mechanical damage as a result of construction works and unsealing of joints as well as expansion joints. In mining areas the gas pipelines are influenced by ground deformations. Mining extraction induces subsidence, horizontal displacements, horizontal strains and curvatures of the subsurface ground layer where natural gas pipelines are buried. The horizontal strains are of significant importance for the considered issue. The mining-induced ground deformations cause displacements of pipelines as well as additional longitudinal tensile and compression loads. The load values depend on the soil-pipe friction coefficient, pipeline depth and pipeline section length subjected to horizontal strains. The load conditions also change in the transverse direction of pipelines. In Polish mining areas distribution gas pipelines are constructed with steel and polyethylene pipes. Transmission gas pipelines are constructed with steel pipes. The steel gas pipelines usually are equipped with built-in extension joints to protect them and to transmit ground deformations. The polyethylene gas pipelines are flexible and are able to transmit mining ground deformations but polyethylene pipes can be used up to 1,0 MPa nominal pressure in natural gas systems. Mining extraction causes additional failures of the gas pipelines despite their above mentioned capacities. The failures occur most frequently in the steel gas pipelines, especially in old ones. The main causes of gas leaks are wall breaks, mostly near welded areas, wall buckling and sealant damage of expansion joints. Mining deformations can also induce the buckling of polyethylene pipelines. Therefore, in mining areas additional inspections of the natural gas network are needed to detect the leaks early.

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IMPACT OF HORIZONTAL SOIL STRAINS ON SEWER MANHOLES AND PIPELINES WITHIN MINING AREAS

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ABSTRACT

The main purpose of the paper is to assess and compare the values of horizontal soil unit loads, acting on the construction of sewer manholes and pipelines within mining areas. The examples of failures of these building objects buried within mining areas are also presented. Flexible (e.g. thermoplastics) and rigid (e.g. concrete, reinforced concrete) objects are taken into account. The impact of mining extraction on sewer manholes and pipelines is mainly manifested by horizontal strains. Soil strains lead to additional loads acting on the construction of the objects, which are buried in the subsurface soil layer, during horizontal soil compaction and loosening. The horizontal strain in the subsurface soil layer within mining areas causes both considerable value changes in horizontal loads acting on the object walls and significant uneven load distribution in comparison to non-mining areas. It should be emphasised that these strains pose a threat to building objects, especially, during horizontal soil compaction. In the case of sewer manholes and pipelines, it is a reason for their failures and a lack of tightness, and changes in the cross-section shape of flexible objects. In the case of flexible manholes and pipelines made of thermoplastics, the deflection of construction elements can occur. The deflection of the elements should be limited to ensure the functionality of manholes. The additional loads should be considered when determining the foundation conditions of sewer manholes and pipelines within mining areas in order to aid their design, protection and resistance assessment to horizontal soil strains. The load values were determined for horizontal soil compaction and loosening caused by horizontal soil strains. For load determination in the case of flexible sewer manholes and pipelines, experimental test results were taken into account. The values of the determined external horizontal soil unit loads acting on the flexible and rigid object walls during horizontal soil compaction within mining areas vary a lot. The uneven distribution of horizontal soil loads is lower for flexible objects than rigid ones buried in the same soil conditions within mining areas. The differences between the values of horizontal soil unit loads, acting on the construction of flexible and rigid sewer manholes as well as pipelines, are also caused by the interaction between soil and these objects within mining areas.

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THE APPROACH FOR EVALUATION OF VOID RATIO OF SANDS WITH VARIOUS AMOUNT OF FINES ON THE BASIS OF SHEAR WAVE VELOCITY MEASUREMENT

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ABSTRACT

The paper is focused on the possibility of evaluation of soil state of cohesionless soils containing fines on the basis of shear wave velocity. The paper presents laboratory test results obtained on the basis of large body of triaxial tests data. Shear wave velocity were measured with piezoelectric transducers embodied in top and bottom platens of triaxial cell. Four kinds of cohesionless soils containing various amount of fines (from 10 to 60%) were tested. In order to obtain waste ranges of void ratio, specimens were reconstituted by moist tamping technique with application of undercompaction. For each kind of material series of tests were carried out in which shear wave velocity was measured. The data were categorized in several ranges of void ratio. In sandy material it was possible to distinguish a few sub ranges of void ratio, while in sands containing large amount of fines the number of void ratio ranges was considerable reduced. The tests delivered shear wave velocity values related to state of material represented by void ratio and mean effective stress. Analysis of test results revealed that relationship between shear wave velocity and mean effective stress p' can be approximated by logarithmic function in distinguished void ratio ranges. This made possible to set formula for calculating void ratio for a given state of stress on the basis of shear wave velocity measurement. Such formulae were obtained for all tested kind of soil.

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CAPABILITY OF TRIAXIAL APPARATUS IN DETERMINATION OF NONLINEARITY OF SOIL STIFFNESS

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ABSTRACT

It has been fairly well recognized that by practicing engineers that conventional elastic or even elastoplastic analyses do not give satisfactory results in prediction of structure and subsoil deformation. This particularly refers to big structures where large volume of soil is involved in stress distribution zone. The main reason for this results from the fact that initial part of stress strain curve is described by two numbers representing elastic parameters ie.: Young′s modulus E and Poisson′s ratio v. Reliable evaluation of stress strain characteristics can be done only in the laboratory where boundary conditions with respect to stress and strain can be controlled. The most popular laboratory equipment is triaxial apparatus. Unfortunately, standard version of triaxial apparatus can reliable measure strains not smaller than 0.1 %. Such accuracy does not allow to determine stiffness referred to strain range most often mobilized in situ ie. $10^{-3} \div 10^{-1}$ %. in which stiffness distribution is highly nonlinear. The most relevant for determination of stiffness distribution in this range is resonant column test. However, very high cost of the equipment makes this kind of test not widely available. An alternative and most economical solution is local deformation measurement in triaxial test. Comparison between resonant column tests and triaxial test with local deformation measurement showed that both method give very similar stiffness distribution for small strain range. Such sophisticated triaxial system with proximity transducer has been described in the paper. The paper aims to emphasize the significance of stress strain behaviour of soil in small strain range, which is characterised by highly nonlinear distribution of stiffness. Some of the key issues controlling any reliably determination of pre failure behaviour of soil are envisage. Examples of some test results are given, which are to illustrate a universal potential of the laboratory triaxial apparatus with proximity transducers capable to trace stress strain response of soil in a reliable way.

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THE USE OF PROBABILISTIC ANALYSIS IN DESIGN OF SHALLOW AND DEEP FOUNDATIONS

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ABSTRACT

The paper deals with some aspects of reliability analysis, with special attention drown to Point Estimation Method, in foundation design. The aim of calculations is to establish reliability index β and probability of failure P_f for two main types of foundations - spread footing and pile system. Most certainly foundations are the most important part of any structure. The correctness of its design determines the durability and safety of the facility at every stage of construction and service life. The resistance of the selected type of foundation depends on its geometry and to a large extent on the soil parameters, which have a strongly stochastic character. In most publications, authors rarely or almost never deal with the problem of deep foundations. For this reason, in the paper equal attention is paid to both types of foundations - shallow and deep (focusing on piles in the second case). The probabilistic analysis is conducted in accordance with the recommendations included in the EN-ISO 2394 standard titled *General principles on reliability for structures*. Subsoil bearing capacity of the spread footing is determined in relation to both Eurocode 7 and Polish standard. It should be noted that in the reliability of the foundations the applied safety measures take into account the randomness of both: geotechnical parameters and loads, such approach is not fully possible according to the standards used in the design of foundations. On the other hand, probabilistic analysis is much more sophisticated and requires the understanding not only of engineering but also mathematics. For example, the difficulty of defining correlation coefficient between *R* and *S* forces most authors to assume that variates (resistance and loads in this case) are not correlated, which is correct in case of pile foundation, but can be very disputable in case of footing. Thus in the paper the influence of correlation coefficient on the reliability index is also shown.

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IMPROVEMENT OF THE MECHANICAL CHARACTERISTICS OF SOIL CONTAMINATED WITH LUBRICANT OIL – CAL MIX

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ABSTRACT

The demographic and technological evolution is confronted by geo-environmental problems. When chemicals or contaminants are introduced into the soil, they affect the soil properties such as the grain size curves, the structure, compressibility and stress-strain behaviour. However, the classical soil mechanics models and method to incorporate the effects of contaminants have not yet been developed. In this study the proposed analysis of geotechnical structure involving effect of chemicals contaminants such as a wasted lubricate oil with lime on the main factors affecting the behaviour of a compacted soil mass and analysis of a granite residual soil involving effect of the moisture on the compressibility and shear stress behaviour. These concepts can improve the use of these kinds of soils in geotechnical engineering works.

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SMALL STRAIN SOIL CONSTITUTIVE MODELS HS-SMALL & RU+MCC: 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. In the RU+MCC model, normal consolidation behaviour is described by the Modified Cam Clay model, which is an isotropic hardening elasto - plastic model originated by Burland in 1967 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 form Schanz and Vermeer. This concept base 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. 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 based on advanced laboratory and field soil tests like resonant columns, triaxial test, dilatometer test and many others.

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COMPLEMENTARY SOIL INVESTIGATION AS A CHANCE TO OPTIMIZE THE FOUNDATION DESIGN

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ABSTRACT

Properly performed soil investigation is important for almost all civil engineering tasks. Nowadays when there is a serious lack of plots with good ground water conditions Investors are often forced to make their projects even when ground water conditions are poor or not suitable. The article presents the case study of a small commercial facility in Chojna, Poland, for which poorly conducted preliminary soil investigation could have caused excessive costs for the investor. The layer of organic soils in the ground was the reason for planning huge exchange of soil. Quick reaction of the construction manager, caused that investor decide to hire geotechnical specialist. A preliminary calculation shows that simple ground improvement should solve the problem. After that, additional static plate tests were performed. Also from organic soil oedometer test, and direct shear tests has been made. In the next step FEM model of subgrade was developed, and serviceability limit state was checked. That provides the possibility to design subgrade improvement by crushed concrete pressed into the organic layers. This type of soil improvement helps to decrease the settlement from 44 mm to more or less 15 mm under the foundation bench. The additional problem to solve was the construction of the roads and parking, especially in the zone of supplies, where heavy trucks were planned to drive. The individual project of geosynthetics reinforcement of pavement and its subbase was performed to prevent uncontrolled settlements. As a next step surveyor measurements of settlement are planned to be perform for the object in different construction stages. Authors of the paper wants to show that even when ground conditions of the plot are not very well, properly planned and developed soil investigation can provide some unexpected savings for the Investor. Paper ends with some conclusions about geotechnical investigation and its influence for the building process.

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STABILIZATION OF SWELLING SOILS USING GYPSUM COLUMN TECHNIQUE

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ABSTRACT

Expansive soils are soils that swell as they get wet and shrink as they dry out. These soils cause severe damages to light structures like highway, airport, low rise buildings. In order to minimize these problems, the methods like changing construction site or replacing problematic soil with a suitable one may not be always economic. Stabilization of soils with some additives like lime, flay ash, cement is generally more economic. In order to obtain an improved soil using additives, either the additive is mixed with the soil in situ or columns are constructed in the soil. The mechanism of column technique is based on ion migration from the column to the surrounding soil. The aim of this study is to investigate gypsum column performance on stabilization of swelling soils. For this purpose, a laboratory model study was conducted. In order to build the laboratory model, a Na bentonite clay was appropriately compacted in a box with dimensions of 43 x 60 x 43 cm and a gypsum column with 50 mm in diameter was constructed in the soil. After a curing time of 90 days, the changes on swelling behaviour of the soil with distance from the column were determined. A treatment distance of 38 mm was achieved and an improvement of 30% was obtained within the distance of treatment. The results of this study show that gypsum column technique can be used for stabilizing swelling soils. However, the technique is more appropriate for stabilization of soils with high permeability in order to obtain a desirable treatment distance.

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RESERVOIR SEDIMENTATION USING SATELLITE DATA IN THENMALA RESERVOIR, KERALA

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ABSTRACT

India is an immense nation with high spatial and temporal inconsistency of precipitation. Keeping in mind the end goal to tap the accessible water assets and to use the water as per the necessities, numerous stream valley ventures have already been developed. To decide the useful existence of reservoir and to evaluate the sedimentation rate in the reservoir, it is fundamental to intermittently conduct the surveys. In the event that the actual sedimentation process is evaluated in the reservoir, measures can be proposed ahead of time and reservoir operational plan can be made arrangements for ideal usage of water. Some traditional procedures of measurement of reservoir sediments like hydrographic valuation and inflow-outflow techniques are unpredictable in nature, expensive and also tedious. Remote sensing method turns into a helpful instrument for valuation of reservoir sedimentation because of its spatial, spectral and time-related features can give succinct, monotonous and auspicious data with respect to the water spread area of the reservoir. Because of deposition of sediments in a reservoir, the water spread at a height continues to alter. Presently by looking at the lessening of water spread region with time, the silt deposition and conveyance pattern in a reservoir can be resolved indirectly. At last, evaluates the deposition of silt with a variation in storage capacity. In the present investigation, the sedimentation rate and volume are ascertained within the Thenmala reservoir. In Kerala, India utilizing satellite data. The satellite data during the years 2008 to 2015 was used for the sedimentation analysis. The data of IRS-P6 satellite with LISS-III sensor was obtained for 6 different dates of pass and the altered water spread regions were extracted. The initial elevation-area-capacity curves and the reservoir levels on the 6 scenes were acquired from the authorities. It was found that due to silt deposition in the reservoir, 30.136 (M Cu.m) storage capacity is lost during the last years i.e., 1985-2014.

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EVOLUTION IN TIME (1980-2014) OF DROUGHT BASED ON SEVERAL COMPUTATION INDEXES. STUDY CASE BANLOC, ROMANIA

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ABSTRACT

Drought is a major issue that humanity confronts with and due to its vast ramifications, it is also most difficult to solve. Being a natural phenomenon, it has various manifestations which scalars have categorized into meteorological, agricultural, hydrological, environmental and others, in order to better define and understand this phenomenon. Several drought indices have been proposed by different scholars for measuring it which take rainfall, temperature, sun shining and other features into account. This of course, led to a variety of interpretations which makes the phenomenon even more difficult to size up and quantify its devastating effects on a long-term scale. The seven indexes this paper makes use of, for calculating drought are: N. Topor index, De Martonne index, Domuta hydroheliothermal index, Selianinov hydrothermal index, Palfai drought index and Lang rain index. In this paper, the case study conducted for Banloc in the 1980-2014 period reveals alternating wet and dry periods which do not pose any threat of aridisation or desertification soon. However, a constant monitoring is imposed for these phenomena not to occur, made by the authorized law enforcement together with specialists from various fields.

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ADVANCE HYDRAULIC MODELLING OF MACIOVITA RIVER, ROMANIA, CARAS SEVERIN COUNTY

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ABSTRACT

Study case is situated in Caras Severin county. To solve theoretical problems of movement of water in the river Maciovita, it requires modelling of water flow in this case. Numerical modelling was performed using the program MIKE11. Advanced computational modules are included for description of flow over hydraulic structures, including possibilities to describe structure operation. The Hydrodynamic (HD) module is the nucleus of the MIKE 11 modelling system and forms the basis for most modules including Flood Forecasting, Advection-Dispersion, Water Quality and Non-cohesive sediment transport modules. The MIKE 11 HD module solves the vertically integrated equations for the conservation of mass and momentum, i.e. the Saint-Venant equations. The input data are: area plan with location of cross sections; cross sections topographical data and roughness of river bed; flood discharge hydrograph. Advanced computational modules are included for description of flow over hydraulic structures, including possibilities to describe structure operation. After simulation with MIKE 11 result the water level in each cross sections.

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ADVANCED HYDROINFORMATIC TOOLS FOR MODELLING OF RESERVOIRS OPERATION

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ABSTRACT

Reservoirs are used to control water flows through downstream waterways: downstream water supply, irrigation, flood control, canals and recreation, also for hydroelectricity generation. Operation policy is essential for reservoir operation because the impact of the operation on the environment, society and economy is significant. In the context of climate change, special attention should be paid to the following functions of reservoirs: flood control through retain water during high rainfall events to prevent or reduce downstream flooding - in this case the reservoir should be as empty in order to retain a larger volume of water from precipitation and runoff; water supply and irrigation, especially in periods of drought - in this case the reservoir should be as full in order to ensure the necessary volumes of water. A special attention should be given to electricity generation; a reservoir built for hydroelectricity generation can reduce the net production of greenhouse gases when compared to other sources of energy. Therefore, developments of reservoirs operating regulations are very important. The advanced hydroinformatic help to develop these regulations for different scenarios of dangerous hydrological phenomena: heavy and abundant rainfall; rapid snowmelt and drought. Such a tool is MIKE HYDRO Basin software, developed by DHI – Institute for Water and Environment. MIKE HYDRO Basin is a multi-purpose, map-centric decision support tool for integrated river basin analysis, planning and management. This paper contains also a case study: modelling of operation of three reservoirs (Gozna, Valiug and Secu) located in Superior Barzava hydrographic basin.

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EXPERIMENTAL AND NUMERICAL STUDY OF AIR FLOW CHARACTERISTICS OF A ROOM WITH AIR VORTEX DIFFUSER

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ABSTRACT

This paper investigates experimentally airflow characteristics of vortex ceiling diffuser and its effect on air flow in a ventilated room. Two thermal comfort criteria namely; mean age of the air and ventilation effectiveness have been used to predict the comfort zone inside the room. Effect of supply air velocity on the flow field is investigated and hence the on comfort and energy consumption. Conservation equations are solved using FLUENT commercial flow solver. The code is validated by comparing the numerical results obtained from three different turbulence models with the available experimental data. The validation shows that the standard k–ε turbulence model can be used to simulate these cases successfully. The results show that we can the saved energy by vortex diffuser than that achieved by different diffuser. The values of the velocity decay coefficient were compared for different diameters of votex diffuser.

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EVALUATION OF SEDIMENT DEPOSITION ON ÇORUM DAM RESERVOIR

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ABSTRACT

In this century, world population is gradually increasing. As a result of this increase, the energy and water need also has increased significantly. Although it is known Turkey as a country with abundant water resources it is actually located in semi-arid region in the world. Nowadays, that water resources are increasingly important for humankind and the biggest role in using these resources more efficiently is dams. The dams can deposit water in their reservoirs as well as allow water to be used in areas such as drinking water, irrigation and electricity generation when necessary. On the other hand, it protects the surrounding habitats from natural disaster like floods. Dam life is estimated to be approximately 30 to 50 years. The most important factor in the end of the dam's life is the filling of the dam dead storage by the sediment carried by the stream. In this study, the Çorum Dam built on the Çomar Stream of Yeşilırmak Basin was considered. In order to provide the irrigation and drinking water needs of Çorum, the dam construction started in 1973 and the dam was came on stream in 1977. The dam has an earthfill body and the height of the thalweg is 49 meters. The lake field is approximately 0.6 km2. Çorum dam's bathymetric maps belonging to planning stage and 2014 is available. On these maps, cross sections were drawn at intervals of 50 meters from the dam reservoir using NetCad 7.6 program. Floor elevations obtained from the cross sections were examined. The floor profiles obtained from two different maps were compared and the floor profile variation of the dam reservoir was examined over the years. It has been observed that there is an increase of 9 to 2 meters at the floor elevation up to a distance of 400 meters from the dam body. Significant change hasn't been detected at the distance from 400 meters to headwater. Besides, the elevation-volume curves were plotted using the elevation-volume belonging to data of the dam's 1977 and 2014, and comparisons were made between the curves. As a result of these comparisons, approximately, dam dead volume decreased by 79.6%, active volume decreased by 11.76% and total volume loss has been found to be 14.58%. It is expected that the dead volume of the dam will expire within 10 years if the necessary measures are not taken. Finally, Çorum Dam's current situation under sediment effect was investigated, the amount of sediment in dam reservoir was determined and the distribution of this sediment in dam reservoir was examined.

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INFLUENCE OF DIFFERENT OPERATING CONDITIONS OF A DISTRICT HEATING AND COOLING SYSTEM ON HEAT TRANSPORTATION LOSSES OF A DISTRICT HEATING NETWORK

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ABSTRACT

This paper deals with different operating conditions of a District Heating and Cooling (DHC) System and its influence on heat transportation losses of a District Heating Network (DHN). The different operating conditions of the DHC System's mean different flow rate and temperature of the network water flowing in the DHN. These different operating conditions of the DHC System result in the DHNs having variable transportation losses. The analysed DHC System consists of the Heat Only Boilers (HOB) plant and the DHN with substations and chambers. The DHNs in Poland are usually installed as underground, traditionally insulated piping placed in concrete ducts (large diameter and main pipelines) or pre-insulated piping placed directly in the ground. The result of the analysis was used to verify calculation methods of fluid flow and heat transportation losses of the DHN, when cold for consumers is generated using either absorption or adsorption chillers. The total heat transportation losses of the DHN differ according to individual systems and depend on the size of the DHC System, its heating loads and quality of insulation of the piping. This paper presents the results of the numerical calculation of the temperature distribution in the soil around the piping channel using an FDA model. The results of the numerical simulation of water and heat flow through the DHN allow to determine the total heat transportation losses of the DHN for different operating conditions of the DHC System.

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WATER BALANCE IN URBAN AREAS

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ABSTRACT

Hydrological characteristics of urban area are heavily modified related to the natural catchments. Higher part of paved areas causes faster runoff process, the travel time of rainwater is much shorter, as well as the runoff volume is bigger than in natural areas. Sewer network transports higher storm water volume in shorter time: this causes higher hydraulic load on the sewer network and following CSO. Important role in this process play also anthropogenic influences. These significantly change the water balance in urbanised catchments with addition of new water (and pollution) sources or with water transfers between particular hydrological subsystems (both natural and artificial hydrological subsystems – water supply network, sewer network). Because of these reasons it is desirable, that these negative influences will be reduced to minimum. The goal is to achieve the hydrologic characteristic of the urban catchments alike the characteristics of the natural catchment. Paper present results of a cause study, expressed in form of a system chart of the water balance. Analysed urban area has very complicated relations between particular subsystems (high exfiltration rate from the water supply network as well as high infiltration rate into the sewer network, interactions with surface and underground water). Hydrological function and impacts of particular system elements will be analysed as well as different possible management scenarios. Important parts of the analysed problems are not economical and financial aspects only, but also technical and environmental aspects regarded from the point of view of the integrated water resources management. Last but not least are also very important technical impacts, which can prevent efficient and safe operation of the water supply and sewer networks.

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URBAN PLANNING IN SCOPE OF RENEWABLE ENERGY

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ABSTRACT

The potential of marine currents is huge (Ralph Sims, 2008). Ocean energy is an emerging renewable energy technology. Design, development and testing of the devices remain mainly in the research and development stage, with many opportunities for materials science to improve design and performance, reduce costly maintenance procedure, and extend plant operating lifetimesunder the marine environment. The most mature ocean technology is the tidal range barrage, three of which, totalling 260 MW capacity, have generated about 600 GWh/year (Ralph Sims, 2008) with the largest by far located in La Rance, France. In general, such systems employ a barrier in a waterway to exploit the movement of water caused by the rise and fall in sea levels due to tides. As the tide comes in, the water accumulates bhind a dam. The gates are then shut as the tide goes out, leaving a stored volume behind the barrage that can then act as a potential energy source once the turbine gates are opened. However, no more such installations are planned because few places in the world have a sufficient tidal range of >3 m. The economic costs remain high, and environmental impacts on tidal mud flats, wading birds, and invertebrates, for example, all need careful analysis site by site. The potential marine energy resource of wind driven waves, gravitational tidal ranges, thermal gradients between warm surface water and colder water at different depths, salinity gradients, and marine currents can be given. However, technologies designed to capture this energy are mainly prototypes or demonstrations and far from fully competitive. The marine energy industry is now in a state of development similar to that of the wind industry in the 1980s, with existing technologies mainly at an early development and demonstration stage and with an economic potential that is currently very low. In order for emerging ocean energy technologies to enter the market, sustained government and public support will be needed. Because oceans are used by a range of stakeholders, the siting of devices will also involve considerable consultation. The best wave energy climates exist at the southern tip of South America, in western Australia, and to the west of the British Isles. These areas have deep-water power densities of 60-70 kW/m, but the values usually decline to about 20 kW/m nearer the foreshore. About 2% of the world's 800.000 km of coastline exceeds a useful energy density of 30 kW/m, giving a technical potential of about 500 GW, assuming that off-shore wave energy devices have a conversion efficiency of about 40% with generating cost estimates of about 80-100 Dollars/MWh at good locations, although these estimates are highly uncertain as no truly commercial-scale plan exists. The only near-commercial wave power projects installed to date total approximately 750 kW capacity. These have relatively high generation costs partly because of the facts that designs and materials that can withstand the harsh operating marine environment have to be selected and engineering designs that can withstand extreme storm conditions need to be developed. Extracting electrical energy from ocean currents could yield in excess of 10 TWh/year (Turkey's hydroelectrical capacity 2.3 109 KWh), if major estuaries with large tidal fluctuations could be tapped. Because the density of water is more than 830 times that of air, an ocean current of just 2.3 m/s can produce electricity at a rate equivalent to a mean annual wind speed of 62 m/s (Ralph Sims 2008). The best sites in the world with currents about 10 m/s are located mainly off of the west coasts of the Amerikas, the United Kingdom, and Australia where power fluxes can reach over 80 kW per meter of coast line. Current cost estimates are relatively high, in the range of 450 – 1350 Dollars /MWh. Preliminary investigations of offshore currents, such as the very swift Agulhas current off of the coast of South Africa, showed that, on the 100 m. –deep seabed, a 1-km stretch of permanent turbines could generate 100 MW of power (W. Nel, 2003). Ocean thermal and saline gradient energy conversion systems remain in the research stage and it is still too early to estimate their technical potential. Initial applications have been for building air-conditioning systems (Ralph Sims, 2008), and for desalination in open- and hybrid-cycle plants using surface condensers. In the future, these technologies could benefit island nations where power is presently provided by expensive diesel generators and sea level rise is causing water supplies to become brackish.

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HYDRODYNAMIC PROCESSES IN THE UNSATURATED ZONE OF A CARBONATE AQUIFER

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ABSTRACT

Groundwater of carbonate aquifers is a very important source of drinking water in Slovenia and elsewhere in the world. However, the heterogeneity of the carbonate aquifer makes it difficult to quantify and predict the movement of groundwater and contaminants through and/or between different aquifer zones. In order to protect groundwater of the discussed aquifers from pollution it is necessary to understand better the natural factors that control the behaviour of contaminants in these media. The detailed study of flow and solute transport mechanisms was undertaken in the carbonate aquifer in the catchment area of the Hubelj spring (South-Western Slovenia) with the aim to clarify the hydrodynamic processes in the upper unsaturated zone. The monitoring of the recharge, storage and discharge processes of the aquifer as well as the transport phenomena was established in the artificial tunnel that lies 5 to 25 m below the surface. The study based on environmental tracers - stable isotopes of hydrogen and oxygen and alkalinity. The data provided an insight into the sampled water dynamics and reactivity and the estimations of sampled water average residence times. The significance of effects of the fast preferential flow – the epiflow and of the duality of recharge processes were highlighted. The main characteristics of the epikarst zone, its role in the aquifer hydraulic behaviour and the resulting consequences on the protection and management problems of karst aquifers were discussed. The results are in agreement with the so-called epikarst hypothesis, which presumes that an important part of the karst aquifer recharge rapidly arrives into the karst aquifer conduit network from the epikarst zone. The epikarst zone plays the role of a Faraday cage with respect to lower aquifer parts, resulting in the water concentration and storage. Epiflow is the main factor controlling contaminant transport towards the aquifer saturated zone, therefore the presented results could improve the karst aquifer vulnerability characterisation.

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REHABILITATION AND RETROFITING OF WATER SUPPLY SYSTEMS IN WESTERN PART OF ROMANIA

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ABSTRACT

In Romania there are more than 13,000 localities of which, only 10%, are equipped with centralized water supply systems at European standards. In the western area of Romania there is a district operator, which manages the water supply and sewerage systems. It can start work on upgrading and rehabilitating water supply systems by accessing European funds, to meet the quality requirements imposed by European legislation. In the first stage, 15 water supply systems were refurbished, works performed in urban and rural part of western part of Romania. In the second and third stages, investments will be continuing for the rehabilitation and upgrading of all the western localities that do not meet the quantitative and qualitative conditions potable water with European standards. Water resources need to be managed very well, in the context of climate change, with water sources having to ensure the flow of the consumers in the western area of Romania. The paper shows how works the centralized water supply system of three localities in western Romania. The aim of the study is to analyse the efficiency of the current water supply system and to identify the causes that lead to the qualitative deterioration of drinking water distributed to consumers in populated centres. Laboratory determinations for samples of treated water were performed. Based on these laboratory determinations corrections were made to ensure the drinking water complies with current regulations (458/2002 Drinking Water Act and completed with Law 311/2004) On the basis of these analyses resulted the retrofitting and rehabilitation of the existing water supply system of the locality. The flow captured from underground source should be increased. To ensure the flow of water to consumers, the existing drilling and extension of the capture front will be rehabilitated. Rehabilitation of the water supply system will bring a real benefit in terms of quality of life according to environmental restrictions under Directive 98/83 / EC

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WATER QUALITY ASSESSMENT USING MULTIVARIATE STATISTICAL ANALYSIS: A CASE STUDY AT TUTICORIN

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ABSTRACT

This study presents an application of principle component analysis method to evaluate water quality data of groundwater obtained at Tuticorin. This study provides multivariate statistical technique such as Principal Component Analysis for evaluation and interpretation of large complex water quality data sets with a vision to get better information about the water quality and design of monitoring network for proper management of water resources. The fifteen groups of data including physicochemical parameters were from seventy monitoring sites for a period of two years (2016-17). The total dissolved solids; total hardness, chloride, fluoride, and nitrate (N) were identified as the most significant variables affecting water classification and quality. The water quality of sixty percentage of the monitoring sites was considered relatively good, while the areas near the industries especially in Tuticorin city was most polluted. It be used as drinking water or industrial water only treatment. There should be proper treatment with advanced green technology before any domestic use. This method provides an effective means to classify multi-zone water quality of the entire Tuticorin district. It can regulate decision-making in time.

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APPLICATION OF SMART COVER IN RETROFITTING CONCRETE BEAMS

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ABSTRACT

The evolution of structural design codes, change of building occupancy category, degradation of structures during their life cycle and other causes are responsible for the constant need for retrofitting of existing structures. Too much effort is devoted to invent and implement different methods for retrofitting existing structures. One of the main methods of rehabilitation is using FRP strips for increasing the strength and stiffness of structural components. In spite of their high strength, low ductility of FRP materials has caused several issues such as FRP-structure debonding, boundary layer cracking and brittle behaviour of the strengthened structural members. To overcome these drawbacks, in this paper the possible application of a ductile retrofitting cover in strengthening of concrete members is investigated. The proposed smart cover is consisted of Shape Memory Alloy (SMA) wires that are embedded in a rubbery substrate. The SMAs show specific characteristics including superelasticity, shape memory effect, and temperature dependent behaviour while the rubbery substrate can withstand severe stretches. To investigate the characteristics of the proposed cover, at first an analytical method based on fiber model analysis (FMA) is proposed for strengthened concrete members. In order to validate the applicability of fiber model analysis, its results are verified against experimental data for two ordinary concrete members and it is showed that this method yields to reasonable results. After verification, the fiber method is implemented to predict the behaviour of concrete members strengthened by smart cover. To capture the whole damage processes which are not completely modelled in fiber method (e.g. cover beam debonding) FE models of beams are built. Different influencing parameters including SMA percentage, cover length and working temperature are investigated through FEA and FEM model of the strengthened beam. The main outcomes of the analytical and numerical simulations can be summarized as; a. Attaching smart cover increases the stiffness and strength of the retrofitted beam, b. Smart cover strengthened concrete beams show ductile behaviour comparing to corresponding FRP-strengthened beams, c. Phase transition temperature of the SMAs plays important role in the structure smart cover assembly behaviour. d. mart covers are less likely to deboned from the strengthened structural members than FRP strips. Regarding the above outcomes, the application of smart cover can be advised as an alternative method of strengthening of existing concrete structural members.

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RAILWAY BRIDGES AS A SOURCE OF NOISE: SELECTED EXAMPLES

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ABSTRACT

This paper presents the results of research of noise in the surrounding of three railway bridges of different type of deck structure. One of the objects has a track fixed directly to steel plate of the deck, next object has a deck in form of an open grid. The last of the objects is a bridge, where the track was laid on ballast. Sources of noise in these bridges were identified. Reasons for an increase of noise when a train crosses the bridges can be generally divided into two groups: a) vibrations coming from wheels transmitted through rails to a bridge structure, make its components vibrate; structure elements with large surface may act as membranes of a loudspeaker and emit unwanted sounds; b) in bridges with an open deck the lack of insulation makes the sounds at point-to-point contact of wheels with rails disseminate. The biggest threat to the environment from the noise emission point of view is caused by steel bridges with an open deck and with a steel deck with no ballast. The noise next to the track beyond the bridge depends mostly on the type of train, its speed and wheels condition. The noise under the bridge was almost 15 dB higher than the noise nearby the track beyond the bridge. The level of noise next to the bridge was higher 3.5 to 10 dB. Nowadays, the analysis of railway bridges for the emission of sounds should be the standard element in the process of preparation and design of investment projects. Such recommendation is included, among others, in Eurocodes.

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THE INFLUENCE OF COMPRESSIVE STRESS ON THE LOAD-BEARING CAPACITY OF MASONRY WALLS SUBJECTED TO VERTICAL DISPLACEMENTS

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ABSTRACT

The paper describes the results of tests of masonry wallets made of solid clay bricks with joints of normal thickness (10 specimens) and filled vertical joints and autoclaved aerated concrete (AAC) blocks with thin joints and unfilled vertical joints (5 specimens). The specimens made of clay bricks were 1290 mm wide, 1415 mm high and 250 mm thick, while the specimens made of AAC blocks had the width of 1250 mm, the height of 1510 mm and the thickness of 240 mm. The tests were carried out in a specially designed steel test stand witch which the masonry specimens were monolithised. The force applied along the vertical edge of the specimens and causing the vertical displacements was carried out by means of hydraulic cylinder. The masonry specimens were tested without participation of vertical compressive stresses perpendicular to the bed joints σ_c or the tests were carried out after initial compression, which induced stress in the wall with mean values from 0.3 to 1.5 N/mm^2 for solid clay brick specimens and 0.9 N/mm^2 in walls made of AAC blocks. The compressive loads was implemented using four pairs of tensioned steel tendons equipped with springs to compensate the influence of masonry displacements. The deformation angles of masonry were also investigated. Deformation angles were calculated based on changes in the length of the system of measuring bases placed on both surfaces of the specimens. The compressive stresses σ_c influenced the values of the mean shear stress $\tau_{cr,\sigma}$ (force inducing vertical displacements divided by the area of the vertical cross-section of the specimen) at which the first oblique crack appeared. The $\tau_{cr,\sigma}$ stress was always greater than the stress $\tau_{cr,0}$ at which the first crack occurred in the specimens tested without compression. The ratio $\tau_{cr,\sigma}/\tau_{cr,0}$ for solid clay brick specimens ranged from 1.38 to 2.24, depending on the stress value σ_c and 2.18 for masonry made of AAC blocks. Compressive stresses also influenced the increase of the masonry deformation angles at the moment of the first cracking $\theta_{cr,\sigma}$ in relation to the deformation angle $\theta_{cr,0}$ of the specimens tested without compression. This effect was proportional to the increase of τ_{cr} so that the mean modulus of deformation was about 1630 N/mm^2 for clay brick walls. In the case of specimens made of AAC blocks a ratio of stress to angles of deformation G_{cr} equal to 631 N/mm^2 when the tests were not accompanied by compressive stresses (σ_c = 0) and 461 N/mm^2 when σ_c = 0,90 N/mm^2. Similar results were obtained in the case of the effect of the compressive stress σ_c on the increase of shear stress τ_u and the accompanying deformation angles θ_u at the maximum force inducing vertical displacements of masonry specimens obtained in tests.

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CRACKING AND FAILURE MECHANISM OF MASONRY WALLS LOADED VERTICALLY AND SUPPORTED BY DEFLECTING STRUCTURAL MEMBER

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ABSTRACT

The paper describes some results of tests on solid walls and walls with openings in full scale, which were built on the steel structure subjected to vertical deflection. The walls had the length of 4550 mm, the height of 2450 mm and the thickness of 180 mm and were made of silicate blocks of group 1 per PN-EN 1996-1-1 standard with mean compressive strength of 17.7 N/mm^2. The specimens had thin bed joints and unfilled head joints. Solid walls (A type), walls with one door opening located unsymmetrically in relation to the vertical axis (B type), specimens with two door openings located symmetrically (C type) and walls with one door and one window opening (D type). The test were carried out in the specially designed steel stand that allowed to test masonry full scale walls subjected to simultaneous increasing of vertical compression load and deflection of the structure which they are supported on. The vertical load of the top walls edge was realized wit the use of two hydraulic jacks with range up to 500 kN. The vertical deflections of steel structure supporting the masonry wall were realized in two ways, by means of loading the top edge of wall and with use of the elements of deflection enforcement system. Apart from vertical loading and support displacements, the displacements of the masonry along the eleven sections on each surface in two fields were also measured. The measurement of changes of the measuring sections length was used for calculating the mean deformation angles of the specimen in both fields. The walls without openings were rigid enough to separate from the support even at the deflection not exceeding 1.5 mm. The walls with one door opening located unsymmetrically also crack at early stage of tests. In this case, the separation from the support of a part of the wall without opening occur and cracks appear at the end of lintels caused by rotation of parts of wall separated by door opening (at early stage of tests treated as rotations of rigid bodies). In the case of walls with two symmetrically located door openings, the first crack appeared at the ends of the lintels as a result of rotations of pillars caused by small, smaller than 3 mm support deflection. The first cracking of walls with the window and door openings took place under the window opening and in the area where lintel was supported by external pillar adjacent to the window opening.

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THE INFLUENCE OF BUILDING STIFFNESS ON ITS TILT UNDER MINING CONDITIONS

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ABSTRACT

Underground mining exploitation causes formation of depressions on the surface of the basin, which are described by deformation indicators of the mining area. One of the indicators is the inclination of the mining trough profile T, which causes the construction objects to be tilted from the vertical. Operation of a single-service area might terrain slope T of the order from 5 to 10 mm / m. Significant slope values of the basin profile occur in the case of aggregation of inflows from subsequent mining operations, in the situation when mining works stop in more or less one region. Then, in the case of the established mining basin, the slope of the area is worth several promiles. In the current engineering practice, the slope of the terrain is assumed to be inclined with the tilt of buildings from the vertical, i.e. $T_b = T$. Tilt of buildings in the area of mining activity depends on the mining and geological conditions, changes in the rigidity of the mining substrate in the surface layer co-operating with the foundation of the building and finally on the construction factors. The research presented in the article concern constructional constraints, i.e. the influence of stiffness of floor disks on the tilt of building walls in mining exploitation conditions. The research was carried out on a model of a tenement house with a traditional construction whose rigidity was differentiated by the type of modelled ceilings. Numerical simulations were carried out for two computational models (variant I - with wooden ceiling slabs in above-ground storeys and a brick floor ceiling above the basement and option II - with concrete ceiling slabs on all floors and with wreaths in load-bearing walls). The main goal of the undertaken research was to show in a computational manner (for specific construction conditions according to variant I and II), a variable tilt of the building walls at the oblique position of the mining works front against the horizontal projection of the segment ($\psi = 45^{\circ}$). The analysis of the results of numerical tests allowed for the interpretation of the behaviour of the wall construction in in-situ conditions, i.e. sometimes observed incompatibilities in terms of tilt of building partitions at the oblique location of the mining works front. Inconsistencies in terms of various sizes of wall tilts demonstrate the important role of spatial rigidity of the building, which is significantly affected by floor disks. The summary contains final conclusions that refer to the observations specified in the archival works of the Building Research Institute.

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CALCIUM SULFOALUMINATE BASED CONCRETE MECHANICAL CHARACTERIZATION

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ABSTRACT

In the last few years, sustainable cement manufacturing has been under the spotlight. Finding alternative cements while maintaining or improving current performance standards is scientist's effort. In particular, Calcium sulpha-aluminate (CSA) cements represent a very promising alternative compared to ordinary Portland cement (OPC) because of its high early strength development, excellent durability against sulphate attack, good performance in aggressive conditions, low energy consumption as well as reduced CO2 emissions. This paper presents the results of several experimental tests, planned in order to characterize the thermo-hygro-mechanical behaviour of CSA-based concrete since first minutes after casting. 12 different tests were carried out: rheology (creep and shrinkage) tests, water porosity, compressive strength and indirect tensile tests, measurement of the temperature evolution during the cement hardening, fracture energy evaluation, setting time evaluation, stress-strain curves, semi-adiabatic curing test, fatigue test and freeze-thaw test. Different curing periods have been selected in order to analyse changes in compressive strength with respect to time periods from about 4 h to 198 days. The total number of samples was 153 with an additional 20 samples used for the calibration phases of the tests. Experimental results show that CSA-based cements can be formulated to produce durable concretes with physical properties comparable to those of common classes of Portland cement concrete.

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PROBABILISTIC ASSESSMENT OF LAPS AND ANCHORAGES STRENGTH IN REINFORCED CONCRETE STRUCTURES

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ABSTRACT

In common practice and in design codes the evaluation of laps and anchorages strength in reinforced concrete structures is performed by means of empirical or semi-empirical equations. These models couple the knowledge coming from the experiments and from the physical assumptions related to the actual resisting mechanism. In fib Model Code 2010 an efficient semi-empirical resisting model for the evaluation of laps and anchorages strength has been proposed. However, in order to use such kind of model for design purposes and structural verifications, it should be calibrated referring to the levels of reliability required by the design codes. In the present paper, accounting for both aleatory and epistemic uncertainties, a consistent calibration procedure based on Monte Carlo method has been used for the probabilistic assessment of the abovementioned semi-empirical model. Then, the design formulation according to a specific level of reliability is defined and its application for calculation of the required laps and anchorages length in reinforced concrete structures is commented. Finally, the comparison with the provisions of Eurocode 2 and fib Model Code 2010 is proposed and discussed.

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SHEAR BUCKLING RESISTANCE OF CORRUGATED WEB GIRDERS REINFORCED WITH TENSIONED DIAGONAL BRACES

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ABSTRACT

In corrugated web girders, many phenomena occur that reduce girder shear resistance to the values below those resulting from pure bending. One of those phenomena that affect resistance and shear buckling resistance is the mechanism of the corrugated web failure due to the action of shear load. For girders with wave-shaped folds, the mechanism is still presented separately as a loss of local and global stability. For girders with a trapezoidal web profile used in bridge structures, the failure mode having the features of loss local and global stability has been classified as interactive one since the mid-1990s. This unified classification brought about the development of many theoretical models, based on interactive buckling resistance, used to estimate the design shear buckling resistance. This study presents the analysis of the shear buckling resistance of the corrugated web of SIN girders reinforced with tensioned diagonal braces. The analysis is based on the determination of the interactive buckling resistance. Experimental investigations into shear buckling resistance were carried out using girders with the web height of 500, 1000 and 1500 mm. The girders were reinforced with tension diagonal braces located in the girder support zones, i.e. in the intervals in which the load produced by a shear force is greater than the web shear resistance. Load displacements paths LDP $P(y)$ and the results of strain gauge measurements of simply supported SIN girders were analysed. The girders employed in experimental investigations were modelled using FEM. On the basis of strain gauge measurements and separated load-displacements paths, the shear buckling resistance of the corrugated web of SIN girders reinforced with tensioned diagonal braces was estimated. That was performed for the experiment and FEM analysis. It was demonstrated that tension diagonal braces increase the linear-elastic area of LDP $P(y)$, thus causing an increase in the global critical force that affects the value of the design shear buckling resistance of the web. The strengthening of girders with tension diagonal braces leads to an increase in shear stiffness of the system consisting of the web and diagonal braces. Consequently, the global resistance of the girders is enhanced. On the basis of laboratory tests and FEM analysis, a solution was proposed for estimating the design shear buckling resistance of corrugated web girders reinforced with tensioned diagonal braces. The congruence range of the solution based on the interactive buckling resistance and the experimental results and FEM analysis was 1.06-1.25. The adopted solution accounted for the effect of the interaction loss of local and global stability the corrugated web in girders reinforced with tensioned diagonal braces. The other issue that was taken into consideration was the division of the shear force between the diagonal braces and the corrugated web. The results of investigation into shear buckling resistance were compared with those obtained using the method proposed for design buckling resistance estimation, and also the computational model in accordance with Eurocode EC3.

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ANALYSIS OF SHEAR ANGLE IN CORRUGATED WEB GIRDERS

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ABSTRACT

Currently, plate girders with corrugated webs are commonly used in the load carrying structures of steel buildings and also public buildings. According to the manufacturer' specifications, webs are made from thin hot rolled flat steel sheet 2, 2.5 and 3 mm in thickness. They utilise sinusoidal profile. Available girders range from 333 to 1500 mm in height. Corrugated web girders are constructed in such a way that the load rising from shear forces is supported by the web, whereas flanges support the load produced by the action of bending moments. The analysis of shear buckling resistance and the results of investigations into corrugated web girders indicate a substantial influence of rigid end stiffeners on the shear buckling resistance of the corrugated web. In simply supported SIN girders, support stiffeners can be made from I sections or T- sections. In cantilever girders, however, the role of support stiffener can be performed by end plate joint that connects the cantilever and span parts of the girder. The phenomena that affect the change in the value of the shear buckling resistance are directly reflected in a change in the shear angle γ of SIN girders. This study reports investigations into a change in the shear angle in simply supported and cantilever girders with a corrugated web. As regards simply supported girders, the analysis was performed for girders with semi-rigid and rigid end stiffeners. For cantilever girders, however, single cantilever girders were selected due to the significant effect of cantilever load P on the girder span. Experimental investigations were conducted using WTA, WTB and WTC girders with the web height of 1000, 1250 and 1500 mm. The load-displacements paths (LDP`s) of the shear angle $P(\gamma)$ were analysed. It was demonstrated that rigid end stiffeners contribute to an increase in the linear range of changes in the shear angle in the LDP $P(\gamma)$. That is equivalent to an increase in the value of the shear buckling resistance up to 42%. The buckling resistance, obtained on the basis of measurements of the shear angle γ, was compared with the results obtained from the measurements of the first buckling load with the solution developed by the author, and also with a widely used computational model acc. Eurocode 3. The range of congruence of the author's solution based on the determination of the interactive shear buckling resistance with the results of investigations into the shear angle was 1.04 - 1.43.

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M5 METRO LINE TUNNELLING WORKS AND THEIR EFFECT ON THE HYDRAULIC STRUCTURES OF THE DÂMBOVIŢA RIVER

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ABSTRACT

In order to carry out the M5 Metro line in Bucharest, the undercrossing of the hydraulic works related to the Dâmboviţa River was required. The common technology for the metro tunnels is the earth pressure balanced excavation (EPB – TBM), precasted segment lining and back-fill grouting to minimise the surface settlements. The Dâmboviţa River hydraulic development is made of 2 main components – the upper clean water channel and the sewage/drainage system cassette, placed below (the base slab of the channel representing the roof of the cassette). In order to evaluate the structural effects of the undercrossing on the existing hydraulic structures, a 3D finite element model was created, to simulate the sequence of construction works. The model was calibrated based on the measured settlements, during the execution works of the metro tunnels before reaching the undercrossing section (a region with similar geotechnical properties). The calibrated parameters were the elastic modulus of the back-fill grout at early hardening stages and the length of the grout, still being in “gel phase” (with no stiffness). The paper presents a brief description of the existing and the designed structures, as well as the steps folowed to creat and calibrate the mathematical model. Concerning the results, the undercrossing’s area of influence is revealed, by longitudinal and transversal effects expressed in induced displacements and stresses. Several considerations and recommendations regarding the tunnelling works are made, in order to avoid any damages to the existing facilities.

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FEM ANALYSES ON SEWAGE COLLECTOR PROTECTION SOLUTIONS

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ABSTRACT

The infastructure development can lead to circumstances in which new roads affect the existing underground public facilities, serving the neighbouring areas. In order to connect the A3 highway with a main road in Bucharest, a new junction arm is planed, crossing on top one of the major existing sewage collectors (a 3.5 m diameter cilindrical structure made of precasted segments with interior lining). The paper presents the numerical analyses using 2D and 3D models, of two protection solutions suggested for the collector: (1) a reinforced cocrete slab supported on bored piles; (2) a self-standing reinforced concrete arch calotte. Concurently, a third solution sugested by the contractor was dismissed (protection using a corrugated metal arch structure with independent foundations). All the loading conditions were considerred: earthfill and road structure weight, traffic and exceptional water pressure inside the collector. The results (expressed by the annular and sectional stresses) were compared to the collector's strength capacity. Advantages and disadvantages of each solution were ephasized and design recomandations for the protection structures were made.

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LARGE UNDERGROUND HYDRO POWER PLANT CAVERN STRUCTURAL MODELLING AND MONITORING

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ABSTRACT

As the deterministic models of behaviour analysis for underground structures have a series of limitations, regarding the simplification of the studied phenomena, nonlinear and irreversible. Abnormal structural behaviour of the underground cavern is highlighted if a set of measured values does not fit into the prognosis interval, while locating the source of the abnormality can only be achieved through the attached mathematical model. The out of the prediction measurements may have multiple causes, some of which are logical and non-hazardous, and others highlight a reduction in structural safety. Additional calculations can finally determine the state of safety of the works based on deterministic models. This approach presented in this study. The case study on Ruieni Hydro Power Plant, commissioned in the early 1990's, in Romania, is excavated in a cavern with a length of 60.20 meters, width of 17.50 m and a height of one. 37,50 m. The hydro power plant is equipped with 2 Francis vertical turbines with a total of 153 MW (2 identical Francis turbines for a 352 m head). The monitoring system of Ruieni cavern for the underground power-plant cavern provides constant and exact data on temperature variations, displacements and external loads by means of adequate instrumentation. The monitoring results combined with a FE model show that the average daily values of relative displacements are induced by temperature variations and the structural behaviour of the cavern is in the normal range. Based on the dual measurement – analysis approach, the future safety of the supporting structure will be assessed. Effort-Deformation calculations for large underground caverns play a double role. On first basis, to evaluate the new state of effort in the rock mass created by the succession of the excavation phases of the cavern as the results reveal whether the excavation is stable or can be stabilized by supporting works, on the basis of failure criteria. If after the first step the answer is positive, the second step calculations aim to determine movements and efforts in the rock and the supporting elements (provisional and final) by checking if the massive rock support assembly provides the general and local stability of the cavern at all stages of operation.

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RETROFITTING OF MASONRY STRUCTURES CONSIDERING THE ARCHITECTURAL PERSPECTIVE: A CASE STUDY IN FOCA, IZMIR

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ABSTRACT

Masonry structures have been preferred for centuries in most of the countries across the world because they are easy to build and economical due to the use of local materials in their construction. As a result of high usage volume, masonry structures that make up the architectural section of history and culture constitute an important part of the current building stock despite the developing and diversified construction techniques nowadays. The protection of these structures, which are important for culture and their transfer to future generations, is of great importance in the architectural point of view. However, these structures are built without considering any design rules and specifications while being built. Therefore, existing masonry structures have to be investigated considering current design rules and determined the performance under the seismic affects. One of the most important factors determining earthquake behavior of masonry structures is the material used. The load-bearing materials used vary according to the area where the structure is located. Other important parameter in strengthening process is that architectural perspective of these structures should not be distorting while retrofitting the structures. In this study, it is aimed to increase structural strength of the case building by using conventional and modern techniques with recovering the structure. For this purpose, a masonry structure example in Foca is selected and the material properties and architectural plan of the structure are determined in accordance with the original. Structure is modeled by using a software program under seismic effects. Displacement and stress values for each acceleration record are obtained and an evaluation is made in the direction of the analysis results and determined seismic performance of the structure. After that, structure is retrofitted according to current design codes and without distorting the architectural perspective.

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FLUID-STRUCTURE INTERACTION ANALYSIS AND THE DETECTION OF WIND INDUCED VIBRATION OF TRIANGULAR LAMELLA

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ABSTRACT

The use of very thin, subtle and light structures as an external part of buildings causes many problems related to wind induced vibration. Constructions of this type occur mostly as a part of roofs or design facades. The principal idea of this paper is to show dynamic response of triangular lamella exposed to wind gusts, which frequency is equal to the first natural frequency of the lamella. By the two-way software fluid-structure interaction (FSI) analysis, oscillation of the lamella was detected. The solution of two-way FSI analysis requires co-simulation between computational fluid dynamics and structural mechanics. In the simulation, it was essential to simulate conditions that if met, create resonant vibration of lamella caused by vortex-shedding on the leeward side of the structure. If the frequency of vortex-shedding matches the resonance frequency of the structure, the structure begins to resonate and vibrates in harmonic oscillations driven by the energy of the flow. In this case, vibration rises and structure can be damaged or deformed permanently. For the long-term vibration, fatigue stress and subsequently fatigue failure is significant. By the usage of empirically derived equations, input data for the software simulation were obtained. It was important to consider mainly natural frequency of lamella, frequency of vortex-shedding behind the structure and also right properties of air such as wind speed, frequency of wind gusts, density of air and Strouhal number. As a conclusion, dynamic response of lamella in the form of deformation and wind stream pattern depending on the time is shown. It has been also shown that if the inputs are specified correctly to software simulation it is possible to analyze time history of many variables such as deformation, wind speed, and acceleration. By this method, it is possible to determine not only the maximum variables such as deformation or wind speed, but also its entire time history. In practice, it is therefore possible to create different design situations and, on their basis, design the lightweight non-bearing structures exposed to the wind.

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NOVEL TOPOLOGY OPTIMIZATION TECHNIQUES ADAPTED TO STRENGTHENING OF CIVIL STRUCTURES SUFFERING FROM THE EFFECTS OF MATERIAL DEGRADATION

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ABSTRACT

Over years, cultural heritage monuments and historical buildings, as well as old civil structures, have been exposed to slow aging processes, material damage and degradation due to climate and environmental changes or problems resulting from poor maintenance. The task of repairing and strengthening of historical structures can be extremely challenging, because of architectural value of buildings, from one side, and selection of appropriate engineering techniques, from the other. The estimation of technical condition of the old structures, from the engineering point of view, is usually difficult or even impossible to carry out in a precise way. Because of a limited knowledge about stiffness of the considered structure, the designing of strengthening elements for historical structures becomes a motivation for developing new concepts and engineering techniques. In what follows some of the well-known, conventional reinforcing methods, like implementation of wood and steel frames or tie rods, have been gradually replaced by innovative approaches, which allow the resulting structures to become lighter, stronger and also attractive from the aesthetic point of view. This paper presents the novel design technique for retrofit strengthening of existing civil structures suffering from the effects of material degradation. The unknown stiffness distribution within weakened structure is modelled by randomly distributed material data, including cracks and reinforcements of original structure. The idea is to adopt topology optimization techniques to find the optimal layout of strengthening elements for loaded, initially and randomly weakened structure. Classical approach to topology optimization is to find within considered design domain the distribution of the material which is optimal in some sense. The material data for design-active and design-passive regions of the structure are defined first. Then, optimization process, understood as minimization of the structure compliance, is performed and material is removed from the parts of the structure where it is not necessary to the parts, where it is essential. Finally, the considered structure takes on a new shape, while the amount of the material is reduced to assumed volume fraction. The new idea discussed in this paper is to implement into optimization process a random information about the stiffness of the original structure by modelling design-passive regions with randomly distributed values of material data. As a result, the new layout of strengthened structure for which the assumed volume fraction is preserved can be obtained. This approach allows to reduce a mass of strengthening elements, but what is essential, the complete information about the material degradation level of the original structure is not necessary to perform the optimization process.

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STABILITY OF PLATE GIRDER WEB WITH LONGITUDINAL STIFFENERS, ACCORDING TO EN 1993–1–5

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ABSTRACT

In the paper two methods for considering plate buckling effects, take from the EN 1993-1-5, are discussed. The first method determines the resistance of a cross section by "effective widths" of its various plate elements in compression, where the reduction of stiffness and strength due to local plate buckling is reflected by a reduced section with "holes" (non-effective zone) in the cross sectional area, which is supposed to be stressed until the flanges reach yielding. The second method determine the resistance of a cross section by limiting the stresses in its various plate elements without considering "holes" by using "reduced stress limits" due to local buckling. In the paper the method to determine critical plate buckling stresses for slender, longitudinally stiffened plates is presented, according to EN 1993–1–5. The panel consists of o thin plate stiffened with one or two stiffeners is considered. The elastic critical plate buckling stress is computed based on the column buckling stress of a stiffener strut on an elastic foundation. The gross cross-sectional area of this strut is composed of the gross cross-sectional area of the stiffener and the cross-sectional area of adjacent parts of contributively plating. The adjacent parts of the contributes plating are a proportion of the subpanel width when the latter is fully in compression or a proportion of the depth of the compression zone of the plating subpanel when the direct stress in the latter changes from compression to tension. Included numerical example provides procedure for the calculation of adjacent parts of the contributively plating and their critical stresses. The results obtained by using EN 1993–1–5 rules and FEM software are compared.

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REDISTRIBUTION OF INTERNAL FORCES IN RC BEAMS DUE TO FIRE ACTION

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ABSTRACT

The overall safety of statically indetermined structures constructed from concrete in fire situation depends not only on structural elements behaviour, but also – even to greater extent – on redistribution of internal forces within the whole structure being the progressive effect of fire duration time. As a result of fire action, due to relatively low concrete thermal conductivity, non-uniform temperature field is created in structural elements cross-sections. At the same time, significant deformation may occur that are restrained by the presence of adjacent elements and as a result of deterioration in material properties stiffness reduction takes place. Hence, internal forces within the whole structure are subjected to redistribution, while the deformations, failure modes and load-bearing capacities change. In the paper there is discussed the problem of redistribution of internal forces (bending moments) in statically indetermined RC beams under the action of fire temperatures. Some selected information from the literature (J.-C. Dotreppe, J.-M. Fransen / 2005; fib Bulletin no 54 / 2008; G. Zhenhai, S. Xudong / 2011) are summed up and briefly commented. As to the bending moments values along the beam, within the fire duration time there is observed the reduction of moments for span cross-section with the increase in moments over the support. Such redistribution of internal forces can be safely carried by the beam if only appropriate amount of top reinforcement over the support is provided. It is worth mentioning that redistribution of internal forces will be even of more importance for RC frames, where variations of bending moment and shear forces within the structure are to be expected, together with possible magnification of the second order effects for columns as a result of deformations caused by the fire action. There are included the results of analysis for RC beam carried out with the application of FEM (Abaqus software package) aiming to determine the process and final effects in time for redistribution of internal forces in span- and support cross-sections of single span beam fixed at both ends and subjected to fire scenario according to standard ISO 834 temparture-time curve. Progression and effects of changes in internal forces are described by the diagrams of effective stresses (Mises / H-M-H hypothesis) distribution within the analyzed cross-sections of beam as a function of fire duration time. Results obtained from conducted analysis proved the importance of redistribution effects in fire design procedure for RC beams for longer fire duration time and indicated the necessity of application of additional detailing rules as to the top reinforcement over the supports when the required fire resistance exceeds the level R90, which is generally in compliance with the approach of EN 1992-1-2 standard for reinforced concrete structures fire design.

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ENERGY SAVING EFFECT IN CONDITIONS OF AIR INFILTRATION THROUGH EXTERNAL WALL MADE OF AIR-PERMEABLE MATERIALS

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ABSTRACT

The purpose of research consists in analyzing the results, obtained on the development of lightweight ceramic materials with variable cellular structure parameters for efficient control of heat exchange and air permeability processes in external enclosing structures of buildings; in the compilation of the model of economizing effect in such a structures with penetrable porous medium. The features of thixotropy processes of ceramic slurry masses based on natural silicites are investigated. Lightweight ceramics with variable parameters of the cellular structure was obtained by the method of vibra-swelling at a frequency of vibration of the slurry 1200...1500 min^{-1}, the amplitude 3...5 mm, during 3 min. A model is developed, that describes the heat transfer and air-permeability processes in external enclosing structures during the movement of countercurrent heat flows from the heated room and as an infiltration from the outer surface of the enclosing structure. This model takes into account, that with such an exchange under certain conditions may arise the economizing effect, in which part of the heat flow of the room is transferred to the pores of the material. It is shown, that according to standards of thermal protection of buildings the process of infiltration of cold air is considered as an unfavorable factor, causing the cooling of the structure mass and increasing of heat losses. Calculation model is applied for a limited number of design solutions of external enclosing structures with the material, having penetrable porous medium, that provides its increased air permeability. Based on model of economizing effect in the external wall, the approximate evaluation of the heat economy is given due to the reducing of the inlet cold air and amount of the heat on its temperature rise. As a result of research are developed the light ceramic materials with changeable parameters of cellular structure. This significantly improved the variability of macrostructure parameters, increased the degree of reproducibility of the required technical result and the strength characteristics of the ceramic material. A model is developed, describing the economizing effect, which can arise during the process of air infiltration in external enclosing with a similar material structure. According to the model the economizing effect increases with raising of building height, as well as with decreasing resistance to air permeability of external enclosure structure. There was given the effect of heat saving during air infiltration on the example of a room with a small area.

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LATERAL TORSIONAL BUCKLING BEHAVIOR OF TRIANGULARLY CORRUGATED WEB BEAM

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ABSTRACT

Lateral torsional buckling (LTB) is a common failure mode of large span beams. In this phenomenon the beam becomes unstable along the unbraced length. This instability of beams can be identified by out-of-plane deflection and twisting. In this paper LTB strength of triangularly corrugated web beams under pure bending condition is investigated. Examined steel beams consist of two flanges and a thin triangularly corrugated web, connected by automatic welding. In the literature, the LTB strength problem of steel beams was dealt with mostly for steel beams with plate, sinusoidal and trapezoidal corrugated webs. Researches of the LTB behaviour of beams with triangularly corrugated webs were found out to be very limited. A parametric study is carried out for various dimensions and geometrical properties of cross sections. A general purpose finite element program (ABAQUS) was used. A number of beams FE models with different geometrical parameters of corrugated web such as thickness, height and corrugation density were developed. The corrugation densities adopted in this study represent practical geometries, which are common used for such structures in building practice. Plots showing the influence of various parameters are presented, along with some analytical approximations for the critical moment in terms of geometric and material quantities. Comparisons were also made between numerical results with design provisions in European and Russian codes of practice. The comparison shows that the proposed equations are in good agreement with the finite element analysis. Finally, recommendations were proposed for the design of simple supported steel beams with corrugated webs against lateral torsional buckling in accordance with numerical results.

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COLUMN STABILITY DURING WELDING

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ABSTRACT

This research is part of the project of strengthening of steel members under load using plates welded parallel to the member axis. Buckling load resistance of columns has to be checked during welding under compressive load. A part of a cross-section is ineffective due to high temperature near the weld. The centre of gravity is shifted and the decisive cross-section is loaded by additional bending moment. Moreover, the weld causes deformations which are higher than in case of regular welding. This paper presents authors' method determining the buckling load resistance of the compressed member during welding. The method takes into account the column cross-section, slenderness, and effective intensity of the welding heat source. The column is treated as a stepped member and its Euler's critical load is decreased. The deformation of the column and the stress are determined with regards to second order effects. The method is validated by experiments performed in the laboratory of Department of Metal and Timber Structures at Brno University of Technology in November 2017. Columns with cross-sections HEA 100 and SHS 100×5 with the length of 3 m were loaded by the maximal force determined using the analytical method and under this constant load the weld bead was being laid from the bottom of the column to 15 cm above the mid-height. Then, still during welding, the force was gradually increased until the column failed via flexural buckling. Measured values of load resistance, deformations and temperatures are compared with the authors' analytical method. All six specimens resisted the maximum calculated load and failed at slightly higher loads.

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TO THE PROBLEMS OF ANCHORING ADHESIVES IN HIGH PERFORMANCE CONCRETE

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ABSTRACT

The paper deals with selected problems of special use of bonded anchors. It is focused closely on the limits of some epoxy resin glues used for anchoring in high strength concrete. If the anchor is loaded by tension force in such conditions, the adhesive may be the weakest material in the anchoring system. Therefore, it is necessary to study and describe which parameter is mostly influencing the final resistance of anchor. The first part of the contribution discusses the design approaches used in codes. The influence of concrete and adhesive performance is closely described there. In the main part of the analysis, there are experiments with epoxy adhesives suitable for anchoring in high strength concrete presented. The analysis is closely focused on bond strength experiments using high strength concrete more than 60 MPa together with several epoxy resin mixtures. There are also some tests of resin filled by FRP reinforcement included. The problem of the testing epoxy adhesive strength itself is also one of the aims of the analysis. The thickness of the adhesive layer is very small in such applications, therefore it is quite complicated to find appropriate test configuration and also the shape of test specimen. Results of experiments in concrete specimens have shown that the shear strength of the adhesive is the crucial parameter under such conditions. Therefore the new steel specimen, effective for the testing of this shear strength was designed. The design of this specimen is presented in this paper. The main part of the experimental analysis of adhesives suitable for this applications was tested in those steel specimens to exclude the effect of concrete performance. The results of this analysis show that the limiting value of the shear strength of such adhesives is close to 30 MPa. Also some problems of adhesive shrinkage during the hardening time appeared in tests and they are also presented in load-deformation diagrams. The progress and configuration of the experiments are as well as the results described in this paper.

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THE REINFORCED CONCRETE BEAMS MADE OF HIGH-PERFORMANCE RECYCLED AGGREGATE WITH USE STEEL FIBRE

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ABSTRACT

The authors of this paper use experimental studies to propose the application of high-performance recycled aggregates in beam-type elements. The paper presents experimental studies of model reinforced concrete beams with a rectangular section using high-performance recycled aggregates with and without steel fibre. Steel fibre, which has become a point of interest for many scientists and researchers. The experimental analyses conducted as immediate studies concerned the following: deflection, load capacity, and strain of concrete, and the width and range of cracks. The comparative analysis entails the behaviour of beams made of concretes using high-performance recycled aggregates with model control elements made of regular concrete based on natural aggregates. Specific studies of reinforced concrete beam elements were preceded with strength tests of concrete samples. The studies and analyses presented in this paper will make it possible to demonstrate that the construction industry can be environmentally friendly and thus specify the ecological aspects and important economic considerations. Perhaps the studies will also provide the answer to the question whether such an aggregate can be seen as a full value substitute of the commonly used natural aggregate.

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INFLUENCE OF WARPING ON BEARING CAPACITY OF STEEL I-BEAM WITH NON-FORK SUPPORT

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ABSTRACT

The European Standard 3 does not provide a direct answer about how to verify the bearing capacity of a beam with non-fork support. For a pinned beam it assumes, that there is no constraint on lateral bending and warping or full restraint. But in the most of design cases the constrainment is somewhere between them. There are some guidelines in scientific literature and computer programs that enhance the calculation of the value of a Critical Moment (which governs the Lateral-Torsional Buckling and as a result – the Bearing Capacity of Bending) for a flexible support. But there is no official information about which of method is the best for a certain case. To confine the variables only an influence of warping on a Lateral-Torsional Buckling was taken into the consideration. It was created by adding an endplate on one or both ends of a beam. Few approaches to calculate the Critical Moment were compared. A beam based on cross section of IS-300/150/10.7/7.1 with the length of 5.0m were taken into the consideration. The first method is the General Formula from pre-code of the European Standard 3 (1992) with the additional equations for calculating the stiffness of endplates according to Lindner (1994). The second approach bases on the General Formula, but with modification of C_1 factor derived by Lopez, Yong and Serna (2006). The third method uses very similar equation to the G. F., but with other value of C_1 factor. It was derived by Lindner (1994). Those approximated formulas were compared with Finite Element Method calculation. It was conducted using three different computer programs. In the first one, ABAQUS CAE, the spatial shell model of a beam was created. An influence of a type of a discretisation on results was validated. Secondly, LTBeamN, the dedicated program for calculating the value of Critical Moment written by CTICM, was used. Thirdly, computing was made using the RFEM – an application for civil engineers which allows to create models of beams with seven degrees of freedom in each node. The results show that an endplate's influence on a value of a Critical Moment is significant. Even the thinnest plates can noticeably increase the bearing capacity of a cross-section. But over the certain value of plate's thickness there is no further growth of the Critical Moment value. The results from equations based on the General Formula and calculations with the FEM are approximate for endplates below 4.0cm of thickness. It is very important to take few approaches to discretise the model of beam with endplates using ABAQUS, because there could be a major difference between them in outcomes.

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THE EFFECT OF TEMPERATURE CHANGE ON THE BEHAVIOUR OF ACTIVE BENDING STRUCTURES USING NUMERICAL MODELING

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ABSTRACT

Transformable structures allow for the reuse of both structures and structural components by making the erection easier and less time-consuming, and the stacking volume be reduced during transportation. Due to its unique ability to utilise structural members under different curvatures and return bent elements to their initial planar or straight geometry, Active Bending exhibits the potential to broaden the existing typology of transformable structures. Because of the high reversibility apparent in Active Bending structures, materials with low elastic moduli and high yield stress are generally preferred. One of the most commonly utilised materials in this field is GFRP. The behaviour of GFRPs varies with temperature changes, given that temperature change results in changes to the elastic modulus of this kind of material. In this research, an Active Bending structure is modelled using the Abaqus software. The models have undergone a span-shortening at first, then the mechanical loadings including the structure weight and a point load have imposed to the structure. After that, the temperature of the structure is increased to a specific value. The effect of temperature increase on the maximum principal stress in the modelled structure and the support reaction forces are studied using this numerical analysis. The results indicate that the behaviour of Active Bending structures under temperature changes is proportional to the changes made in the elastic modulus of the material. Another important conclusion to consider with this finding is that these materials must be used within structures only under specific temperature conditions.

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SIMPLIFIED ANALYSIS METHOD FOR SEISMIC VULNERABILITY ASSESSMENT OF TWO-STORY CONFINED MASONRY BUILDINGS IN THE COAST OF PERU

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ABSTRACT

The importance of the seismic behaviour of confined masonry buildings and the interest generated on its study in the field of civil engineering are mainly based on the generalized usage of this type of construction in urban zones of Latin America and other developing parts of the world, as a solution to the shortage of family housing. In this context, most of the confined masonry buildings are built in an informal manner, phenomenon which is known as non-engineered construction. The main reason of this phenomenon is the social economic conditions of a wide sector of the population which, unaware of the consequences, decide to design, structure and construct their houses empirically. However, despite of being a widespread practice, non-engineered buildings are constructed to resist gravitational forces only, without taking into consideration the effect of lateral seismic loads. Consequently, many seismic events which have occurred during the last years in Latin America have brought massive destruction and great amount of fatalities. The understanding of non-engineered structures seismic behaviour from an engineering point of view is important for the generation of simplified engineering tools which allow the evaluation of existing buildings to be strengthened within the context of seismic vulnerability assessment. Under this framework, the objective of this article is to present the formulation of a Simplified Seismic Analysis Method (SSAM), which is proposed to be used as a fast and simplified practical tool for the preliminary seismic design and performance assessment of two-story confined masonry buildings. The SSAM is based on the results obtained from the application of the elastic Response Spectrum Analysis method on 142 parametrically generated building cases, which definition was based on the systematic consideration of the actual geometric characteristics of the confined masonry buildings which are the result of non-engineered construction activities in Peru. The typical form and dimensions of the buildings plan view, the characteristics of the structural configurations, the number of stories and the inertial seismic forces magnitudes characteristic of this type of structure were taken into account. The SSAM input data, procedure, relevant expressions and interest structural responses are presented. The method is applied in five real non-engineered masonry buildings from the coast of Peru with the objective of evaluating its accuracy. In addition, the article presents the derivation of analytical simplified expressions to estimate the minimum required wall-floor ratios, as well as the translational fundamental periods of vibration for these kind of buildings. The results obtained with these expressions are compared with those of some representative South and North American building seismic design codes. It is concluded that the precision of the overall SSAM's expressions is fair enough for the purposes of preliminary seismic design and performance assessment of non-engineered low-height confined masonry buildings. Lastly, the authors consider that the expressions proposed to estimate the translational periods of vibration and the minimum wall-floor ratios, together with the suggestions made for the improvement of the Peruvian building design codes, constitute the most relevant contributions of the article.

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REVITALISATION OF A VERTICALLY DEFLECTED HISTORICAL 16TH CENTURY BELL TOWER

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ABSTRACT

A wooden bell tower, erected in the 16th century, was vertically deflected due to uneven settlement of the subgrade having insufficient load-bearing capacity. The structure's condition was continuously deteriorating due to the advancing structural deformation. Structure renovation was designed and carried out in two phases. Foundations in the form of piles and strips were executed under the existing structure in the first phase, and then the structure was reinforced and straightened with twelve hydraulic jacks. The damaged above-ground components of the construction and its sheathing were replaced in the second phase. With the designed and executed procedure, it was possible to preserve the historical building in the unaltered form without interfering with the elements of the 500 hundred-years-old structure's construction. Force values and jacks' displacements were measured during straightening. The construction's behaviour, when eliminating the deflection, was described with the measurement forces in jacks and it's displacement.

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MOVING AND STRAIGHTENING THE BUILDING SEGMENT

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ABSTRACT

The segments of buildings located on areas where the impact of underground mining is seen are subject to mutual displacements. For poorly designed or executed expansion joints, the direct interaction of the neighbouring segments occurs (compression and closing down of the expansion joint). Such compression has led, in many cases, to a threat to the safety of residents, to building failures and to significant property losses. The subject of the publication is a multi-family dwelling building consisting of two semi-detached segments. Each segment is provided with a complete basement and has two aboveground floors. Due to the acting mining area curvature and compression horizontal deformations, the direct interaction of the neighbouring segments occurred in the expansion joint on the ceiling level above the last floor. In addition, due to uneven vertical displacement of mining land, the building has deflected vertically, which has considerably reduced the comfort of its use. One building segment was moved by 300 mm versus the other segment to avoid a building failure caused by direct interaction. Moreover, the comfort of building use was restored by straightening the building through uneven raising. The segment was displaced vertically and horizontally in four phases, during which mobile supports were installed, and the structure was moved in the horizontal direction and raised unevenly. All the designed works, that were individually designed, are presented in this publication. The works carried out have prevented a building failure and restored the comfort of building use.

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PROPERTIES OF BEAM-TO-COLUMN JOINT IN STEEL-CONCRETE COMPOSITE FRAME UN-PROPPED OR PARTLY PROPPED DURING SLAB EXECUTION

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ABSTRACT

The issues of load-bearing capacity and stiffness of end-plate beam-to-column composite joints under monotonic or cyclic bending moment loading have been discussed in numerous publications. Publicly available descriptions of various computational models and reports from experimental research concern joints with structure not changing in their entire load range. However, It is difficult to find the results of experimental tests or theoretical analyses of the load-bearing capacity and rotational capacity of a beam-to-column joint in composite frame with a reinforced concrete slab or steel-concrete composite slab executed on not propped steel member. Meanwhile, there are structural solutions in which floor slabs are executed using permanent formwork and temporary formwork girders arranged between the girders of a steel frame before concreting, without vertical slab props or with a limited number of them. In such a structure with a variable static scheme, the results of the internal forces analysis in the ultimate limit state may be different from the results for a structure made with full support. These differences are related among other to different characteristics of seemingly the same joints. The aim of the work was therefore an attempt to assess the impact of technology of the structure execution on the load capacity and rotational capacity of the beam-column connection in the steel-concrete composite frame in the ultimate limit state. The examples of steel-concrete composite joints of frame made with full temporary support as well as without vertical slab props were analysed. A modified two-stage non-linear component method was used in the calculations. Load capacities of the basic components were adopted according to Eurocode 3 and Eurocode 4, while their deformation values at the moment of plasticization as well as limit state deformability in ULS were adopted in two variants: according to Eurocodes 3 and 4 and according to the author's own analyses or other available results. The rotational capacity of composite joints made at several levels of the steel joint's effort during slab concreting was considered. It was assumed that during execution the steel beams are always protected against torsional buckling. Conclusions regarding the estimation of the load capacity and rigidity of the joint as well as its rotational capacity depending on the assembly method are presented.

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RESISTANCE OF STEEL-CONCRETE COMPOSITE GIRDERS WITH CORRUGATED WEB

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ABSTRACT

In plate girders with corrugated web type SIN, web thicknesses of 2, 2.5 and 3 mm and heights from 333 to 1500 mm are used. Due to shear loss stability of such a web it is often impossible to reach bending resistance of the whole girder. In Eurocode 4 it was recommended to adopt the shear capacity of steel cross-section according to Eurocode 3 in calculation of composite members. Design formulas for calculation of the plate slenderness according to Eurocode 3 are adequate to determine the stability of the web freely supported on edges. Such a scheme occurs in steel girders with slender flanges and stiffeners. In the case of a steel-concrete composite girder, the aforementioned method of calculation leads to results that differ from reality. In fact, in girders with a suitably constructed connection, it is possible to transfer a portion of the shear force through the plate. Moreover, due to change of support and load conditions of the web, its stability is also improved. The paper presents the analysis of the shear resistance of girders with corrugated web, combined with a concrete slab in a way that enables the creation of a composite structure according to the definition of Eurocode 4. The results of own experimental tests of girders with a corrugated web connected to a concrete slab and the results of testing girders without a concrete slab were used. The experimental research of reinforcement effectiveness of SIN girder (WTA 500 / 300x15) by use of concrete slab for the shear capacity of the whole steel-concrete element and the shear critical strength of the web is presented. Load – displacements paths LDPs $P(y)$ as well as the results of tensometric strain measurements of the web were analyzed. The results of the composite girder tests were compared with the results of tests of SIN girder without a concrete slab with a similar static scheme and a similar failure mode by the loss of the web stability. In addition, the first buckling load and plate contribution in transferring of shear force were analyzed. Analyzing the experimental investigations results and available analytical models, the solution of estimation of design shear buckling resistance of girders with corrugated web reinforced with a concrete slab was proposed. Using the proposed formula, the contribution of the web and concrete slab in the transfer of shear load for the whole set of girders at web heights h_w = 500 mm to 1500 mm and thickness t_w = 2 mm, 2.5 mm and 3 mm is shown. The proposed formula takes into account the mutual interaction between the local and global form of shear stability of the web, which leads to the reduction of design shear buckling resistance. On the other hand, the improvement of the web boundary conditions as an effect of the increased flange stiffness by joining it with the concrete slab was taken into account. This paper also uses the results of tests other than WTA 500/300x15 SIN girders without a concrete slab.

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SPECTRAL APPROACH IN VIBRATIONS OF OVERHEAD TRANSMISSION LINES

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ABSTRACT

Overhead transmission lines are constantly subjected to unsteady wind loads, which may gradually lead to the impairment of their durability, resulting in the reduced service life. It is the huge need to design and construct the overhead transmission lines with the respect of a wide range of load cases acting on these slender structures. Thus, an easy and fast methodology is essential to design structure able to takes into consideration all loads and uncertainties. The wide development of new materials and solutions increase the conductivity, whereas, the durability in conductors has changed, which requires a permanent monitoring. The spectral element method (SEM) has an advantage over the classical Finite element, SEM is formulated in the frequency domain and the element interpolation function is the exact analytical solution of the differential equation. Regarding these characteristics, the number of elements required for a spectral model will coincide with the number of discontinuities in the structure. The majority of common wind-induced vibrations are aeolian vibrations. These vibrations are generated as a result of vortices shed in the conductor wake under the sustained wind of low speed from 1 to 7 m/s – they occur mainly in the vertical plane. Vibrations of conductors, both single and in a bundle, form standing waves with forced nodes and intermediate nodes located along the span at intervals depending on the frequency of free vibrations. The central goal of this paper is to develop a model of the transmission line via spectral element method. Numerical tests investigate the model according to the numbers of elements needed and the structure under the wind load.

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MODELS OF STRONG WIND ACTING ON BUILDINGS AND INFRASTRUCTURE

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ABSTRACT

Since last years the most attention has been focused on the phenomena and effects of strong winds. The results of such a load consist in destroying building structures, their elements and infrastructure. Such objects are unsuitable for further exploitation, requiring demolition or extensive and costly repairs. Strong winds, including tornadoes, appear quite often in all continents except Antarctica. The largest number of tornadoes is found in the United States with the majority on the central and in the south-eastern states, e.g. Tornado Alley, in Europe and in Asia. They can occur throughout the year at any time of the day. Tornado is a rotating column characterized by small size, axial symmetry and short-term action. The area of action of tornadoes is usually smaller than e.g. earthquakes or hurricanes, but they appear more frequently and bring more deaths than earthquakes and hurricanes in total. During the formation of the tornado, the air column approaches the ground surface as a funnel of air, dust or debris. Tornadoes are known as the most violent and destructive meteorological phenomena, because cause huge damage to property and pose serious threats to life. Significant wind speed changes are accompanied by sudden changes in pressure. Tornadoes are very different from each other. The average return period is 1000 years. Due to the short duration of action of tornados, rapid changes in the amplitude and direction of velocity, and rapid changes in pressure, the conventional procedures for design of structures under wind pressure can not be used, that is the reason for analysis of models of tornadoes. Many analytical and experimental models are created that describe the tornadoes and the effects they cause. In the paper the general concept of tornado is presented. A tornado wind distribution is analysed with use of modified Rankine, Burgers-Rott and Bjerkens vortex model. These models are very useful in the analysis of assesment of damages of buildings and infrastructure. Differences between these models are presented.

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RESPONSE OF OVERHEAD TRANSMISSION LINES IN TURBULENT WIND FLOW WITH APPLICATION OF SPECTRAL METHOD

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ABSTRACT

Wind is the cause of approx. 20% of all failures of overhead transmission lines. Depends on among others magnitude of the wind, turbulence, vibrations of small amplitudes and significant frequencies are generated, as well as high-amplitude and low frequency. In the paper the response of overhead transmission line in turbulent wind flow with use of spectral method is investigated. The analysis is performed for wind flow model that reflects the real conditions. Numerical analysis investigates the vibrations of the conductor due to different parameters of turbulence. For comparison the excitation of sine function is investigated. Spectra of longitudinal wind velocity for numerical case, as well for the spectra of Karman, FSU and the proposal of author's models are analysed. Couniham and ESDU integral length scale is performed. The Spectral Element Method (SEM) is a meshing method similar to Finite Element Method (FEM), where the approximated element shape functions are substituted by exact dynamic shape functions obtained from the exact solution of governing differential equations. Therefore, a single element is sufficient to model any continuous and uniform part of the structure. This feature reduces significantly the number of elements required in the structure model and improves the accuracy of the dynamic system solution. At the same time, there are some drawbacks like the unavailability of exact wave solutions for most complex and 2D and 3D structures. In these cases, approximated spectral element modelling can be used and may still provide very accurate solutions.

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CALCULATION OF COMPOSITE CONSTRUCTIONS FOR DEFORMATION CRITERIA

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ABSTRACT

In this paper we consider the calculation of reinforcement and cross-sections of reinforced concrete structures: beams, columns, diaphragms of rigidity, etc. The article is divided into two parts. In the first part, the criterion for limiting deformations in given zones of the most stressed sections of composite systems is proposed as the basis for calculating reinforced concrete structures. The introduction of the appropriate limitations makes it possible to determine, from the equilibrium conditions of forces in a given section, one of the main geometric parameters of this section: height, width, cross-section of the working armature or the maximum possible load. An algorithm for solving the problem of selecting sections of a statically indeterminate system is shown. This approach is called the method of limited deformations (MLD). The method is illustrated by a number of examples. In the second part, the definition of points of nucleation of cracks and trajectories of their development is established by solving the problem of determining the deformed state of a composite under conditions of a plane stress state. Determination of the main deformations is performed by a modernized finite element method. The finite element calculation is based on specially developed composite elements describing the joint work of concrete and reinforcement. Two new (planar and spatial) composite finite elements are proposed. We show the scheme of formation of the general matrix of rigidity of a composite, as superposition of global matrixes of rigidity of a binder and armature.

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CRACKS FORMATION TRACKING IN CONCRETE WITH THE USE OF ACOUSTIC EMISSION METHOD AND DIGITAL IMAGE CORRELATION

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ABSTRACT

The paper presents analysis of spatial crack formation in a reinforced concrete beam using an acoustic emission method (AE) and a digital image correlation (DIC). The examined element was loaded monotonically until reaching 50kN force during the three-point bending test. Six acoustic emission sensors (two on the left and right surfaces of the sample and the other two on the bottom surface) combined with three-dimensional location method were used to find the destructive processes. The optical measuring system ARAMIS (DIC) was used to verify the obtained results. This device help to specify the location of crack and track its development on the basis of the strain map. The crack width was measured in 6 sections which were located in different positions of the element height with the use of ARAMIS software. First section was applied at the center of gravity of the longitudinal reinforcement. The following cross-sections were set every 2 cm towards the top edge of the element. In the first part of the analysis, a graphical comparison of the strain map (obtained with ARAMIS system) and the location of events (obtained with AEWin software) was made. In the second part of the analysis, the obtained crack width results were compared with number of AE events counted in zones which were defined around the previously mentioned sections. The statistical analysis (Pearson's linear correlation) shows that the number of recorded events depends on the maximum crack width, the average crack width as well as the crack width increase registered between successive load levels. The results of the study conclude that simultaneous use of DIC and AE methods provided complete information on local strain and damage location in concrete.

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THE CONCRETE CAPACITY AS A PART OF THE FULL SHARE CAPACITY OF THE REINFORCED CONCRETE BEAMS SUPPORT ZONE IN THE LIGHT OF PRESENT USED STANDARDS

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ABSTRACT

Using a new material as a high strength or more deformable concretes and high strength steels enforces continuous modifications of computational models. Especially for models regarding to calculation the shear capacity of reinforced concrete beams. Some of these changes can be observed in current European standards. An example of which are changes applied in ModelCode 2010 (PreNorm), were in contrast to Eurocodes in case of shear capacity of reinforced concrete beams supports zone some of concrete capacity was included. This paper presents a comparison analysis of a theoretical and an experimental shear load capacities of reinforced concrete beams support zone. The theoretical capacities used in this paper were calculated based on a currently used standards which were divided into two groups. First was standard in which when the shear reinforced is needed the capacity of support zone was identified as a capacity of only shear reinforcement without concrete capacity (PN-EN-1992-1-1). The second group were standards in which the support zone shear capacity were a sum of concrete and reinforcement capacities (ModelCode 2010 - PreNorm, ACI-318). Shear capacities calculated based on designated standards were verified by the experimental tests carried out on single-span, statically determinable, reinforced concrete beams, loaded monotonically to a failure. It should be also noted that in the case of the ModelCode2010, the calculations took into account the higher values of concrete capacities than the standard regulations prescribed. The comparative analysis showed smaller differences between the experimental and theoretical shear capacities in case of results calculated according to PreNorm, with higher level of concert capacities, and ACI-318 then in case of PN-EN-1992-1-1. These results of shear capacity were obtained as the sum of the concrete and shear reinforced capacities. The smallest differences were obtained by using the method given in ACI-318, which takes into account the heights value of concrete load capacity than other standards. As a result, it is necessary to carry out further analysis of the shear capacity of reinforced concrete beams support zone to determine next corrections of standard in which the level of concrete capacity in the total shear capacity should be increased.

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COMPARISON OF DIFFUSION AND MIGRATION COEFFICIENTS DETERMINED FROM TESTS ON CONCRETE IN PRESTRESSED FLOOR SLABS HC-500

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ABSTRACT

Diffusion coefficient is the main criterion for assessing protective properties of concrete to steel in the environment exposed to chloride ions originating from the sea water or deicing agents. Unambiguous determination of diffusion coefficient in the aggressive environment containing chlorides is difficult due to electrostatic interaction with other ions in concrete pore water, adsorption of hardened cement grout on the surface of hydrated minerals, and reaction with concrete components. Despite such complex physical, chemical and electrostatic processes, Fick's laws are usually used to describe chloride ion flow in concrete. In most cases, Fick's laws are the base for calculating coefficient values and standard methods AASHTO T 259, 2009; NT BUILD443 1995. Long testing time is disadvantageous, thus the flow of chloride ions is accelerated by the electric field. Results from such tests are used to determine either the value of passed charge according to ASTM C 1202 – 97, 1977 or the value of migration coefficient according to NT BUILD 492, 1999. Migration coefficient determined according to NT BUILD 492 quite satisfactory describes the process of chloride penetration into concrete under the impact of the electric field. However, we are unable to determine time, after which concentration of chloride ions reaches the critical value at the reinforcement surface under the structure normal operation, as chloride ion penetration into concrete is described by the diffusion process. Similarly, tests performed according to ASTM C 1202-97 can be only used to compare protective properties of concrete. The theoretical thermodynamic model was used in the paper by Szweda, Zybura 2013, to analyse chloride migration. As a result, the equation of migration was obtained and the converse task of the migration equation was expressed. Therefore, experimentally determined results were averaged on theoretical grounds and values of diffusion coefficients were determined from migration tests. In the paper (Szweda, 2018), the accelerated tests performed on chloride ion migration into cylindrical elements drilled directly from the top surface of prefabricated and prestressed floor slabs HC500-19/R120, were used for defining the diffusion coefficient of chloride ions in concrete, from which those slabs were produced. The obtained value of diffusion coefficient $\overline{D}_s^1 = 0{,}72 \cdot 10^{-12}$ m²/s classifies the tested concrete to the group of very low chloride permeability (Szweda and Zybura, 2013; Szweda 2016, Szweda, Ponikiewski, Katzer 2017). This paper describes how cylindrical specimens drilled directly from floor slabs, were subjected to diffusion tests carried out in accordance with AASHTO T 259 and NT BUILD443 standards, and migration tests in accordance with to ASTM C 1202-97 and NT BUILD 492 standards. The value of diffusion coefficient determined from diffusion tests and standard methods was close to the diffusion coefficient determined from the thermodynamic migration model in the non-stationary state (Szweda, Buliński, 2018).

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STATIC ANALYSIS OF PRESTRESSED FLOOR SLABS HC500 WITH CHANGES IN TENDON ADHESION TO CONCRETE INDUCED BY PENETRATION OF CHLORIDE ION

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ABSTRACT

Pre-stressed hollow-core slabs are suitable for various span applications in different types of buildings. Such structures are quick to mount and do not require boarding system or assembly supports reducing deflection, which is an economic asset (Ajdukiewicz and Mames, 2004). The performed analysis included HC-500 slabs made of C50/60 concrete with w/c ratio of 0.31, with Portland cement CEM II 52.5 R. Strength of such structures is determined by, among other things, chloride ion concentration at the interface between the surface of pre-stressing tendons and concrete. Corrosion products, induced by chloride ions, will certainly reduce stress of adhesion to concrete, and consequently, second-order momentum in the structure (Nürnberger, 2002; Yu-Chen Ou et all., 2016). It may be difficult to draw firm conclusions about the predicted strength of analysed slabs on the basis of the obtained results (Szweda, 2018). Therefore, we performed the static analysis including the changes in tendon adhesion to concrete caused by corrosion. We also analysed bearing capacity of slabs according to concrete cover thickness of upper and lower tendons. The analyses included results from the accelerated tests (Szweda, 2018) on chloride ion penetration to cylindrical elements drilled directly from the top surface of prefabricated pre-stressed floor slabs HC500-19/R120. Those results were used to determine diffusion coefficient of chloride ions into concrete, from which the analysed slabs were made. The value of diffusion coefficient $\overline{D}_s^1 = 0{,}72 \cdot 10^{-12}$ m²/s for the tested concrete was used to illustrate the results for changes in bearing capacity over time. We determined times, after which those tendons could corrode assuming that penetration of chloride ions is observed only at the surface of the upper floor slab. The obtained results were used to develop recommendations and draw conclusions for further tests.

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NUMERICAL STUDY OF A RC SLAB SUBJECTED TO BLAST: A COUPLED EULERIAN-LAGRANGIAN APPROACH

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ABSTRACT

The behaviour assessment of structures or structural elements affected by extreme loads, such as explosions, has become in recent years an interesting topic for the research community. Characterised by the application of a force in a very short time, such events have recently generated important human casualties and have had a significant economic impact on society. Thus, it is of great importance to understand and if possible to mitigate the effects of blast loads on the structural integrity. The response of structures (or sub-assemblages) subjected to explosions can be assessed through experimental and/or numerical approaches. Due to increased costs and constraining infrastructure requirements, experimental studies related to this topic are available in a limited number in the technical literature. The increased computational power and the advanced FEM software available nowadays, facilitate the efficient use of numerical approaches in the study of blast effects on structures. Two numerical methods are widely mentioned in technical literature for predicting the air blast loads effects on structures: a pure Lagrangian approach (ConWEP) where the loads are applied to the affected surfaces without the computation of the propagation, respectively a Coupled Eulerian-Lagrangian (CEL) approach where the blast waves propagation through the fluid domain (air) is computed. The main goal of the current study is to numerically investigate the structural response of a reinforced concrete slab, subjected to close-in explosion by using the Coupled Eulerian-Lagrangian (CEL) approach. A 3D numerical model is developed and a series of four nonlinear dynamic analyses is performed. An erosion algorithm is used to represent the concrete spallation phenomenon caused by cracking. Thus, if for a finite element the tension strain exceeds a certain specified limit, that finite element is definitively deleted from the numerical model. The obtained results, expressed in terms of maximum vertical displacement values and degradation patterns, are compared with the results of an experimental study available in technical literature. A good agreement between the two data sets is obtained. The maximum vertical displacement values recorded experimentally are close to the numerical corresponding values; the degradation patterns revealed through the numerical analyses match the failures detected on the experimental specimen subjected to blast. Finally, the performance of the erosion algorithm in modelling the concrete spallation phenomenon is discussed.

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THE IMPACT OF ANCHORING STEEL MAST STRUCTURE ON THE STATE OF STRESS AND STRAIN IN EXISTING MASONRY BUILDINGS

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ABSTRACT

The intensive development of mobile networks puts the operators first of all the requirement to provide coverage to their users. Antenna transmitters are primarily install on steel or prestressed free-standing mast structures, which are built on low-built areas or at a considerable distance from cities, which does not provide sufficient coverage. In order to improve this situation, it was started to mount mast constructions with a much lower height to ceilings or walls of existing buildings or on structures such as chimneys etc., with steel anchors. The paper presents an analytical solution of the mast installation to fragment of a solid brick wall. For this purpose, reactions in connection nodes were determinated and the anchoring capacity of steel bolts in brick elements was checked. Using the analytically calculated forces acting on mast attachment element to the wall, numerical simulations were performed in the ABAQUS/CAE application. Due to the two-components (brick and mortar) for modeling the masonry structure, a heterogeneous method of material description was used, consisting in the fact that each finite element is within one material. The numerical analyzes were aimed at describing the behavior of the masonry structure in the linear and nonlinear state. They illustrated the effect of anchoring a mast structure on the state of stress and deformation in individual elements of the wall. The model used in the non-linear numerical analysis was based on the plastic degradation concrete model (Concrete Damaged Plasticity), which is implemented in the ABAQUS system environment. It combines model elements based on theory of plasticity and mechanics of destruction. This model is based on two main destruction mechanisms: tensile cracking and compression failure. Elastic properties degradation of material (reduction of stiffness) is described by two scalar parameters d_t and d_c. The aim of the analysis was a qualitative assessment of the condition of the effort of the wall fragment at the anchoring point of the mast structure. On the basis of obtained results: map of stress and strain distribution, equivalent plastic strains and maps of destruction parameters distribution in individual incremental steps, it could be observing the influence of the applied non-linear analysis on the behaviour of the masonry fragment.

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STRUCTURAL DESIGN OF VENTILATED FAÇADES ACCORDING TO THE ROMANIAN CODE NP 135 - 2013

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ABSTRACT

The Code NP 135 - 2013, developed by a team of UAUIM teachers, provides the specific conditions and measures necessary for the design, execution and maintenance of ventilated facades. This paper details the principles of construction and the structural calculation rules for the design of ventilated facades with the outer layer made of brick masonry. Under the specific natural conditions of Romania, the structural design for the earthquake resistance of the ventilated facades is essential given the high risk for the life safety resulting from the local or global collapse of the veneer, as well as the high costs for restoration of the damaged masonry. In this specific context, the paper presents the main steps of the structural design process: a. evaluation of gravity loads and other external actions (wind, earthquake), b. the choice of masonry materials (units, mortars, reinforcements, anchors) according to their mechanical qualities and durability, c. verifying the satisfaction of the essential requirement of stability and mechanical resistance by simple but sufficiently accurate calculations, d. use of recommended construction details.

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ASSESSMENT OF THE ENERGY CHARACTERISTIC OF THE TERRACE HOUSE

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ABSTRACT

In the article, the energergic characteristics of a terraced house located in Kielce were assessed. The analysed house was put into use in 1982. Due to the old manufacturing technology, mainly in the area of the materials used, to limit significant heat losses, it has been thermally renewed many times. The aim of the calculations was to indicate the financial benefits, in example to reduce the costs of maintaining the house and to provide its residents with the proper comfort of use of the building, also taking into account the health aspects. The analysis of the object was made in several stages. Proposed are changes reducing the demand for non-renewable primary energy Ep, using modern thermal insulation materials, joinery with low heat transfer coefficient and renewable energy sources. As a result, an energy-efficient building that meets WT 2017 was obtained.

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ULTRASONIC TOMOGRAPHY OF BRICK COLUMNS BASED ON FEM CALCULATIONS

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ABSTRACT

Ultrasonic tomography is one of the non-destructive method used to evaluate the internal sections of building structures. This technique is based on measuring the velocity of ultrasonic waves passing through the material. A series measurements are taken from different points located on the structures. The article is devoted to the analysis of the ultrasonic tomography used to evaluate the internal geometry of the brick columns. The implementation of the basic objectives are carried out with the use of numerical FEM simulations. The waves propagation velocity and the path of its transition in the examined cross-section are evaluated. The results obtained for several examples of brick columns were compared. The first one, as a reference model, was made as a full column. The other models contain elements that disturb the wave transition. In two columns the hole was modeled, located in the middle and on the eccentricity respectively. In the next two columns steel elements, in the form of a rod and sheet, were introduced. The obtained results are aimed at showing the legitimacy of using ultrasound tomography for imaging the brick structure. Some aspects of ultrasonic technique are discussed in this paper. The results of numerical simulations enable to carry out a detailed analysis of the given structural element's material and waves propagation velocity dependence. The impact of the combination of two materials (brick and mortar) on the obtained results are investigated in this paper. The research enables the assessment of ultrasonic tomography algorithms and its usability for imaging of masonry elements.

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ON PROBLEM OF TORSIONAL CHARACTERISTICS OF THIN-WALLED STEEL BEAMS WITH WEB OPENINGS

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ABSTRACT

The current trend in the design of steel structures leads, due to the saving of the material, to the frequent use of thin-walled cold formed steel sections. In practice are widely used various systems of thin-walled steel purlins, wall girders and floor girders of different types of cross-sectional shapes. The thin-walled cold-formed steel profiles are often manufactured with web holes. These web openings are primarily used for the installation of wiring, water or drain piping, ventilation or sprinkler systems, etc. In the design of such a thin-walled steel members with web openings arises a question of correct determination of the real cross-sectional properties. This paper focuses on the problem of the real torsional characteristics determination which are parameters needed for the design of members subjected to the bending with respect to lateral torsional buckling or for the design of the compressed members prone to torsional buckling or flexural torsional buckling. These torsional characteristics include St. Venant torsion parameter and warping constant. In the forthcoming European Standard specifying the rules for the design of beams with holes, it is recommended to use the cross-sectional characteristics of the most weakened section of the member with web openings. This paper deals with the possibility of introduction of “substitute cross-section” whose cross-sectional characteristics are determined as the weighted average of the properties of full section and the most weakened section. The solution with substitute cross-section is validated by the series of tests focusing on the experimental verification of the both real torsional stiffness – St. Venant stiffness and warping torsion stiffness. Based on the results of test series with twisted beams freely supported in torsion, the St. Venant torsion parameter is being derived, respectively from the results of the test series with twisted beams fixed in torsion (the warping is restrained at both beam ends), the warping constant is being derived. Both torsional characteristics are verified by tests executed on three different lengths (2, 3 and 4 m) of beams with sigma cross-section with large circular web openings.

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ON PROBLEM OF EFFICIENT DETERMINATION OF ELASTIC CRITICAL MOMENT OF BEAMS WITH SELECTED TYPES OF CROSS-SECTIONS

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ABSTRACT

Assessment of the lateral-torsional buckling resistance of slender metal beams with no intermediate restraints requires the determination of the critical moment. Nowadays, its magnitude can be found using numerical analysis e.g. by means of widely used finite element method but also available derived formulae for the calculation of the critical moment based on the mathematical solution of the eigenvalue problem of differential equations of bending are still of considerable importance. For some common cases of support and load conditions and some specific types of cross-sections of metal beams they allow to practically and reliably calculate the desired magnitude of the critical moment required for the buckling resistance check. The paper focuses on problem of derivation of the elastic critical moment of beams of double symmetrical cross-sections and channels loaded perpendicularly to the axis of symmetry. Starting with the Vlasov's theory of stability of thin-walled members and variational methods, the process of derivation of the critical moment is briefly described. Whereas in case of beams of prismatic cross-sections the application of this method can subsequently result in general formula for calculation of the critical moment for various support and load conditions, the solution for tapered members is much more complex due to variable members in the utilized equations and requires application of specific methods. The paper deals with application of selected methods of numerical mathematics on problem of determination of the elastic critical moment of metal beams and, when possible, compares the gained values with analytical solution. Special attention is paid to tapered members (beams with tapered webs) where primarily numerical methods can be used. Based on comparison of results, suitability of the utilized methods applied on problem of lateral-torsional buckling of metal beams is evaluated with significant emphasis on tapered members. Approach to the determination of the elastic critical moment for some particular cases of metal members is outlined.

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ON THE PROBLEM OF THE IMPERFECTIONS OF THE STRUCTURAL GLASS MEMBERS MADE OF FLAT GLASS

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ABSTRACT

This paper deals with initial geometrical imperfections of the structural glass members made of flat glass. The use of the load bearing glass members is not exceptional in modern architecture, but there is not a design code to static design of it. Thus practical design is still a challenge for structural engineers. In the case of structural glass members with problems of lack of stability (columns, beams and beam-columns) it is necessary to know the shape and size of the initial geometrical imperfections to carried out a static design. European product standards of float glass panes distinguish several types of geometrical imperfections. In the frame of this paper the measuring and evaluation of the most important of them – overall bend – is presented. The initial geometrical imperfections (in the shape of overall bend) were measured on the 33 specimens. But in the real structures we can recognize three types of imperfections: geometrical imperfections of structural member (imperfect shape), structural imperfections (loading eccentricity, unknown boundary conditions) and physical imperfections (inhomogeneity, residual stresses). All that types it is possible take into account by only one equivalent geometrical imperfections. The only way how to find out the size of this imperfection is to carried out an experiment – on flexural buckling and lateral torsional buckling. Equivalent geometrical initial imperfections were evaluated using Southwell's plot of flexural buckling and lateral torsional buckling results. The amplitudes of that imperfections were statistically evaluated and with knowing of the 5% quantile of that amplitudes it is possible to obtain parameters of Eurocode buckling curves.

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FAILURE MODE IN SHEAR OF BASALT FIBER REINFORCED CONCRETE BEAMS

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ABSTRACT

The experimental tests were carried out to assess the failure model of basalt fiber reinforced concrete beams. Experimental research was focused on observing the behavior of the tested elements depending on the amount of shear reinforcement and the content of fibers. Model two-span beams with a cross-section of 80x180 mm and a length of 2000 mm were tested. The beams had a varied stirrup spacing. The following amounts of basalt fibres in concrete were used: 2,5 kg/m^3 i 5 kg/m^3. At the same time the concrete beams without fibres were examined. The beams were loaded in a five-point bending test until they were destroyed. Shear or bending capacity of the element was observed. Fibre reinforced concrete beams were not destroyed rapidly. Larger number of diagonal cracks with a smaller width were observed in fibre reinforced concrete beams. Failure of beams of concrete without fibres was rapid with a characteristic brittle cracking. Basalt fibres revealed the ability to transfer significant shear stress after cracking in comparison to plain concrete.

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OPERATIONAL MODAL ANALYSIS OF FRAME BUILDING MODULE DURING ROAD TRANSPORT

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ABSTRACT

A real structure performance does not necessarily match the way the structure's numerical model reacts to a load applied – even though it was constructed by specialists in the field and with the use of a state-of-the-art generation of software based on the finite element method (FEM). Inconsistencies are even greater, when the construction material is not as uniform and isotropic as steel, but wood, whose mechanical properties depend on a greater number of variables, like whether the loads apply longitudinally or across the grain. In such cases, it is necessary to customise a previously developed numerical model (model calibration) to fit real conditions of the performance. More and more frequently, to carry out experimental modal analyses (EMA), some measuring equipment and software is used to this end, which allows for estimation of credible structure modal parameters, i.e. particular normal mode shapes and their equivalents of natural frequency and modal damping values, which are necessary for credible calibration of a numerical model developed in FEM. It is not in every case, however, that one can excite vibration in a structure by means of classical modal exciters or modal hammers. Being a relatively new approach in the structure modal analysis, vibrations present in immediate surroundings of a tested object are used for this purpose. An analysis of such type is called the operational modal analysis (OMA). This study seeks to estimate credible modal parameters for one of the wooden modules of a multi-storey, multi-unit residential building, constructed by UNIHOUSE in Bielsk Podlaski in Poland, during its test road transport to its project site. The operational modal analysis of the frame building module was conducted with the use of a dedicated software LMS Test.Lab Spectral Testing. Measurements of vibration accelerations were carried out in 12 measurement points of the tested frame building module using a 32-channel and 24-bit data acquisition hardware type SCADAS Recorder from SIEMENS with 130 dB dynamic range and signal to noise ratio – minimum 106 dB, as well as a set of 10 high sensitivity triaxial piezoelectric accelerometers type TLD356B18, manufactured by PCB Piezotronics and two uniaxial, high sensitivity accelerometers type 333B50 – also manufactured by PCB Piezotronics. As a result of the tests and analyses executed on the proposed structure modal model, it was possible to estimate modal parameters of a single module of a frame multi-storey building, which may be used for calibration of the structure numerical calibration in the FEM software.

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INNOVATIVE COLD FORM GEB SECTION UNDER BENDING

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ABSTRACT

In recent years cold formed steel sections have been frequently designed for metal structures. An innovative GEB section was invented to serve as a primary load-bearing member in fabricated steel panels and trusses. On the basis of studies conducted recently for the cold-formed open cross-sections it may be concluded that the optimal dimension configuration may be decisive for the profile bearing capacity and production possibilities. According to the European Standard requirements every newly invented section shape should be tested sufficiently. The paper is focused on numerical analysis and experimental bending capacity testing of innovative cold-formed GEB profiles. The open cross-sectional shape is an equilateral trapeze. The tested profile was pinned at the marginal supports and point-loaded in two different structural positions. The GEB open cross-section was analyzed with or without battens. The analysis was performed due to the profile without any additional side braces along the element length. Both linear buckling analysis and non-linear static analysis incorporating geometric and material nonlinearity were carried out assuming a shell structural model. As a result, the magnitudes of buckling loads and limit loads were assessed with respect to the GEB section height and thickness. Based on the LBA results a threshold GEB section depth was estimated to ensure maximum buckling load magnitudes. In a frequent routine local buckling was detected instead of global lateral-torsional buckling modes. The non-linear static analysis GMNIA results prove that the limit load is highly affected by the profile structural position.

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METHOD OF CALCULATING THE MAXIMUM SNOW LOAD IN THE BASINS WITH SIMPLIFIED FORMULAS IN THE TRANSCARPATHIAN REGION

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ABSTRACT

The snow cover significantly affects the formation of the climate in the winter season. The snow cover has a high reflection and radiating power, dramatically reduces the radiation balance, promotes the cooling of the surrounding layers of air and the formation of a vast land of stable anticyclones. Snow, settling in large quantities in the damplands (hollows) and near various obstacles, aligns and calculates the bedding surface, resulting in reduced roughness and increases the speed of wind. Due to the dispersal and transfer of snow, the wind significantly changes the shape of the snow cover, especially in areas with a predominance of strong winds and rough terrain. The snow load in the basins is practically investigated partly by the initial data of the snow cover of the III climatic zone, and later by the observer observations at the meteorological stations, and in recent years by observations in 1948 − 2015 at 9 meteorological stations in the Transcarpathian region. To calculate snow parameters in wet, high altitude coefficients and 6 and 8 directions are used between meteorological stations with altitudes above the Baltic Sea level. Simplified formulas for maximum snow parameters in the basins are presented for the first time. It is enough to have a point height above the Baltic Sea level in order to determine the maximum snow parameters in the basins: the height of the snow cover, the density of snow, the snow load on the horizontal plane. Differences in computations using simplified formulas with calculations of these parameters at high coefficients ranges from 0 to 1.0%. The maximum snow load in the basins is used to calculate the design of the roofs of a complex configuration. These parameters are used to design ski bases in mountainous areas and to calculate water supplies from melting snow during flooding. The proposed snow normative parameters in the basins should be used when adjusting state building norms.

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SUSPENSIBILITY OF STEEL FIBRE REINFORCED CONCRETE VALUES WITH EXTERNAL RIBBED ARMORATION

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ABSTRACT

In 2013 Lviv National Agrarian University patented reinforced concrete beams containing fibove external reinforcement and steel reinforcement tape with end anchors. Such technical solutions aimed at significantly reducing the cost of construction by reducing the complexity of manufacturing due to the complete replacement frames and ribbon fibre. The task of this work was to determine experimentally the bearing capacity of normal sections of steel-fibre reinforced beams with ribbon valves and compare them with the designed according to normative documents and to develop proposals for a refined calculation methodology. For studies of the bearing capacity of normal sections, 3 beams were manufactured in the size of 1500x150x60 mm. The first beam B-1, reinforced with steel strip valves in the sizes of 1500x60x3 mm with end stops, executed without fibres; The second and third beams (BF-2, BF-3) contained, in addition to the specified reinforcement, fibres in the amount of 1.59 kg and 2.12 kg, which corresponded to the coefficient of fibre reinforcement in volume, $\rho_{fv} = 1{,}5\%$ і 2% respectively. Mechanical characteristics of concrete and steelfibrobeton were studied from the cavities of compressed prisms 400x100x100 mm and stretched samples 700x100x60 mm. The beams tested according to the scheme of the three-point bend for a run of 1400 mm. For disperse reinforcement, an anchor fibre type with curved ends HE 1050 type in diameter of 1 mm and length of 50 mm was taken, because it is a mass produced fibre in Ukraine and abroad. The percentage of fibrous reinforcement in the volume of samples taken = 1.5% and 2%, to obtain a power effect, ensuring a sufficient bearing capacity for both normal and inclined cross-sections. As a binder for the production of concrete C20/25, cement of the mark 400 (activity 42.3 MPa). Experimental samples were made of fine-grained concrete, for the manufacture of which Yasinetskyi sand was used with a grain size unit of no more than 2.5. The composition of the mixture was chosen in such a way that the fibres could not settle down to the bottom of the forms; the cone's settling did not exceed 4-6 cm. Characteristic issue was that with an increase in the number of fibre reinforcement in the beams there was a large number of cracks. Closer to the supports, they were tilted to the longitudinal axis, indicating a joint effect on the cracking process, both bending moments and transverse forces. It has been experimentally established that the bearing capacity of steel-fibre reinforced composite reinforced beams was 16% and 21% higher than the percent reinforcement of fibres 1, 5 and 2, respectively, in comparison with steel concrete. For identical values of bending moments of strain relief, the deformation of the extreme compressed fibres of concrete and the deflection of beams containing fibres are smaller than fibres without beams. The calculation of the deformation method gave a good convergence of theoretical and experimental results. Ukrainian norms for the design of steel-fibre-reinforced concrete structures require the replacement of a power calculation method using rectangular stresses of strain with a deformation method.

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DIAGNOSTICS OF DAMAGES IN REINFORCED CONCRETE BY THE PARAMETERS OF ELECTRIC RESPONSE TO MECHANICAL IMPACT

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ABSTRACT

Reinforced concrete is widely used in civil engineering. The integrity of engineering structures made of reinforced concrete is of great importance. Therefore, there is a need for monitoring reinforced concrete structures to ensure the safety of the infrastructure. To solve this problem, various methods of nondestructive testing are used. In this work, a method of nondestructive testing of reinforced concrete, based on the phenomenon of mechanoelectric transformations is proposed. The procedure for assessing damage in concrete is based on measuring an electric response to a weak elastic impact. The measured electric response is the result of two different processes: deformation and shift by an elastic wave of electric double layers arranged on the borders of the components in the concrete; and piezoelectric quartz polarization, which is contained in sand and gravel, used for concrete manufacturing. In the paper, the patterns of changes in the characteristics of the electric response registered from concrete beams during the process of four-point bending tests were studied. In the experiment, the concrete beams with a size of 100x100x400 mm reinforced by steel bars were used. The bending tests were carried out using a computerized press IP-500. During a bending test, a periodic weak mechanical impact of a concrete sample was carried out and an electric response to this impact was registered using a hardware-software complex. As a result of the experiments, the main stages of the stress-strain state under bending conditions were established. The main diagnostic parameters that carry information about structure degradation processes during bending were established based on the spectral, time-frequency and correlation analysis. It was found that the moments of cracks formation and growth during bending are accompanied by a significant decrease in the correlation coefficient of the electric responses spectra and by a stepwise change in the value of the spectrum shift (at frequency domain) at which the maximum correlation coefficient is observed. It was determined that an increase in the energy attenuation coefficient of the electric response can serve as a harbinger of catastrophic destruction in concrete. The diagnostic criteria proposed in this work can be used for monitoring the damage processes in reinforced concrete under bending conditions. This work was performed under Russian science foundation (Project №16-19-10119).

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FRP STRENGTHENING OF TIMBER STRUCTURES UNDER THE ELEVATED TEMPERATURE

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ABSTRACT

For centuries timber has been the most popular construction material. However, over the last few decades, it gave way to man-invented structural materials, it is still willingly used in civil engineering, commonly for roof constructions, ceilings but also small bridges, lookout towers. Sometimes, as a result of environmental deterioration or changes in load conditions, timber structure requires to be strengthened. Flexural or tensile performance could be simply increased by using external fibre reinforced plastic (FRP) composite sheets or strips. Such type of reinforcement almost does not change the geometry, but uncovered may be exposed to environmental influences including sunrise heating. Its temperature can exceed 70°C, while commonly as save is considered temperature below 45°C. Paper describes the bending tests of timber beams externally strengthened with three types of composites: unidirectional CFRP sheet, CFRP strip and SRP tape. Beams were heated in the various ranges of temperatures and tested in flexure. Among nine tested beams only one, heated to 95°C failed by delamination of composite overlay, the remaining beams reinforced with CFRP strips and SRP tapes could not be destroyed due to deflection outside the press cylinder range, while beams strengthened with CFRP sheets failed after rupture of carbon fibres. Experiment results show that independently of the type of reinforcement danger temperatures can be recognized over 90°C. Under that temperature behaviour of heated beams is only slightly worse than tested in room temperature and differences are visible in deflections. As a result of slippage in the adhesive layer weakened by temperature measured deformation growths. This trend applies to both CFRP strip and sheet strengthened specimens. It should be emphasized that the obtained results are much better than in the case of commonly tested reinforced concrete beams, which were subjected to delamination failure just a little above 65°C.

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ARCHITECTURAL AND STRUCTURAL ANALYSIS OF SELECTED TWISTED TALL BUILDINGS

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ABSTRACT

Nowadays, twisted high-rise buildings have become a worldwide architectural phenomenon. All buildings over 90 meters, under construction or complete that twist through a gradual rotation of floor slabs is about 30. It is a difficult task for the architects and engineers to design a tall building with a twisting form due to the complex geometrical shapes and interrelationships between non-orthogonal components. The article presents an architectural and structural analysis of seven selected tall buildings with a twisted form, of which three have a residential function (the Cayan Tower, the Absolute World Tower, the Agora Garden Tower), three office function (the Al Bidda Tower, the Evolution Tower, the Shanghai Tower) and one educational (the Mode Gakuen Spiral Towers). Buildings are characterized by different bodies and plans that are not related to the function of the object. They were designed on a convex plane (ellipse, circle, convex triangle), quadrilateral and on complex system. The central core plays a major structural role in all presented buildings. The stiffness of the bearing structure is a superior criterion in the shaping of such buildings and its value lies in the size of permissible vertical deflection. Limitation of the vertical deflection of a high-rise building is not only aimed at preventing and minimizing the adverse P-delta effects on the structure of the building. The stiffness of a tall building can also be considered as an indirect indicator of its susceptibility to dynamic influences. This impact depends on the strength of the wind and on the aerodynamic properties of the building. The value of the wind load increases with the height of the building. High spatial rigidity reduces the amount of acceleration associated with the horizontal displacements of a structure and also increases the natural vibration frequency, which for low values can be dangerous for construction. The structure can fall into resonance at critical wind speeds, which generates both high stresses and vertical deflection. The aerodynamic twisted shape has the advantage of disturbing the form of the impact of wind around the building to effectively reduce wind excitation. Mix of complex computing power, new architectural trends and sustainability were the main factors which have been driving this new design. The development of computer technologies and the BIM system had a positive effect on designing of the twisted building. Designers are currently supported by innovative computer software when designing extra-ordinary shapes. In order to simplify the design process, this software must allow rapid shape generations and enable the huge amount of digital data of the components to be handled. In addition, designing the façade system of a twisted tall building, due to its variety, is also a significant issue. However, this complicated form of a high-rise building is not only aesthetic but also plays an important role in the carrying of dynamic loads.

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NONLINEAR SEISMIC RESPONSE ANALYSIS OF CONCRETE GRAVITY DAMS CONSIDERING SOIL-STRUCTURE INTERACTION

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ABSTRACT

The stability analysis of the dams subjected to seismic loads is really very complex. One of the most important problems in evaluation of seismic behavior of concrete gravity dams is soil-structure interaction phenomenon. In this paper, we study the effect of soil-structure interaction (SSI) on seismic response of concrete gravity dams. For this purpose, two finite element models using ANSYS software are generated. The first model represents the dam alone, which is fixed at its bottom base (model without SSI). The second model illustrates the dam-foundation rock coupled system (model with SSI). Oued Fodda concrete gravity dam, located in the north-west of Algeria, is chosen in the present study. The Drucker-Prager model is considered in the nonlinear analysis for concrete of dam body. Reservoir water is modeled using Westergaard approach. A two-dimensional (2D) finite element model with 288 plane solid elements (PLANE 82) is used to model dam body alone. A two-dimensional (2D) finite element model with 792 plane solid elements (PLANE 82) is used to model dam-foundation coupled system. A finite element model with 20 structural masses (Mass21) is used to model the reservoir fluid. The horizontal component of 2003 boumerdes earthquake during 20s with peak ground acceleration (pga) 0.34 g is employed in analyses. According to finite element analysis, numerical results show that taking into account of soil-structure interaction phenomenon increase more displacements and stresses in the dam body. In addition, the damage situations in the concrete dam are evaluated. Therefore, it is becomes imperative to carry out the soil-structure interaction analysis for massive structures such as concrete dams in order to evaluate their stability.

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LIFE CYCLE ASSESSMENT OF RETROFITTING LARGE PREFABRICATED PANELS LOW-RISE COLLECTIVE DWELLINGS

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ABSTRACT

During the 1970s, the urban landscape of the major cities in Romania has suffered significant changes. The rapid growth of the urban population, even doubled in some cases has led to an increased demand on the housing market. In order to quickly provide new homes, standard housing units using large reinforced precast concrete components (LRPCC) were used. Today, these units' house more than half of the urban population. Buildings have a high energy demand during their life cycle starting from construction to demolition and are one of the main factors responsible for the negative impact on the environment. Therefore, applied LCA strategies on the built environment, in the last years, has developed into a distinct working area within other LCA practices. This is not only because of the complexity of a building but also due to numerous factors that make this sector so unique. Firstly, buildings are designed to have a long lifetime, usually more than 50 years. Currently LRPCC housing units have not yet even reached half of their intended lifespan and are now failing to meet the modern living standards. Secondly, with the constant changes of daily routines, social lifestyle and needs, buildings usually undergo changes in their forms and functions. This aspect can be as significant or more, than the original element. Third, a building has the highest impact on the environment during its use. Therefore, proper design and selection of materials are important in order to minimize the in-use environmental loads. LRPCC buildings have a huge energy savings potential and because they are project types, extensive retrofitting strategy on the whole building, extending to the community, can be implemented. By taking the ISO 14040 and 14044 standards into consideration, a Life Cycle Assessment is carried out on a chosen LRPCC collective housing unit in four distinct phases following an iterative process, in order to evaluate the behaviour of the building components, materials and systems before and after the retrofitting process. Furthermore, combinations that reduce building's life cycle environmental impacts, considering all life-cycle stages, from cradle to grave, are chosen.

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EFFECT OF INCREASED DENSITY OF NODESIN GEODESIC DOME ON ITS CRITICAL LOAD CAPACITY

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ABSTRACT

The paper reports an attempt at assessing the effect of increased density of nodes in the geodesic dome on the structure limit capacity. The initial surface of geodesic domes is the sphere divided into spherical triangles. Consecutive subdivisions of the spherical triangles decide the frequency of the geodesic domes. Two computational models (3V and 4V) were examined. The notations, namely 3V and 4V, result from the division of each side of the spherical triangle that originates from a regular icosahedron (*ikosaeder)* into 3 and 4 parts, respectively. For 4V dome, two types of structure, namely truss and frame ones, were considered. In each computational model, the structure height of 6,448.253 mm is constant, and the span is 20,866.986 mm. Due to the height-to-span ratio of 0.309, the structure of concern is classified as high-rise dome. The first case concerns the geodesic dome structure modelled as a spatial truss of frequency 3 (3V). The second case refers to the geodesic dome structure modelled as a spatial truss with frequency 4 (4V). In the third case, the structure geometry from the second case was modelled as a spatial frame. Additionally, for this system, the values of the limit load were determined for three coefficients of buckling length of the struts μ: 0.5, 0.7 and 1.0. Buckling of struts was found to be a decisive mode of local stability loss in all models. Global modes of stability loss differ in individual cases. For the structures modelled as spatial trusses, node snap-through is the global mode of stability loss, whereas for the frame structure, it is the bifurcation point of the equilibrium paths. It should be added that even when the structure is modelled taking into account strut buckling coefficient μ=0.5, which corresponds to a rigid connection, the local or global modes of stability loss do not change.

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RESISTANCE OF SLENDER-WALLED CHANNEL SECTIONS WITH MONOSYMMETRICAL SIMPLE CROSS-SECTION

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ABSTRACT

The paper reports procedures for the determination of the buckling resistance and the design ultimate resistance of a slender-walled channel section subjected to axial compression. The slender-walled channel, built from thin plates (walls), is classified as Class 4 section acc. Eurocode 3. The computational model used to determine resistances is termed the Critical Plate Method (CPM). The model is more accurate than the tools that are widely utilised. The method accounts for bilateral elastic restraint of the section component plates, and also longitudinal stress variation. The buckling resistance determined with CPM was validated using ABAQUS software. The design ultimate resistance was determined from the yield condition of the most stressed edge of the critical plate. Additionally, the process of determining the critical force acc. Appendix D to standard PN-EN-1993-1-3 was shown. The results of design ultimate resistance in the channel section were compared for different geometric ratios h/b. The results obtained with CPM were compared with those produced when the method acc. PN-EN 1993-1-5 was applied. It was found that for the mono-symmetrical channel section with slender walls, in many technical cases that are important from the technical standpoint, the design ultimate resistance (in the post-buckling range) is conditioned by eccentric compression. That results from non-symmetrical reduction in the effective section, the centre of gravity of which is shifted with respect to the compression axis of the gross section in the pre-buckling range. In the computational model adopted in PN-EN 1993-1-5, it is the weakest wall, unaffected by neighbouring walls, that decides the local buckling resistance of the section, determined from the local buckling condition. In reality, in a majority of cases, the so-called critical plate decides the local buckling of the slender-walled section. The critical plate is elastically restrained in the stiffening plate, which increases the critical stress in the former. In the paper, it was demonstrated that local buckling of slender-walled elements with mono-symmetrical open cross-section should be analysed while taking into account the effect produced when the critical plate is elastically restrained against rotation in the stiffening plate. As a rule, that leads to more optimal design.

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FOUR-POINT BENDING TEST ON A HIGH REINFORCED CONCRETE BEAM: NONLINEAR NUMERICAL ANALYSIS USING MATERIAL PARAMETER IDENTIFICATION

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ABSTRACT

The numerical analysis of concrete or reinforced concrete structures using nonlinear mechanics tools is currently the focus of interest of many scientific institutions. Today, numerical modelling of the real behaviour of concrete and concrete reinforcement is mainly performed with the aid of nonlinear constitutive relations (nonlinear material models). Current modern computational systems based on the implicit or explicit finite element method include a relatively large amount of nonlinear material models intended for modelling the real behaviour of concrete and concrete reinforcement. However, the accuracy of the simulated behaviour of real concrete and reinforced concrete structures depends on the correct definition of the input parameter values of these material models. This makes the nonlinear numerical analysis process quite difficult because the correct definition of the input parameter values of (in particular) the material models for the modelling of concrete is often not a trivial task. However, a combination of nonlinear numerical analysis with the identification of the input parameter values of the used material models based on relevant experimental data can be currently employed to address this task. The aim of this paper is to perform a nonlinear numerical analysis of a high reinforced concrete beam stressed by four-point bending so that the numerical response of the beam corresponds to the real response of the beam as closely as possible. For this purpose, an optimisation-based parameter identification process is used in this paper. Within this process, the input parameter values of a nonlinear material model of concrete which is known as the modified CSCM model and implemented in LS-DYNA finite element software are identified (optimised). Specifically, the parameter identification is based on the combination of optimisation methods with nonlinear numerical simulations and experimental data. The optimised input parameter values of the material model are an important result of the performed parameter identification process because they make it possible to achieve the primary aim. It can be concluded that the applied procedures and obtained results can be advantageously used in further analyses of concrete or reinforced concrete structures.

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FULL-SCALE MEASUREMENTS OF LOCAL WIND LOADS ON A HIGH-RISE BUILDING USING WIND TUNNEL BASED PREDICTIONS

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ABSTRACT

Land use and development is an important issue in densely populated cities where the available land resources are limited. As societal and cultural requirements evolve, urban renewal is an important mechanism in the overall strategy of making the best use of available land and infrastructure, especially in already formed built-up area. Urban renewal projects typically involve changing building forms from predominantly low-rise or medium-rise single buildings to high-rise building groups that are often located above a common podium with integrated infrastructure and community facilities. Due to the significant changes of building forms, community awareness has been raised and concerns have grown over how the newly built structures alter the surrounding wind environment and wind loads. To address these concerns, the basis for evaluation and the corresponding solutions suggested by designers and engineers are mostly based on personal and professional experience, which are often subjective. Therefore, there is a genuine need for solid scientific data to guide decision making. Significance of full-scale experiments, analysing wind conditions and local wind pressures on tall buildings are evident from the attention that has been dedicated by researchers to these programs in the recent past. This paper presents some recent results measured from a tall building located on the left banks of the Dnieper River of Kiev, Ukraine. In the first part of this study attention is devoted to the characterization of the wind flow field atop a high-rise building as a comprehensive investigation on wind velocity and local wind pressures on surfaces using wind tunnel simulation. In the second part was concentrated on the comparison results of mean wind pressures and mean pressure coefficients obtained from full-scale measurements and scale modelling in the wind tunnel. In this paper, pressure coefficients (C_p) at high-rise building is investigated and discussed. C_p values are determined in the Climatic Wind Tunnel Laboratory at the Centre of Excellence Telč, Czech Republic, the Wind Tunnel of the National Aviation University, Ukraine, and full-scale experiments. The study uses the building models tested in a set of parametric wind tunnel experiments, comprising form the local pressure measurements and Particle Image Velocimetry (PIV). This research represents full-scale method of wind loads investigation and the wind tunnel experiments. Full-scale research of wind effects in natural environment could become verification of model experiments. Till now due to a range of objective reasons there were few research works, concerning wind loads on full-scale objects. Complex study and comparison of the results of scale model and full-scale experiments could allow obtaining engineering information about the formation of wind flows in urban environment, wind loads measurements on a tall building and its influence on neighbouring low-rise buildings and constructions.

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COMPOSITE SLAB MADE OF PRECAST PRE-TENSIONED CONCRETE PLANKS AND LIGHTWEIGHT CONCRETE

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ABSTRACT

New architecture trends, which consists in designing large, space-free spaces, forces structural engineers to develop new solutions that allow them to overcome large spans with relatively small thickness. Therefore, structural engineers are looking for new or improving existing solutions both in the field of post-tensioned slabs as well as pre-tensioned precast elements. In particular, precast concrete manufacturers offer many solutions of partially or fully precast slabs, each of which performs better in one site usage conditions, and works worse in other situations. The advantages of precast structures are increasingly noticed by all participants of the construction process, including producers who want to satisfy the pressure from the construction market to develop newer, better and more hybrid solutions, so that competition with traditional concrete technology is possible. In the field of optimization of existing precast slabs solutions, in Poland, work has been undertaken in recent years on the use of pre-tensioned concrete boards proposed a few decades ago as a shuttering element and at the same time a tension reinforcement zone in the slab. The author of the work proposes making a slab made of pre-tensioned concrete elements of low thickness for use as shuttering for reinforced concrete made of lightweight concrete, which is lighter than conventional traditional concrete by about 30%. The resulting composite slab of precast elements would be relatively cheap in transport and assembly, which makes them competitive for popular ribbed floor structures usually used in houses, at the same time having the advantages of solid slabs, such as good mechanical and acoustic properties. In addition, they also compete with each other pricing, which is why they could be a good alternative for investors to choose. The work presents the concept of such slab and an example of analysis.

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EVALUATION OF TECHNICAL STATE OF REINFORCED CONCRETE AND MASONRY BUILDINGS

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ABSTRACT

This study focuses on the identifying and evaluating the physical wear and tear of selected objects and to select the optimal option between the different construction year buildings, differing initial investment cost. The essential requirements for structures, reinforced concrete and masonry buildings longevity, life–time cycle of buildings are discussed. An overview of Lithuania and European Union legislation and acts of structures technical evaluation. The reinforced concrete and masonry structures inherent defects, their causes, the classification of defects and their detection methods, there is description of defects and physical deterioration assessment are discussed. Also the multicriteria evaluation of alternative solutions is discussed. In the three the same construction buildings, but different construction years are chosen. In order to determine which alternative is optimal for the investor, a research, on the basis of the chosen methodology, is carried out. After the calculations and analysis of the three alternatives, was determined the best selection for investor and a suitable multicriterial evaluation based project was identified.

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EVALUATION OF DESIGN SOLUTIONS FOR LOW ENERGY BUILDINGS

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ABSTRACT

Evaluation of technological variants of alternative processes of construction are limited by comparing their costs and duration. There are number of technological factors, which determine the technological efficiency of the comparing technological variants, however they are evaluated by describing them qualitative. The proposed method of the alternative technological variants allow qualitative determine the technological efficiency of alternative processes of construction by comparing various evaluation criterions graded into the scores. The application of this method is particularly useful to compare technological variants, which have similar prices and durations of work. The installation of flat roof and interior finishing of residential house was chosen as a model for determining the effectiveness of technological variants. To evaluate the technological processes of construction can be applied criteria system, which combine indicators such as work mechanization, production quality, working safety, convenience. All of these criterions are graded points, where the best option is given the highest score and the worst – the smallest. This criteria system allowed quantitatively evaluate technological efficiency of processes of construction.

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STRENGTHENING AND REPAIR METHODS FOR BRICK ARCHED BALCONIES

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ABSTRACT

Many important buildings for historical heritage preservation show cracks and damages in their wall area, lintels area and balconies. Balconies are construction that is very exhibited to external weather conditions that's why their condition is mostly devastated. This happens very often. Such balconies construction is made from steel beams and masonry. Very often masonry spans are shaped into segmental arches for allowing of creation for bigger spans. Such spans lengths are in most cases about 0,9 m. There is not enough knowledge how such balconies constructions should be strengthened and what are their strength limits. Not every crack means that balconies construction has to be rebuild. Very often it would be enough just to make simple repairs like clean steel beams and reapply anticorrosion specimens. There are no clear solutions how to preserve this construction with respect to conservations doctrines. Article shows example of devastated balconies with repairs examples. Suggests repair types dependent on the crack/devastation classification. Results are presented from experimental tests made in West Pomeranian University of Technology in Szczecin made for brick segmental arched balconies models. Test models were with axial and uniaxial load also with and without strengthening with FRCP mats. Results are discussed with real balconies types and how they could be used for determining masonry arches strength of balconies spans. Other analysed construction parts are steel beams which very often suffer for corrosion. This beams are often in bad condition and have to be repaired or strengthen. Sometimes it is necessary to cut them off and replace with new ones. But the old beams are anchored deeply inside buildings which makes it hard to properly situate new beams.

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ASSESSMENT OF THE CHANGES IN THE COMPRESSIVE STRENGTH OF DEEP BEAM ELEMENTS CAST USING HIGH PERFORMANCE SELF-CONSOLIDATING CONCRETE FROM A SINGLE CASTING POINT

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ABSTRACT

This experimental work investigates into the effect of a change in the compressive strength of concrete along the length and height of monolithic deep beams made of high performance self-compacting concrete (HPSCC). In the tests, three different HPSCC mixes were used with varying contents of silica fume (0, 5 and 10% by mass of cement). The binder content (550 kg/m^3) and the water-binder ratio (0.32) were constant. Experimental deep beams, measuring 150 cm in length, 15 cm in width and 450 cm in height, were cast. A variant of casting was explored in which concrete is cast from the top of a mould from a single casting point at one edge of an element. All the HPSCC mixtures exhibited small variations in the compressive strength in relation to the length and height of the experimental deep beams. In general, those variations were limited to 8% and 16%, respectively. Casting HPSCC from a single casting point at one edge of an element may be used in practice as an alternative way of laying self-compacting concrete.

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DEVELOPMENT OF BOND STRENGTH OF REINFORCEMENT STEEL IN NEW GENERATION CONCRETES

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ABSTRACT

The paper presents an experimental investigation on the steel-to-concrete bond using a pull-out test. Namely, the development of bond strength of reinforcement steel in new generation concretes was investigated. In the tests high-performance self-compacting (HPSCC) and vibrationally consolidated concretes (HPC), with the same water-to-binder ratio and made of components with the same properties, were used. For comparison purposes, the normal concrete was also used. For each concrete used in the experiment a compressive strength development test was performed. To assess the development of bond strength in the tests cubic specimens with the dimensions 160x160x160 mm were used. In each test element ribbed reinforcing bar with a diameter of 16 mm was embedded in. Two variants of orientation of reinforcing bars with respect to the direction of concreting were considered - perpendicular and parallel. Test results showed that the development of bond strength between steel rebars and concrete increases with the increasing age. Additionally, the bond strength between steel rebars and concrete escalated with the increasing concrete strength. However, the development of bond stress with age was faster than the development of compressive strength, especially at early test ages. No significant difference was noticed between HPC and HPSCC mixes in terms of bond or compressive strength development with age. The conducted studies showed that in new generation concretes as well as in normal concretes the rebars placed parallel to the direction of concreting obtained higher values of the bond strength in comparison to rebars placed perpendicularly. This behaviour was observed in all stages of bond development.

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ANALYSIS OF THE INFLUENCE OF SPAN GEOMETRY ON THE DYNAMIC RESISTANCE OF EXISTING REINFORCED CONCRETE SLAB ROAD VIADUCTS SUBJECTED TO MINING TREMORS

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ABSTRACT

The article presents the results of research of the influence of span geometry on the dynamic resistance of existing reinforced concrete slab road viaducts. The basis for the analysis was the database of dynamic resistance of 3,000 objects varied in terms of geometric and material. The database contained the results of multiple numerical FEM simulations using the response spectrum method and a set of criteria for assessing dynamic resistance. The requirements set in Eurocode 8 and its adaptations to the seismic conditions prevailing in Poland in the LGCD (Legnica-Głogów Copper District) area were applied. The research involved a detailed analysis of the criterion condition regarding the strength of the spans. The relationship between the length and width of spans slabs on shaping the permissible vertical values of ground accelerations was investigated. The analysis were carried out for two types of viaducts, in which the spans were freely supported and continuous over intermediate supports. The results are presented in graphical and analytical form by linking the length and width of the span with the permissible values of the vertical component of ground acceleration.

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ASSESSING THE INFLUENCE OF MINING IMPACTS ON BUILDINGS USING SVM AND MLR METHOD

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ABSTRACT

The article presents research studies, the aim of which was to assess the influence of mining impacts in the form of surface deformation, as well as mining tremors, on technical wear of traditional residential development in a mining area. A group of 170 single-family masonry residential buildings located in the mining area of the Legnica-Głogów Copper District (LGCD) were analysed. The assessment was based on the model of technical wear, developed using SVM (Support Vector Machine) method in ε-SVR regression approach. In order to interpret the metrics describing the monotonicity of the nonlinear ε-SVR model and to confirm the established trends, they were confronted with the results obtained using a multiple linear regression model (MLR - Multiple Linear Regression). The results confirmed the view that it was the age of the masonry buildings located in the Copper District which had the dominant influence on their technical wear, while the influence of mining impacts was to be considered secondary, however, significant in the statistical sense.

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INFLUENCE OF TRUSS TOPOLOGY ON RELIABILITY INDEX

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ABSTRACT

The reliability of steel trusses is calculated in the paper. The influence of truss topology on reliability is analysed. Five cases of truss – one statically determinate and four statically indeterminate are discussed. The reliability analysis concerns the formulation of the limit state, calculation of the failure probability and determination of the reliability index. In case of a statically indeterminate trusses, there exist many possible failure modes and paths to complete failure of the structure. To generate all of them it is necessary considering a structural arrangement and determine so-called reliability model of structures. There are four groups methods commonly used for the structural reliability assessment but only one of them, using in the paper, is definitely most complete. It is system approach. This method contains both determining reliability models and reliability analysis. Defining a reliability model is the most difficult part of the system reliability analysis. Reliability model can be defined as the structure eigenvalue, which depends on its geometry and boundary conditions. In principle, it is not numeric approach. To define the reliability model, the kinematically admissible failure mechanisms which contain minimal critical sets of elements (MCSEs) are specified. Exhaustion of the capacity of all the elements included in the MCSE leads to the transformation of the safe structural system into a geometrically variable system (mechanism). In the paper, to identify mechanisms and determine reliability model, the spectral analysis of the linear stiffness matrix is used. To identify all possible non-repeatable combinations of removed rods transforming truss to a mechanism the program based on the application of the finite element method was created. After determining reliability models, the reliability of the system and the reliability index, which is a measure of safety, are calculated. In order to determine the reliability of the system, it is necessary to compute the reliability of a single element. It is assumed that both the capacity of an element, and the effect of actions, have normal distribution and are characterised by standard deviation and expected value. The analysed trusses are designed according to the standard and the maximal stress intensity level is 80%. For each truss the reliability index is estimated by evaluating its lower and upper bounds. The lower bound is evaluated by assuming that the truss behaves itself like a statically determinate truss, i.e., a failure of one element is equivalent to the failure of the whole structure (serial system). The upper bound is evaluated by assuming actual connections and interactions between the rods by using generated reliability model (mixed system). In this case the reliability index is computed using the program developed by the authors.

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INFLUENCE OF JOINT CONNECTION MODELLING ON DYNAMIC CHARACTERISTIC OF THE BUILDING

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ABSTRACT

In this paper, a 6 storey existing RC building is investigated in terms of having different joint types between the masonry infills and RC frame. First, the building is modelled according to the pre-described project of its own. Then, dynamic characteristics of the structure are found for the bare frame, since it is the most common type of designing technique being used currently. Following that, different connection approaches are implemented along the infill-frame interfaces of the building elements. In order to understand influence of the joints on the building dynamic characteristics, two extreme conditions are taken into consideration, namely stiff and hinged connections. Furthermore, an innovative solution using flexible polyurethanes (polymer PM) as a joint element between RC frame and masonry infill is proposed. This new method exhibits a highly ductile behaviour and therefore it increases the modal periods of the building, compared to the stiff one. On the other hand, due to the intrinsic features of the material such as visco-elastic behaviour that leads to dissipate energy, a visible contribution to the building damping parameters is also observed in time history analysis. Finally, three different connection options are compared between each other and the results are discussed. Large deformability capacity with highly durable reaction ability against the external forces is one of the most crucial points from structural engineering perspective. According to the results of this study, the new proposed method gives promising expectations that such approach might be used in seismic areas both for existing buildings and new constructions. In addition, dynamic behaviours of the building with different joint types also revealed the importance of masonry modelling whilst designing as well as choosing an appropriate connection method.

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ASSESSMENT OF THE EFFECTIVENESS OF SECONDARY HORIZONTAL INSULATION AGAINST RISING DAMP PERFORMED BY CHEMICAL INJECTION

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ABSTRACT

Dampness in basement walls caused by capillary rise of water from the ground, as well as possible resulting damage, is very unfavourable phenomenon. This problem mainly concerns historical buildings and other structures erected before 1920, and the destruction is caused by lack, damage or technical wear of insulation. However, it can also arise in relatively new buildings where insulation was made incorrectly (or was not made at all). Performing of a barrier that intersects the capillary rise of moisture in the existing wall, i.e. secondary horizontal hydro-insulation is perceived as one of the most difficult, from a technical point of view, tasks in the field of building protection against water and dampness. The so-called mechanical methods are seen as the safest. Assuming that the works will be flawlessly planned and executed, a durable layer, impermeable to water and thus completely inhibiting the capillary transport of water in the partition, is formed in the cross-section of the wall - in many cases resulting in highly efficient isolation as ‘’in a new building" (Frösel 2007). However, due to practical limitations, mechanical methods are used much less frequently than injection schemes. By injection, injection technology or chemical injection is meant the introduction of injection fluid into the masonry, whereby three ways of administering an injection can be distinguished: penetration, pressure and pulse in the form of an aerosol. This technology must ensure the distribution of an injection agent in the entire wall cross-section, and its principle is to create a continuous layer interrupting capillary rising to obtain (after some time) an area with regular dump in the masonry zone above the membrane. Injection methods, although widely used, are associated with a greater risk of partial or complete failure. The universality of applications combined with the risk of failure has somehow forced the search for a parameter to assess the effectiveness of secondary horizontal insulation. A suitable parameter is the AQ coefficient (from German - Abdichtungs Qualität), based on the capillary water absorption coefficient, proposed by Venzmer et al. (Venzmer et al. 2010). The article presents research results on the effectiveness of chemical injections performed in the reference walls made of ceramic bricks. The membrane was made using three different injection agents: a preparation based on silicates (mixtures of silicates and alkaline methyl silicates), a silicon micro-emulsion and a silane-based injection cream. In the injection zone, the drill cores were taken to perform capillary water absorption coefficient measurements. In order to obtain reference samples, additional drills were made above the impregnation zone protected with the injection agent. Both the measurements made and the calculated AQ coefficients showed the effectiveness of the above-mentioned injection agents.

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LATERAL-TORSIONAL BUCKLING OF BEAMS ELASTICALLY RESTRAINED AND LOADED WITH CONCENTRATED MOMENTS AT SUPPORTS

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ABSTRACT

The study presents the results of theoretical investigations into lateral torsional buckling (LTB) of free supported bi-symetric I-beams, elastically restrained against warping at supports. Beams with loaded by moments focused at supports (with a variable the ratio of moments) and with different types of ribs were taken into account. To determine the critical moment (M_{cr}) of LTB of beams, the $M_{LTB,EL}$ program (Piotrowski, Szychowski, 2015) and proposed in this article formula were used. The obtained results were compared with the results received from approximation formulas (Lindner, Gietzelt, 1984) and with FEM (*LTBeam*, *Abaqus*). The best accuracy of M_{cr} compared to LTBeam, was obtained from the $M_{LTB,EL}$ program (Piotrowski, Szychowski, 2015). The maximum differences did not exceed +0.2%. A very good estimation of M_{cr} was given by the formula proposed in the article, which was derived using one terms of the function of the torsion angle, which was aproximated in the form of polynomial series. Differences in the results oscillated between -1.1% and -0.1% in relation to M_{cr} obtained from the *LTBeam* program. While M_{cr} obtained from other formulas (Lindner, Gietzelt, 1984) gave bigger differences (from -21% to +1.4%) in relation to FEM (*LTBeam*). Of the types of ribs examined, the most effective were proved ribs with a closed cross-section (M_{cr} increase to + 90%). In turn, the efficiency of commonly used end plates is small. In order to obtain a comparable stiffening in relation to the closed rib, it would be necessary to use plates of considerable thickness, which is not rational due to their heavy weight and unfavorable welding conditions. The investigations confirmed that elastic restraint against warping at supports of beams, can significantly increase the elastic critical moment of LTB of beam. The approximate formulas for estimating the critical moment of LTB of beam, developed in the article, may be an important aid in the design of metal structures, due to their simple application and "technically" sufficient accuracy. It seems that a good standard of engineering calculations should be obtaining more important computational parameters, eg. critical moments, by at least two independent methods.

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DYNAMIC RESOPNSE OF ROAD VIADUCT TO A MINING TREMOR USING MULTIPLE SUPPORT RESPONSE SPECTRUM METHOD

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ABSTRACT

In this study the dynamic response analysis of concrete road viaduct to a mining shock was presented. The dynamic analysis was performed using a few kind of calculation methods, the Time History Analysis (THA), the Response Spectrum Analysis (RSA) and the Multiple Support Response Spectrum Analysis (MSRS). The RSA and MSRS methods are similar. Both are based on spectral curves. However, in the RSA only the uniform excitation can be analyzed - the non-uniform effects are neglected. During analysis the effectiveness and the suitability of these methods in case of non-uniform kinematic excitation were conducted. The analyzed object was a real road viaduct located in the southern Poland. The object was a single-span bridge 40 m long. The structure was subjected to a mining shock as a kinematic excitation, since it is located in the Upper Silesian Coal Basin (Southern Poland) which is mining activity zone. For the dynamic analysis of the viaduct, a typical mining shock that occurred in Upper Silesian Coal Basin was taking into account. In the first part of the dynamic analysis THA method was performed. Two kinds of excitation models - the uniform and non-uniform – were assumed as kinematic excitation model. In case of the uniform excitation infinite velocity of wave propagation was taken. In case of the non-uniform excitation two wave velocities were taken into account: 500 and 1000 m/s. In the second part of the analysis, the dynamic response of the viaduct was conducted using RSA and MSRS methods. The MSRS method was based on the calculated (real) spectral curves. The application of the MSRS allows to take into account the non-uniform effects connected with the passage of the mining shock wave. The spectral curves were calculated on the basis on real mining shock accelerograms. In the MSRS procedure the wave velocity of 500 m/s was used. The site effect and incoherence effect were considered by using the coherency function. As the results of the analysis stresses in representative points were determined. To compare the obtained solutions, the results of each analysis were correlated. The MSRS procedure much better represented the behavior of structure subjected to non-uniform excitation than RSA method. The MSRS method allowed to estimate the stress level in the structure which underwent non-uniform excitation. The maximum value of stress during the whole shock obtained from the THA method did not exceed the stress value achieved from MSRS analysis, whereas the RSA method led to underestimation of the results. The maximum value of stress, obtained for non-uniform excitation by the THA method were greater than ones estimated by the RSA. The key conclusion of this studies was that the non-uniform effects have important impact on the dynamic behavior of multiple-support structures, like bridges. Neglecting of these effect may result in underestimation of the dynamic response of a structure. In addition, the comparison of results obtained by different methods showed that the MSRS method can be used as an estimating method in non-uniform dynamic analysis.

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SEARCHING FOR BIONICS STRUCTURAL FORMS OPTIMIZATION

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ABSTRACT

The architectural design becomes an interdisciplinary process while the architectural forms, due to their various criteria, are more and more often created as a result of conducted optimization (simulated processes - "form follow process"). Activities that mimic the processes occurring in nature seem to be of particular interest. The inspirations with observed structures in nature shaped under the influence of loads acting on them constitute an interesting aspect of the search for optimization. The material and energy consumption were minimized through the evolution of structures and their adaptation to the environment. Therefore, such processes can serve as important patterns in the pursuit of building objects, effectively adapted to the location conditions, as an urban ecosystem element in accordance with the idea of sustainable development. In modern architecture, research is conducted using mathematical models in the search for optimal forms, based on the patterns of structures observed in nature. The article presents an analysis of a number of examples of bionic architecture in terms of structure and material. In addition, own model studies of selected bionic and geometrical structural forms were presented. The aim of the analysis at hand was to conduct optimization searches for the shaped bionic rod structures, selected due to the criterion of minimum mass. Among the analyzed structures, a noticeable effectiveness of forms transferred from nature was observed, which indicates the need for further research in this area.

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COMPARATIVE ANALYSIS OF OBLIQUE BONDED ANCHORS WITH POINT ANCHORS FIXED IN THE CONCRETE STRUCTURAL LAYER OF BUILDINGS OF LARGE SLAB

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ABSTRACT

The subject of the article is derived from the current problem, the scope of which applies to the whole of Poland, namely the risk of detachment of the external textured layer in external three-layer walls. Works are being carried out to increase the durability of fixing the textured layer before thermal insulation. The issues discussed in the article are aimed at determining the variant ensuring the longest durability of fixing. The subject of this article is bonded anchors at 60˚, 45˚ and 30˚. The load-bearing capacity of these anchors was compared with the results of point anchorages obtained from previous experimental tests. The tests were carried out on samples made of two concrete classes: C12/15 and C30/37. Two types of resin were also used: R-KER and Sika AnchorFix-1. A total of 12 samples were tested, 4 for each angle. In the case of anchors at 60˚ and 45˚ angles, three-layer samples with two concrete layers and thermal insulation in the form of expanded polystyrene were used (a 5 cm thick texture layer, a 6 cm thick thermal layer and a 6 cm thick construction layer). Samples with 30˚ anchorages were made as one-layer (construction layer 6 cm thick). In samples of concrete class C 30/37, only partial anchoring of the anchorage was made only in the construction layer, which is the fixing factor for the textured layer. The test results were quite varied, which was influenced not only by the concrete and resin parameters but also by the angle of inclination and the length of the anchorage. For 60° anchorages in C 12/15 concrete, breaking forces of 11.25 kN and 9.1 kN respectively were obtained with anchors glued through the Sika AnchorFix-1 resin, whereas in C 30/37 concrete the breaking forces were very low due to "Partial" fixing with R-KER resin resulting in a lack of greater resistance and had values of 0.6 kN and 2.9 kN. In the case of 45˚ anchorages fixed with Sika AnchorFix-1 resin in C 12/15 concrete, breaking forces of anchorages were obtained: 3.5 kN and 4.2 kN, while in class C 30/37 concrete using R-KER resin values: 1,7 kN and 1.3 kN. Tests of anchors fixed at an angle of 30˚ were checked only in the structural layer of the gr. 6 cm without additional layers in a cross-shaped way, i.e. both resins were applied to both classes of concrete samples. The results were as follows: for the Sika AnchorFix-1 resin in C 12/15 concrete, the value of 10.6 kN was obtained, whereas in concrete C 30/37 27,6 kN. Using R-KER resin was obtained: in C 12/15 11.9 kN concrete, while in concrete C 30/37 30.5 kN. All attempts resulted in the destruction of the concrete surface. The results of anchoring studies have led to the conclusion that the use of a resin with better strength parameters in samples from lower-class concrete gave better results of testing the anchoring capacity of the anchors than in the opposite case.

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SELECTED BEARING PROBLEMS OF OLD RAILWAY BRIDGES LOCATED ON MINING AREAS IN POLAND

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ABSTRACT

In this article are discussed bearing problems of old railway bridges located on mining areas. Polish experiences, i.e. more than 150 years of intensive development of railways on large mining areas, provide a lot of practical information, valuable for both engineers and researchers. Theoretical considerations are complemented by practical examples of repair actions and actions associated with the mining prevention and illustrated with photos from real bridge objects. The problem is important because the old railway bridges in the areas of active mining exploitation are still in use, but often lack of money for their replacement or major reconstruction. Railway traffic is still underway after these objects, but the requirements for increasing the speed of rolling stock are bumped up. The article applies to bridge objects which have the static scheme of the freely supported beam, which is universally used, popular structural solution. The article describes how mining exploitation affects bridge bearings and the conditions that bearings should fulfil on mining areas. A short review of Polish technical conditions and Polish literature information's on bearings of railway bridges in mining areas is made, it may be valuable for people dealing with similar problems in other countries. Attention is taken to the features that differ the bridge objects from cubature structures in the context of transferring mining influences, e.g. such features as multi-solid of bridges and elevation of their main structural part (spans) above the ground. The general principles of ensuring kinematic freedom and selection of bearings are shown. Typical damages and threats to the safety of the rail traffic (e.g. breaking the permanent bearing, blocking the bearing, cutting the head of the pillar) triggered with mining area deformations are pointed out. Types of bearings applied in old railway bridges and structural elements associated with bearings are described, such as bearing benches, plate of pillars. Author discusses the significant influence of bearings on the static and dynamic resistance of railway objects to mining deformations of the area. Attention is paid to the difficulties in diagnostics of the bearings technical conditions and the possibilities of a sudden deterioration of bearing operating conditions as a result of mining deformation and the need to monitoring of bearings. In the article is pointed, when and how to monitor the "work" of bearings and also attention is paid to the need to connect together (integration) SHM systems with rail traffic control systems. There is also described when traditional geodetic measurements do not ensure the safety of using a bridge object located in mining area and also the solution is there given i.e. system of permanent remote monitoring of displacements in which boundary values are determined. It is pointed out that in order to effectively use information from monitoring systems, it is necessary to have up-to-date bridge model with information about damages, up-to-date information on mining impacts and damage updates as they grow over time - relevant tools are provided by modern methods of building object information known under common name as BIM.

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EFFECT OF CURING METHODS ON COMPRESSIVE STRENGTH OF SUSTAINABLE SELF-CONSOLIDATED CONCRETE

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ABSTRACT

Concrete can only achieve the desired compressive strength and durability if cured properly for prescribed period. For most building codes, concrete structural components and systems are designed for the 28-day compressive strength. Nonetheless, concrete structures are cured typically for only 3 to 7 days. There is an increasing use of curing techniques that involve chemical compounds, such as acrylic-based compounds. The emergence of such techniques requires investigation of their effectiveness, compared to traditional curing methods. This article presents the findings of a study to compare the compressive strength of concrete cured using three methods, namely submersion in water, air curing under elevated temperature, and curing with a chemical compound. Compressive strength was determined on standard 150 mm x 150 mm x 150 mm cubes made of sustainable self-consolidated concrete (SCC) in which 90% of ordinary Portland cement content was replaced with combinations of high volume ground granulated blast furnace slag (GGBS), silica fume, and fly ash. A total of 20 mixes were tested, a set 10 mixes were prepared with water to be binder (w/b) ratio of 0.33 and a second set of 10 mixes was prepared with w/b of 0.36. For all mixes, samples cured under air with 45 ^{0}C temperature produced the highest 28-day compressive strength compared to other curing methods. Similarly, concrete samples cured using the chemical compound produced higher compressive strength compared to the traditional curing method. The sustainable SCC mix producing the highest compressive strength of 76.22 MPa under air curing was prepared with w/b of 0.33, 72.5% slag replacement ratio, 12.5% silica fume replacement ratio, 10% fly ash while Portland cement represented only 10% of the total binder content.

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PROPAGATION OF VIBRATION IN HETEROGENEOUS SOIL

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ABSTRACT

The need to develop communication lines is the cause of reducing their distance from buildings. One of the most effective means of transport is the subway, which often passes under existing buildings. Subway cars moving into a tunnel are causing dynamic loads. These actions have an environmental effect particularly on buildings and people staying inside. Standardization guidelines (eg. PN-88/B 02170) define influence zones, within which this kind of loadings should be taken into account during designing of structures. However, they do not specify how its amplitude-frequency character depends on distance from source of vibration. It is quite understandable, because a large influence on the waves propagation in the soil medium beyond material characteristics of the individual layer have their alignment. This paper shows changes of extreme amplitudes as well as frequency character of vibration accelerations of the ground depending on the distance from the wall of subway tunnel. These results represent analysis of acceleration waveforms registered in real conditions - "in situ" (in geometrical and material sense). As it turns out, not always with increasing distance from the source of vibration the size of dynamic loads decreases. This phenomenon could be used during designing structures adjacent to the subway. Presented study shows an example calculation of two buildings loaded with dynamic actions caused by passing subway. Analysed buildings are subjected to the ground accelerations measured at their foundation as well as theoretical distributions calculated on the basis of knowledge of accelerations in their neighbourhood.

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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, PN / B-02171, PN/B-02170). During designing 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 5,0m 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 analysed 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 behaviour 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. Analysing 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.

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SHEAR CAPACITY OF THE ENDS OF PRECAST LINTELS MADE OF AUTOCLAVED AERATED CONCRET

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ABSTRACT

The paper presents the experimental results and analytical calculations of shear capacity of the ends of precast lintels made of Autoclaved Aerated Concrete (AAC). Three series of elements with that same span but with different dimensions of specimens' cross-section and types of reinforcement were taken into consideration. The lintels were tested in four point bending test but the mode of damage indicate on low shear capacity of lintels. During the tests forces, displacement and cracks propagation were recorded. The analytical calculations of shear capacity of the lintels were conducted according to three codes: PN-EN 1992-1-1:2008, PN-EN 12602, PN-84/B-03264. The analytical result were compared with test results. Significant influence of the method of anchoring of the longitudinal bars on the shear capacity of the beams has been shown. The analytical result of shear capacity gave danger values if the longitudinal bars weren't properly anchored. Analytical calculations of longitudinal bars anchorage capacity in AAC precast lintels must be conducted mandatory.

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A FINITE ELEMENT MODEL FOR ANISOTROPIC LAMINATED COMPOSITE BEAMS

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ABSTRACT

This study presents a finite element model for analysis of laminated composite beams with arbitrary lay-ups. Based on the first order shear deformation theory, a five-node beam element with thirteen degrees-of-freedom is proposed. It accounts for both in-plane and rotary inertias, Poisson effect, width effect, and material couplings (bending-extension, bending-twist and extension-twist) due to anisotropy. The equation of motion is derived by using the Lagrange equations. Numerical results are obtained for bending and free vibration problems of a cantilever laminated composite beam. Comparisons with the previously published experimental and numerical results are made for validation of the model. According to the study, the model proposed here has a good accuracy for analysis of generally laminated beams.

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A FINITE ELEMENT FOR FREE VIBRATIONS OF NON-UNIFORM BERNOUILLI-EULER BEAMS WITH MULTIPLE CRACKS

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ABSTRACT

In this study, a finite element for free vibration analysis of non-uniform Bernoulli-Euler beams including multiple transversal cracks is presented. The two-node beam finite element with four degrees-of-freedom per node is developed. Rotational spring model is used to account the crack effects through the local flexibility approach. Lagrange equations are employed to derive the equations of motion. Numerical results for cracked and un-cracked elastic beams with uniform and linearly varying (tapered) cross-sections are obtained and compared with those given by previous work. Effect of multiple cracks on the free vibration response is investigated.

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DAMAGE LOCALIZATION IN STEEL CANTILEVER BEAMS WITH MULTIPLE CRACKS USING MODAL CHARACTERISTICS

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ABSTRACT

This study presents damage detection and localization in steel cantilever beams with using modal data such as mode shapes, curvatures, strain energy and flexibility. Natural frequencies and corresponding mode shapes of the beams are first obtained analytically by the transfer matrix method under six different damage scenarios. Theoretical results are validated by the ambient vibration tests. Based on the calculated and measured modal data, inverse problem is then considered to detect and localize multiple cracks in the beam. The modal assurance and the coordinate modal assurance criteria, the modal curvature, the damage index and the modal flexibility methods are used. Some comparative results are presented to show efficiency of the methods considered.

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DYNAMIC MECHANICAL THERMAL ANALYSIS OF EVA AND PVB POLYMERIC INTERLAYERS IN LOW TEMPERATURES

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ABSTRACT

Many examples of glass load bearing structures such as beams, panes, balustrades, columns or even stairs can be found in a current architecture. These members are usually made of laminated glass panels. Glass plies of a laminated panel are bonded with polymeric interlayer significantly influencing shear forces transfer between them. It principally depends on a polymer shear stiffness which is affected by an ambient temperature and load duration. There is still general lack of knowledge in task of commonly used interlayers shear stiffness. Civil engineers thus design laminated glass members with excessive caution neglecting positive shear coupling of the glass plies provided by the interlayer. This approach leads to uneconomical and over-sized glass bearing structures profoundly preventing an extensive use of laminated glass in a civil engineering. There are many polymer interlayers of different chemical composition available on a market. Mechanical properties of most of them are unfortunately not available to civil engineers dealing with laminated glass constructions design. This paper is focused on dynamic shear modulus of EVA (ethyvinylacetate) and PVB (polyvinylbuthyral) interlayer experimental investigation as a function of temperature and loading ratio. Possible way how to find out this modulus is a shear dynamical thermal analysis (DMTA) which further enables to derive EVA and PVB time and temperature dependent shear stiffness. This experimentally investigated property helps engineers design safer and cheaper glass constructions. This is the way how to extend the use of laminated glass in a current architecture.

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ELEMENTS OF DIAMOND TOOLS DEVELOPMENT USED IN THE TECHNOLOGY OF BUILDING MATERIALS PROCESSING

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ABSTRACT

The publication presents a timeline for the development of the industrial application of diamonds in the production of machining tools used for cutting, drilling and surface treatment of stone, concrete and ceramic materials. The development of industrial production of synthetic diamond powders used for the production of diamond segments, which are equipped with technological machining tools, is indicated. The technical parameters of diamonds have directed the technology of their production and the technology of improving their technological features in the field of producing more and more effective grains of synthetic diamonds and working segments. In order to increase the efficiency of work of tools equipped with diamond segments, the analysis was carried out and directions of searching for ways to increase the efficiency of their work were indicated. For this purpose, a model of the work of diamond grain working on a metallic binder was presented, and the methods of increasing the efficiency and quality of machining depending on the design of machining tools and technological parameters of their application were presented.

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DAMPING EFFECTS ON VIBRATIONS OF RAILWAY PRESTRESSED CONCRETE SLEEPERS

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ABSTRACT

Railway concrete sleepers have been generally used in ballasted railway track around the world for over 50 years. They are commonly used to redistribute wheel forces onto track structure and to assure stable track gauge for safe passages of rolling stocks. The dynamic behaviours of railway sleepers are commonly well known; however, its damping characteristic is often neglected. With the increased demand for heavier and faster trains, the nature of track forces applying onto each track components is no longer static or quasi-static. Statistically, almost a quarter to track load spectra is typically of transience and high intensity. The ignorance of damping can no longer be persisted as pre-mature damage or failure of track components can take place at a faster rate. A single sleeper failure may not affect open, plain track operations but it can give rise to the risks of rail breaks at rail joints, welds, bridge ends, switches and crossings, curved track, etc. Such the risks can later result in detrimental train derailments. This is thus very important to consider the failure of sleepers in a case by case basis that is suitable for the track type, track condition and level of maintenance and operations. This paper will highlight the effects of damping on the vibrations of railway concrete sleepers in a track system. An established and validated finite element model of sleeper has been adopted for further studies. The model has been validated by experimental results. This study aims to quantify the potential to improve damping in concrete in order to suppress vibrations in a track system. The insight into the vibration suppression of railway sleepers will help track engineers to decide the better choice of materials for manufacturing railway concrete sleepers.

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DYNAMIC RESPONSES OF RAILWAY SLEEPERS WITH UNDER SLEEPER PADS TO HIGH-INTENSITY IMPACT LOADS

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ABSTRACT

Under sleeper pads (USPs) has recently been adopted as a component installed under the concrete sleepers generally to improve railway track resilience. The initial development in Europe, particularly the pilots in Austria, has been benchmarked around the world. In practice, the component has commonly been used in certain applications, mainly to moderate track stiffness in special locations such as turnouts, crossings, and level crossing. In heavy haul operation, the heavier wagons result in sturdier bogie structures, higher unsprung mass, and then higher level of wheel-rail interaction forces. With imperfect wheel or rail, the impact load imposed is rather of high intensity. Accordingly, the application of USPs to mitigate detrimental impact load consequence on track structure is presented in this paper. A field trial aimed at mitigating rail joint impacts using the USPs with a thickness of 10mm and bedding modulus of 0.2 N/mm3 has been conducted in NSW Australia since October 2011. It was found that the track structure and its heavy-duty components were designed to cater heavy load burden of 30t axle load with rail pad stiffness of 800 MN/m (HDPE pads). This paper will present a 3D finite element model of sleepers with under sleeper pads. The model has been validated by experimental results. Although the studies have found that the sleepers with USPs tend to have lesser flexures, the field data also confirms that a railway track with USPs could experience a large amplitude vibration, especially when excited by a high-frequency impact force. These behaviours imply that the use of USPs may have a trade-off impact that could aggravate dynamic behaviour of sleepers with under sleeper pads.

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THE USAGE OF PRESTRESSED CONCRETE IN THE PROJECT OF THE MUSIC PAVILION IN MUSZYNA

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ABSTRACT

Untypical architectural forms force the constructors to seek innovative and simultaneously more courageous solutions. The example of the usage of such solutions is the project of the Music Pavilion in Muszyna. Architectural vision and the willingness to reflect the character of the place where the designed building was located caused that the created project was integrated with the surroundings, and finally the designed structure together with its surroundings resembles a cave. The discussed building structure was designed on a circular plan with a diameter of 19.40 m. The intended effect of oneness with nature was obtained by partially covering the structure with soil and additionally by designing a glass fasade. The introduction of glazing on almost 1/3 of the construction circumference led to the necessity of designing a perimeter beam with a wrap angle of 140 ° and a span of 17.00 m. Due to the considerable span of the circumferential beam, the beam was designed as post-tensioned element. Prestressing with 15 unbonded tendons of 7□5 made of Y1860 steel were used. In addition, due to the flat roof span, it was also designed as a post-tensioned slab with 4 areas of prestressing unbonded tendons. In total 44 unbonded tendons 7□5 were used in slab. The tendons in the post-tensioned slab were applied as a straight section and curved, which was determined by the arrangement of the walls supporting the flat roofs. i The tendons in the post-tensioned slab were applied as a straight section and curved, which was determined by the arrangement of the walls supporting the flat roofs. In this paper, these solutions are presented in detail together with the obtained benefits and proper calculation results.

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THE PLATFORMS OF TRUCK SCALES CONSTRUCTED WITH POST-TENSIONED CONCRETE

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ABSTRACT

A whole range of truck scales with a nominal capacity of 6 to 80 t. is available on the European market. A platform of truck scale is intended to transfer load of weightening truck to foundations through load cells. The basic requirements for weighbridge platforms is their stiffness, because of deflection, durability and low self-weight, because of their low cost of transport. Typically, the platform scale is made of reinforced, steel or composite (steel and concrete) structure. More rarely, they are made of prestressed and mostly as a pre-tensioned element. In Poland, the authors have been created several types of prestressed platforms, using post-tensioned technology with unbonded tendons, lately. The slabs are designed as partially prestressed elements, operating as cracked, that reduce amount of required prestressing steel. Because of poor knowledge about behaviour of the prestressed elements with unbonded tendons under cyclic load, two different types of slabs (with capacity of 30 and 60 tonnes) were testing at the Cracow University of Technology. The authors assumed the number of 250 load cycles per day and a 10-year lifetime of slabs in designed program. Finally, the slabs were subjected to 1 000 000 load cycles. Obtained test results shown that the geometry and weight of post-tensioned weighbridge platforms can be optimized. The paper presents the history of development of weighbridges, the basic principles of design results. As a result of carried out research and gained experience due to implemented post-tensioned weighbridges for mass production, the authors presents possibility of improvement and further development the devices.

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ASSESSMENT OF SEMI-RIGIDITY OF DOWEL TYPE KNEE JOINT BETWEEN TIMBER ELEMENTS

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ABSTRACT

Creation of a moment resisting connection between column and beam elements in knee joints is the core problem in portal frame design of structural timber. The main performance requirement for rigid joints is to avoid any rotation between the members connected. Withstanding this condition by using glued finger joints, the knee joint can be classified as a rigid one and the bending moment produced by external loads can be transferred safely. Nevertheless, the solution of knee joints with mechanical fasteners is an effective way to overcome transportation limitations. Knee joints with mechanical fasteners exhibit a relevant semi-rigidity when some rotational movement develops between beam and column members connected due to the embedment of the fasteners in the wood and their bending deformation. The aim of the current study is to examine the rotational stiffness of semi-rigid joints. The rotational stiffness of the connection was determined in terms of design moment capacity to radians of rotation. The calculation methods for design of semi-rigid structural timber connections developed during recent years were used for the calculation of the bearing capacity. L-shape connection models of softwood lumber assembled by normal strength dowels were tested under a stepwise static load. The analysis of the test data testifies that connections with dowels located around a single circle demonstrate an intensive development of rotational movement. For design purposes the semi-rigidity of these connections may be characterised by the rotational stiffness value K_{φ}= 10 M_d/rad. Moment resisting joints of dowels located in double circles behave almost as rigid, and their stiffness may be characterised by rotational stiffness value K_{φ}= 65 M_d/rad. It is found from comparison of embedment deformations that dowels located around external circle transfer more than four times bigger reactive shear force than dowels around inner circle.

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ABOUT DISTRIBUTED INTERNAL AND SURFACE STRAIN MEASUREMENTS WITHIN PRESTRESSED CONCRETE TRUCK SCALE PLATFORMS

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ABSTRACT

Distributed optical fibre technology provides new possibilities in structural technical condition assessment in comparison with traditional spot measurements. It is not only possible to analyse strains continuously over structural member length (Samiec 2012) with spatial resolution starting from as fine as 5 mm, but also the crack state within reinforced concrete structures (Minardo at al. 2012, Barrias at al. 2016) and displacement state (Huang at al. 2017). Thanks to the appropriate installation ways, it is possible to provide adhesion between optical measurement fibre and the material (which is the concrete in this specific case study) under consideration both on its surface and inside. The article presents pilot studies regarding prestressed truck scales slabs with a length of 8 – 16 m. Optical fibres were glued within composite rod attached to the stirrups inside the cross section of the slab on the height of lower and upper prestressing strands, as well as they were glued to the concrete surface immediately after concreting. That allows for comprehensive analysis of concrete strains state including all local nonlinearities (cracks) starting from hydration process (thermal-shrinkage strains), through prestressing strands activation (strains regarding the transfer of compression forces from the strands to the concrete) and finally during laboratory tests, when slabs were mechanically loaded until destruction. The ways of installation and exemplary results from selected phases of the research were presented as well as data interpretation was described and discussed. Based on this analysis and on the literature investigations it can be concluded, that distributed optical fibre sensor technology, as it is comprehensive and has variety of potential applications in civil engineering field, seems that it will be increasingly used in the near future in practical case studies.

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MULTIDIMENSIONAL HYGROTHERMAL ANALYSIS OF BUILDING CONSTRUCTIONS

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ABSTRACT

In accordance with nowadays building energy performance requirements, building constructions developed significantly in the past few years due to new construction materials and building elements, because of the need for increased thermal insulation layers and the development of new building technology solutions. However thermal performance requirements are tightening, there are no moisture performance requirements connected to them, therefore in most cases, building construction design only include simplified hygrothermal calculations. This paper presents a comparative analysis of multidimensional conjugated heat- and moisture transport numerical FEM simulations of typical building construction joints. For comparison reference, thermal simulations were made, neglecting the hygrothermal aspects. The building construction joints, such as wall corner, intermediate slab and wall connection, and roof and jamb wall connection was built in 3D from detailed building elements, such as insulation filled masonry blocks and were tested using different fillers (aerogel, expanded perlite, expanded polystyrene, mineral wool and PUR foam), respectively. The material properties of the insulation filled masonry blocks were measured in laboratory. Both temperature field, internal surface heat flux, heat flux magnitudes and relative humidity field through the constructions were compared. The evaluation of the numerical simulation results shows how well insulated building construction joints behave differently using different thermal insulation fillers in the masonry blocks. Using better insulation fillers can cause moisture damages in the elements due to thermal bridge induced moisture bridges. The results also show that there is significant difference in the linear thermal transmittance of the construction joints using different fillers. Comparing the hygrothermal simulations to only thermal simulations, there is significant difference in the temperature distribution through the constructions and in the linear thermal transmittances too. Additionally, this study proves the need for different construction solutions and thinking, when hygrothermal aspects considered in the building construction design.

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A FEASIBILITY STUDY TO DEVELOP RAILWAY SLEEPER USING COARSER FINE AGGREGATE

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ABSTRACT

UHPC (ultra-high performance cementitious concrete) is one of the most advanced cement-based composites, which possesses dense microstructures after the specially tailored mixture designs such as optimization process based on the particle packing theories. UHPC shows superior mechanical properties, e.g. compressive strength greater than 150 MPa, high ductility and impact resistance. It is also revealed that the developed UHPC has three times higher abrasion resistance compared to conventional high strength concrete, which is the great benefits as the material for railway sleepers to accommodate higher axle loads and faster speeds, and to enhance service life at the same time. In addition, the superior durability of UHPC by virtue of dense microstructures shed lights on the possibility to extend the service life of the target concrete structures. The used UHPC mixture design developed by the author adopted an innovative design concept, in which proper coarser fine aggregates were incorporated without sacrifice of mechanical properties, and this new mixture has never before been achieved for concrete sleeper. A railway sleeper using UHPC is newly designed and produced in this research to fully utilize the superior materials benefits of the developed UHPC mixture. According to the new structural design, it can minimize steel reinforcements in railway sleepers, e.g., removed all reinforcing steel bars and reduced diameters of pre-stressing bars from 11.0 mm to 9.2 mm. Based on the experimental per European standard, it is found that the developed UHPC sleeper met structural performance. Furthermore, it is expected that high durability, ductility and impact-resistance of the developed cement-based composites makes it possible to extend their service life compared to conventional concrete sleepers.

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DIMENSIONING OF CRANE GIRDERS WITH MONOSYMMETRIC CROSS SECTIONS

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ABSTRACT

The paper presents the methods of dimensioning crane girders of a mono- and bisymmetrical cross-section. Authors' special focus was on monosymmetric sections composed of a rolled I-section reinforced with a set of angles, commonly used in design of crane beams. Formulas, which allow dimensioning of crane girders with mono- and bisymmetrical cross-sections are included in PN-EN 1993-6: 2009. They complement the standard dependencies for two-fold bending with the term coming from the Vlasov's theory of twisting thin-walled rods. This approach however neglects the impact of displacements (twist of section) on magnitude of cross-sectional forces in the beam. In contrast, guidelines for the design of crane beams, included in the study of the British Institute of Steel Constructions, require determining both the bending moment with respect to the axis z and the horizontal force in deformed configuration (i.e. after twisting the section by angle φ), which results in an increase of cross-sectional forces. In the paper, authors have investigated the mentioned approaches, and estimated magnitude of impact of bimoment and the deformed configuration. As a result, authors investigate simplified method, where only the terms for two-fold bending are considered, while the impact of beam rotation and contribution of bimoment is simply taken into account as numerical coefficient applied to term for minor-axis bending. This simplified approach is valid for normal design situations, where deformation of the beam is limited, giving reasonably small error, while still on the "safe side". It allows for great simplification of calculations, so they can be easily implemented spreadsheet. To complement it, authors provide method for determining torsional characteristics for any cross-section from investigated class of sections and present analytical models for the critical moment of lateral torsional buckling. To illustrate, couple of numerical examples were included in the paper. Authors have analyzed the load bearing condition for various cross-sections (mono- and bisymmetric) for single- and two-span crane girders. These examples give good evidence for thesis of the paper.

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LATERAL BUCKLING MOMENT OF SIMPLY SUPPORTED UNRESTRAINED MONOSYMETRIC BEAMS

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ABSTRACT

The analytical solutions were used for checking the stability of laterally unrestrained monosymmetric beams. Considering the boundary conditions for the simply supported beam, the differential equation of the flexural-torsional loss of stability, as the function of the torsion angle. The stability equations were solved approximately using the Bubnov–Galerkin method. In case of simply supported beams with free warping, sinusoidal mode is assumed for the torsion angle. After integration, the lateral buckling moment is given by the roots of the quadratic equation, with regard to the absolute of the maximum bending moment The lateral buckling moment depends on bending distribution and on the load height effect. Each of applied concentrated and distributed loads, may have arbitrary direction and optional coordinate for the applied force along the cross section's height. To illustrate, couple of numerical examples were included in the paper. Authors have analyzed the load bearing condition for various cross-sections (mono- and bisymmetric) for single- and two-span girders. These examples give good evidence for thesis of the paper. In conclusion we may state, that the proposed method, described above, give estimation of lateral buckling moment with accuracy sufficient for design purposes. Derived equations allow for simple, yet fast control of lateral buckling moment estimated by FEM.

This work is extension of paper: R. Bijak, The Lateral Buckling of Simply Supported Unrestrained Bisymetric I-Shape Beams, Archives of Civil Engineering, Volume 61, Issue 4 (Dec 2015), pp. 127–140.

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GROUP METHOD OF DATA HANDLING AS A TOOL TO DETERMINE VERTICAL DISPLACEMENTS

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ABSTRACT

Surveying measurements carried out to determine displacements and deformations of existing civil structures and their surroundings provide information making it possible to represent their geometry in space and any changes it undergoes over time. Data acquired through geodetic monitoring can be modelled using artificial neural networks, capable of learning (adaptability) and quick operation and providing the possibility of visualisation by means of computer simulation. Neural networks, however, require specification of an optimal architecture by the user, as a result of which any resulting solutions are flawed by a difficult to identify error of method. Therefore, this article proposes an alternative approach in the form of the Group Method of Data Handling (GMDH) based on evolutionary algorithms. Evolutionary algorithms provide the possibility of finding solutions to optimization problems, using a solution selection process based on the assumed objective function (measure of adaptation) to successive iterations. This kind of approach enables the formation of new sets of solutions which become better and better adapted to a given environment with each subsequent iteration. The Group Method of Data Handling (GMDH) is an example of a method which belongs to the class of evolutionary algorithms. The operating principle of the GMDH algorithm is the synthesis of a network which involves two stages: estimation of the parameters of partial models and their combination using appropriate selection methods. Such a course of action makes the network structure closer to the optimum with each subsequent solution. The article presents the fundamental assumptions for the GMDH and the principles of development and training of static neural networks with multiple inputs and one output. The GMDH network was used to develop a geometric model of vertical displacements determined on the basis of periodic measurements taken on civil structures.

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CONSTRUCTIVE ANALYSIS OF THE FLOODED BRIDGES AND ARISEN BY THE CONSTRUCTION OF THE ALCÁNTARA RESERVOIR: THE BRIDGE CASE ON THE EX - 390 OF SAN FRANCISCO

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ABSTRACT

The construction on the Tajo River of the Alcántara dam, in the 60s of the last century, gave rise to a reservoir with a volume of 3,162 hm^3, which caused the flooding of 10,400 hectares. This flood affected a significant number of kilometers of road and rail infrastructure, whose most singular element is the bridge. In the flooded area and its surroundings, there are also other important tributaries such as the Almonte or the Alagón, in addition to a high number of secondary rivers. This, together with the orography of the area, has led to the construction of a significant number of bridges throughout history, to maintain communication between the north and the south. The flood caused by the Alcántara reservoir left many of them without service, and new ones appeared. This paper presents the analysis of the main bridges lost since the Romans with the bridge of Alconetar del s. II, that not to be flooded moved ashlar to ashlar. Its constructive system is by means of granite ashlars forming reduced arches. Originally it had 16 arches, of which only 6 remain. Others analyzed is the bridge of Don Francisco del s. XVI, built in the time of Carlos I and paid for by Francisco de Carvajal and Sande. It has the singularity that there really are two bridges of an arch at the confluence of the Almonte and Tamuja rivers. Its configurations and materials are unusual, presenting masonry instead of ashlar or brick. It is especially interesting the typology of the masonry that is formed by slabs, also the one used in the arches. Despite being flooded most of the time; the condition of the masonry is good. The most important bridges built during the works of the Alcantara dam were six viaducts, five for road and one for the railway. Their lengths vary between 150 m of the bridge over the Araya and 360 m of the bridge of the Cardinal over the Tajo. The heights vary between 20 m from the Guadancil bridge for the railway, up to 55 m from the bridge 56 m from the Serradilla bridge over the Tajo. In the study the structural configuration of all of them has been analyzed, presenting an interesting similarity, although the designers were different. In all of them the structural scheme of the board is isostatic. This means that in order to save lights of up to 55 m, unusual solutions have been applied at the time, whose basis is presented in the communication. Finally, an analysis of the state of conservation of the six bridges is made, making a comparative analysis between the different structures. Similar damages have been observed in several of the structures, which due to their similarity have been studied in more detail the San Francisco bridge. Advancing a possible cause of the damage and a proposal for action.

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BEHAVIOUR OF STEEL-CONCRETE COMPOSITE BEAMS WITH BOLTED SHEAR CONNECTORS AND PRECAST CONCRETE SLABS

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ABSTRACT

Concrete-steel composite beam, which comprises of concrete slabs resting on a steel beam has been a revolutionary design in the civil engineering industry. The structural properties of this composite member as a whole such as stiffness and strength capacity have been greatly improved as a consequence of combination of concrete and structural steel. However, carbon emissions and pollution caused due to the production of materials needed and the disposal of the waste materials at the end of the service life of the traditional composite structures is a problem which requires an engineering solution. To improve the efficiency of composite construction, a deconstructable composite beam has been researched upon using post-installed friction-grip bolted shear connectors. This system can be deconstructed to individual components (precast concrete slab and steel beam) unlike conventional composite systems. This paper presents a non-linear continuum-based finite element model to investigate the structural behavior of deconstructable composite beams using the general purpose software ABAQUS. In this research, the research data obtained from the previously conducted experiments on deconstructable composite beams using bolted shear connectors is used to verify the developed model. An extensive parametric study is conducted to investigate the effect of the different bolted shear connectors on the structural behavior of a composite beam with deconstructable post-installed friction-grip bolted shear connectors and precast concrete slabs. In addition, this research gives a detailed guideline to perform finite element analysis along with the relevant prerequisites such as assumptions, constitutive laws and boundary conditions. The failure modes and their criteria in the deconstructable composite beam is also discussed.
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PLANAR GRILLAGES MADE OF SHORT STEEL RECIPROCAL BEAMS

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ABSTRACT

The paper presents the concept of planar grillages made of the beams of only one length, assembled according to the principle specific for reciprocal frames. The important requirement of reciprocal frames is locating the joints of beams along their lengths, in the distance freely adopted from the end of the beam, what enables constructing from identical beams the grillages of different dimensions and density of beams, so also the carrying capacity. The analysis is inspired by research of Jose Sanchez and his collaborators (Sanchez, Escrig, Rodriguez 2010, Sanchez, Escrig 2011), especially in terms of selection of beams, which have been assumed same in the form of steel pipes of a rectangular section. The eight grillages made of beams of identical lengths and sections, but differing in pattern of beams layout and of density of beams and thus dimensions of the whole grillage, have been taken into consideration. It has been assumed that each of the grillages is subjected to influence of identical external load. The joints have been considered alternatively, both as stiff or articulated ones. The aim of the analysis was to compare the maximum bending moments and deflections in particular grillages. The calculations have been made with the use of Robot Structural Analysis Professional software. The results show that along with the increase of the distance between the joints of the beams, the difference between the parameter values measured for grillages of the same beams arrangement, but differing in the use of rigid or articulated joints, decreases. It is possible to obtain the same carrying capacity in the grillage spatially arranged in the way specific for reciprocal frame, but with the application of articulated joints, as in the grillage classically arranged, with the use of stiff joints. The relative ease of making articulated joints in relation to rigid joints is the essential advantage. The grillages of bigger sizes can be constructed from identical beams as the smaller ones, what only limits their carrying capacity to a small extent. The paper presents direct comparison of the values of analysed parameters, as well as the comparison of relative load and beam efficiency coefficients, given in the form of graphs. The concept creates the possibility of storage of not complicated assortment of structural elements and construction from them of rapid assembled and easy demountable structures with parameters adapted to current needs, which can be potentially useful in military service or civil defence.

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MEDIUM SCALE EXPERIMENTAL INVESTIGATION FOR BENDING OF THIN-WALLED VENEER BEAMS WITH FOAM FILLING

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ABSTRACT

Steel or aluminium thin-walled (cold-formed) structures are relatively popular in the construction industry over a few decades. Typical civil engineering applications are roof and wall systems. Open profiles are applied due to the nature of manufacturing process. However, despite of the attractiveness and advantages, the metal thin-walled structures are not sustainable structural products and several disadvantages can be defined. The timber as a structural material looks much more attractive, but the efforts on the application of timber/veneer thin-walled elements is not popular and limited to the tension elements [Gilbert et al., 2014]. The present paper is an introduction to developing very light and structurally efficient veneer profiles for applications as secondary beams in bending for ceilings and roofs. The elements can be combined together with main glulam beams to make the structure stiff as well as light. The profile is open and consists of two very thin veneer sheets (2x0.6mm) glued on wet, with the polyurethane foam filling as a stabilization (100 mmx42 mm of a single profile cross section). The length of medium scale specimen is 80cm. Concentrated load bending experiments were done for double profiles with the use of *Instron* machine with Blue Hill software an external camera in the Water Centre of Warsaw University of Life Sciences. The preliminary experimental studies are promising. The average limit concentrated force is approximately 80N and local damage is observed (Fig. 1d, 1c). The profiles are extra light (7 times less than the respective steel profile), esthetic and greenhouse gas extensive products. Further investigations are recommended for uniformly distributed load and internal reinforcement of the profiles in the direction of successful application as secondary beams in timber celling grillages.

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FINITE ELEMENT MODELLING OF THE CONNECTION FOR TIMBER-CONCRETE COMPOSITE BEAMS

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ABSTRACT

The present study investigated the structural behaviour of the connection for timber-concrete composite (TCC) beams using numerical analysis. In the proposed TCC system, a concrete slab was connected to timber girders with mechanical shear connectors developed by the authors of this article. The load-slip behaviour of the connections was characterised in the push out test. Non-linear 3D finite element (FE) models of the tested joints were verified against experimental results. The comparison between the experimental and numerical results indicates that the adopted 3D model can adequately capture the response of the TCC joints.

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FIRE RESISTANCE OF THE RAFTER USED IN THE STEEL PORTAL FRAME

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ABSTRACT

This paper presents an analysis of the main member of a steel frame in a fire situation. The authors of this article used prescriptive rules and simple calculation models to present an impact of the roof bracing on the fire resistance of a rafter. Designers often have problems with the fire protection of the roof bracing made of steel round bars (Ø). This article presents a solution to this problem.

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STIFFNESS OF COMPOSITE BEAMS WITH FULL SHEAR CONNECTION

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ABSTRACT

This paper presents an analysis of the stiffness of various composite beams with full shear connection. The authors analysed steel-concrete composite (SCC), aluminium-concrete composite (ACC), steel-timber composite (STC) and aluminium-timber composite (ATC) beams using numerical simulations. The purpose of the analysis was to compare and contrast the stiffness of the above-mentioned composite beams. Non-linear 3D finite element (FE) models of the analysed beams were developed and used to evaluate deflections. The SCC beam demonstrated the highest stiffness and the ATC beam demonstrated the lowest stiffness.

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DURABILITY ASSESSMENT OF WATER TOWER AFTER 55 YEARS OF EXPLOITATION

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ABSTRACT

The purpose of this paper is to define the durability and technical condition of the water tower building after 55 years of exploitation. The function of the building is to provide water under high pressure to water supply installation for a water railway distribution station. The building consists of four floors above the ground and the basement. The main masonary structure is made of brick casted on lime and cement mortar. Each story is separated by reinforced concrete ceilings constructed as two-way slabs supported by beams. A circumferential reinforced concrete water tank is situated on the top floor. The tank consists
of two chambers with the total volume of 250 m^3. Experimental investigations of structural concrete include destructive tests made on drilling trial elements and non-destructive tests, to qualify mechanical properties of the material. Supplementary tests concern the humidity measurements and concrete alkalinity examination. For detection of rebar in structural elements, scanning of the specimen surface was performed and the concrete cover was removed in several places. For brick walls the main attention was focused on moisture content measurements. Experimental investigations and on-site inspections made it possible to assess the level of consumption of individual elements and durability of the structure. Experimenta tests' results were used to prepare the numerical model of the tank. Outer wall of cylindrical chambers and the bottom slab of the tank were verified in terms of load-bearing capacity and cracks widths, taking into account rheological effects. On this basis, main guidelines for necessary repairs and strengthening of structural elements which endanger the safety of exploitation were proposed.

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ANALYSIS OF SUPPORT ZONE FAILURE MODES OF PRE-TENSIONED BEAMS SUBJECTED TO SHEAR

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ABSTRACT

The paper presents a study of the most common shear failure modes of support zone in pre-tensioned concrete beams occurring during experimental works. Based on analysis of results from UTPCSDB shear database, the various failure modes have been identified, described and shown graphically. Additional quantitative and qualitative analyses were performed on a sample of 156 single-span beam elements. More than one shear failure mode has been found in 30 % of the elements during testing. The results of analyses were commented in the view of current trends in the development of precast pre-tensioned concrete structures.

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A STUDY OF PRE-TENSIONED CONCRETE HOLLOW CORE SLABS FABRICATION IN POLAND

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ABSTRACT

Pre-tensioned concrete hollow core (HC) slabs have been used in construction for several decades. In Poland, industrial production has been carried out since the 1970s. Currently, due to the dynamic development of precast structures, these elements are gaining in popularity. The article includes a study of a development of pre-tensioned concrete hollow core slabs fabrication technology in Poland within 40 years. During this period, the methodology of casting concrete HC slabs remained unchanged. However, modern elements have gained new features, high load capacity and high quality. The quality and repeatability of characteristics of the slabs is associated primarily with the use of new-generation concretes (with admixtures and additives). The paper describes and analyses the most important differences related to the production of HC slabs currently, and the production from the 70's and 80's of the last century. The analysis is supplemented with a calculation example of determining the bending capacity in commonly used cross-section of HC slab.

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NUMERICAL STUDY REGARDING THE INFLUENCE OF DIFFERENT LINK CONFIGURATIONS ON THE BEHAVIOUR OF COMPOSITE ECCENTRICALLY BRACED FRAMES

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ABSTRACT

The importance of structural stability and resistance has long been an important topic for civil engineers, but with the constant progress of science and building technologies, some aspects of structural design, especially seismic design need to be re-evaluated. This is the case of composite eccentrically braced frames (EBF) where the norm provides a design approach aimed at predicting composite beam behaviour only outside of the dissipative beam area, rather than a full composite behaviour including the dissipative area of the link element, where the plastic hinge develops. The current numerical study is aimed at analysing various factors which can influence the behaviour of a composite beam part of an eccentrically braced frame, by establishing which factors result in a behaviour closer to the pure steel element and which closer to a full composite frame element. The different configurations which were analysed include different loading patterns, different types of configurations of the dissipative link element, different configurations of the steel beam – reinforced concrete slab connection. The adequacy of using finite element software in order to predict structural behaviour, damage and failure modes has been previously proven in various scientific studies in the same field. The current research uses finite element software for establishing the dissipation capacity of the different types of EBF which were analysed, in order to offer design guidelines for improving seismic behaviour of such structural typologies. The results will present the main differences in strength, stiffness and ductility between the responses of steel and composite eccentrically braced frames.

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EXPERIMENTAL INVESTIGATION OF THE BEHAVIOR OF SQUARE REINFORCED CONCRETE COLUMNS WRAPPED WITH CARBON FIBER REINFORCED POLYMER SHEETS AND LOADED ECCENTRICALLY

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ABSTRACT

This study aimed at investigating the performance of square reinforced concrete (RC) columns wrapped with carbon fiber reinforced polymer (CFRP) sheets under eccentric compressive loading. Twenty three square (200 x 200 mm) columns with a corner radius of 12.5 mm and a height of 1200 mm were tested. All columns were reinforced with eight 10 mm diameter longitudinal deformed rebars. The transverse reinforcement consisted of 6 mm diameter deformed ties spaced at 96 mm on centers in the middle region of the column and at 48 mm on centers in the end regions. To examine the effect of different CFRP wrapping schemes, the specimens were divided into three categories: columns of the first category (U) were kept unwrapped; columns of the second category (1C) were wrapped with a layer of circumferential (hoop) CFRP sheets whereas columns of the third category (1V1C) were strengthened with a layer of vertical (axial) CFRP sheets and then confined with a layer of hoop CFRP sheets. The columns in each category were tested under axial compressive loading with eccentricities of 35, 50 and 65 mm as well as in pure bending. Test results indicated that the 1C confinement scheme results in significant enhancements in axial load resistance, ductility and axial stiffness of the eccentrically-loaded square columns. Compared to the CFRP confined columns, using the additional axially-oriented fibers in the 1V1C scheme had no tangible effects on axial load resistance and ductility. However, compared with the unwrapped and the 1C confined columns, the 1V1C wrapped columns exhibited excellent performance under highly eccentric loads. Experimental axial force-bending moment (P-M) interaction diagrams were constructed showing that CFRP jacketing enhances the axial and flexural column strengths.

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MICROCLIMATIC CONDITIONS IN OFFICE SPACES - CASE STUDY

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ABSTRACT

The modern man stays in closed rooms for the most part of the day. It is important that the indoor environment has a beneficial effect on the health and well-being of people. The conditions in the room are called the microclimate of the interior. It is a set of all physical and chemical parameters of rooms affecting the human body and building. The values of these parameters are influenced by the structure of the building and installed installations such as heating installation, ventilation installation, and lighting installation. From the time of the introduction of installation systems into the construction industry, shaping the internal microclimate of the building has become on the one hand an easier task, but on the other hand it requires due diligence and professional knowledge of the design of the internal conditions. The office space is located in a building that will be thermomodernized. Currently, spaces have various technical solutions in the field of window frames, installed radiators and installed lighting fittings. The Predicted Mean Vote (PMV) and Predicted Percentage Dissatisfied **(***PPD)* indicators were determined in an analytical way for selected office spaces and the analysis of factors affecting conditions in particular rooms was carried out. The article contains the comparison of the results obtained from the observation analytically for selected office spaces in different seasons. The article contains a comparison of the results obtained from the observations with the recommendations contained in the legal regulations together with the analysis of the applied technical solutions of the central heating installation.

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OPERATIONAL SAFETY OF SKELETON FRAME BUILT STRUCTURES WITH A LOW-RIGIDITY COVERING

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ABSTRACT

The paper discusses issues related to the safety of light skeleton frame structures with a low-rigidity covering. Non-building structures of this kind have been broadly used as large-scale greenhouses. The most commonly used layout for these structures is the multi-span layout. The paper presents legal preconditions related to construction and operation of these structures; it particularly focuses on external climatic loads, i.e. snow and wind, affecting reliability of these structures due to their uneven distribution on multi-slope roofs. One of the problems associated with the use of plastic covering is the accumulation of snow in multi-slope roof valleys. Designers sometimes happen to transfer this problem to the user of the structure by allowing obligatory snow removal in their calculations and thereby leading to situations where the snow load of the main structural frame is underestimated. The paper presents examples of structures in case of which, as a consequence of underestimating the snow load, failures can occur. In addition, a method of determining wind loads for roof shapes not provided for in standards was noted. The summary contains final conclusions regarding construction and operation of foil tunnels in Polish conditions of operation.

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AN ATTEMPT TO CONTINUE THE MODERNIST TREND PRESENTED ON THE EXAMPLE OF MULTI-FAMILY HOUSING

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ABSTRACT

While trying to understand the current need for continuity of thoughts and ideas derived directly from the modernist trend with regard to multi-family housing, it is doubtlessly necessary that we need to make a synthetic assessment of the quality of Polish architecture over the last several decades. This period was characterized by an extremely diverse, multi-directional and multifaceted way of a building's creation. In the face of a generally noticeable regression, the past several years, recognized so far as indisputable paradigms of culture, brought an inconsistent mix of independently consecutive different tendencies and aesthetic needs. The specific state of permutation, peculiar intellectual vacuum created by rejection of the existing rules and shortage of new ones, must have led to anarchy in architecture manifesting in the omnipresent "all-ism". Against this background, it is difficult but possible, to find a clearly defined style, direction or the need to continue modernist thought on the example of modern housing. Dating back to the seventies of the twentieth century, we can observe activity of the generation of architects, where we can find the attempts to think about architecture on the basis of patterns of contemporary avant-garde world's architecture. So-called "modernism", which was in fashion at that time, resulted in frequent borrowings of formal and functional ideas, yet it brought a number of successful realizations of timeless architectural values, expressed in a clear idea and clearly defined form. The second half of the seventies was dominated by the omnipresent classification and prefabrication based on "the systems of industrialized buildings", which defined the character of the housing architecture. This gave rise to a gradual limitation of individual creativity for the benefit of use and reproduction of typical projects adapted to the needs of particular locations. The economic crisis of the 1980s, as a result of decline of the socialist economy, also resulted in the stagnation of construction activity. An example of the existence of any design process remained the urban design of large housing estates based on the consistently simplified and limited construction systems of multi-family buildings. Thus, monotony and repetition became a ubiquitous standard and the only aesthetic criterion that defined the architectural space of cities at that time. The political and economic transformations that took place after 1989 as well as a strong feeling of freedom, regained after years, triggered off revolutionary changes in thinking that resulted in a multitude of events taking place in architecture, and consequently in the diversity and variability of aesthetic tendencies. Therefore, it is difficult to believe that the buildings constructed at that time were a direct indicator of a post-modernism idea, which, locally, were a sort of specific alibi, resulting from the momentary, deep need to rebuild the times of modernism, unfairly reduced in our reality only down to the criticism and negation of a ubiquitous residential large-panel housing. Luckily, the end of the nineties brought a noticeable reassurance of these tendencies. Uncertainty and indecisiveness, and hence the multitude of ideas and stylistic themes that provoked safe passivity and aesthetic borrowings, have been replaced by escapism from "eclectic postmodernism" towards "neo-modernism" as a more sophisticated form of convention. As a consequence, there appeared objects with a balanced form, not giving in the need to draw directly from classical patterns and not succumbing to the intrusive and chaotic need to recover from the past. Despite the fact that the possibilities of a designer's creative expressions have become apparently expanded in new, modern economic realities, the designer's creation has at the same time been very limited. His freedom and free expression were additionally determined by the investor, whose opinion on the social and economic expectations, and thus on the architecture and purely aesthetic issues, has in many cases become superior. However, numerous examples of contemporary multi-family buildings, which are also the result of their own professional experience, offer prospects that the stage of total abandonment of the idea of modernism turned out to be apparent and was provoked by rather temporary emergence of various aesthetic tendencies, which are the result of views denying the architecture, commonly regarded as impersonal.

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THE PLATFORMS OF TRUCK SCALES CONSTRUCTED WITH POST-TENSIONED CONCRETE

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ABSTRACT

A whole range of truck scales with a nominal capacity of 6 to 80 t. is available on the European market. A platform of truck scale is intended to transfer load of weighting truck to foundations through load cells. The basic requirements for weighbridge platforms is their stiffness, because of deflection, durability and low self-weight, because of their low cost of transport. Typically, the platform scale is made of reinforced, steel or composite (steel and concrete) structure. More rarely, they are made of prestressed and mostly as a pre-tensioned element. In Poland, the authors have been created several types of prestressed platforms, using post-tensioned technology with unbonded tendons, lately. The slabs are designed as partially prestressed elements, operating as cracked, that reduce amount of required prestressing steel. Because of poor knowledge about behaviour of the prestressed elements with unbonded tendons under cyclic load, two different types of slabs (with capacity of 30 and 60 tonnes) were testing at the Cracow University of Technology. The authors assumed the number of 250 load cycles per day and a 10-year lifetime of slabs in designed program. Finally, the slabs were subjected to 1 000 000 load cycles. Obtained test results shown that the geometry and weight of post-tensioned weighbridge platforms can be optimized. The paper presents the history of development of weighbridges, the basic principles of design results. As a result of carried out research and gained experience due to implemented post-tensioned weighbridges for mass production, the authors presents possibility of improvement and further development the devices.

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AN ATTEMPT TO DESCRIBE THE MECHANISM OF WORK OF MASONRY JOINS

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ABSTRACT

The issue of joints in masonry walls is often neglected and belittled from the structural point of view. It may even be said that the problem of joints is better investigated in terms of their thermal and acoustic insulation. Although such an approach can be justified to some extent in traditional construction (ceramic walls joined with traditional masonry bond), in case of joints with steel connectors such negligence can even lead to catastrophe. The issue of load transfer and co-operation between the crossing walls is very important for durability and safety of the structure. There is little experimental research in this topic worldwide. Designers do not have sufficient procedures and recommendations to design joints safely. Because of this void in the state of the art as well as the need to investigate the issue of masonry joints the authors decided to work on this subject. Experimental campaign is currently on going at the Faculty of Civil Engineering of the Silesian University of Technology in which joints in masonry walls made of AAC blocks with thin joints and unfilled head joints are tested. This paper presents the results of three series of tests. The first, reference series included the walls with traditional masonry bond. The other two series of joints were made with the popular steel connectors available on the market. The tests were performed in a specifically constructed T-shaped test stand, with a web and a flange of ~89 cm length. In addition to presentation of the differences in cracking and failure mechanisms as well as in load-bearing capacity, the authors attempted to describe the mechanism of each type of the joint.

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RECOMMENDATIONS FOR REDUCING PROGRESSIVE COLLAPSE POTENTIAL IN FLAT SLAB STRUCTURAL SYSTEMS

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ABSTRACT

Flat slab structural systems are amongst the oldest methods to transfer gravity loads and contribute to resistance of lateral forces. The popularity of the system is owed to the ease and speed of construction compared to other floor systems. Flat slabs also offer flexibility where light and heavy partitions may be placed freely anywhere on plan. Properly designed flat slabs possess considerable ability to transfer vertical loads through membrane action. However, in the event of loss of primarily load-carrying system, the potential for progressive collapse is relatively high due to the inherent lack of alternate load path to transfer gravity load and mitigate progressive collapse. Compared to interior columns, Loss of corner and exterior columns produces higher local demands on the slab and increases the potential for global progressive collapse in the panels at the vicinity of lost corner columns. This paper discusses the dominant failure modes associated with progressive collapse in flat slab construction. The paper also explores options for geometric and structural design of flat slab system that will enhance resistance for progressive collapse with better life safety. The following measures for reducing progressive collapse potential are discussed: 1) use of enhanced local resistance approach for corner and penultimate columns, 2) use of edge beams along perimeters to increase stiffness and improve load transfer, 3) detailing requirements for flat slab system to decrease the potential for punching shear and where continuity and anchorage of bottom reinforcement through columns was noted as critical in improving collapse resistance; 4) selecting columns configurations with improved resistance to punching shear and buckling, 5) addressing the inherently lower collapse resistance in corner slab panels through judicial selection of shear wall locations incorporated with perimeter exterior beams to form a load path.

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HOW TO DESIGN ECONOMICAL NETWORK ARCHES

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ABSTRACT

Network arches with low cost of materials can be achieved in economic spans that look good. The network arch has hangers that cross each other at least twice. The arches are made of steel. When the distance between the arches is less than 20m, the tie should normally be made of concrete. Standard adjustable hangers are recommended. The tension in the tie is best taken by prestressing cables between the ends of the arches. There is little bending in the arches and little longitudinal bending in the tie. Thus, arch and tie can be slim. The arch looks best if it has a rise of 0,15 to 0,16 times the span. The lane was cast in a wooden form on timber piles in the river. The arch was erected from the lane before the prestressing cables between the ends of the arches were tensioned and the wood was removed. The pedestrians were outside the arches. Thus, concrete slab between the arches could be slim. The bridge is in good shape after 55 years. Often the main span of a network arch can be lifted in place by big cranes. Then it is an advantage if a light steel skeleton is lifted to the pillars. The arch could be a steel tube that is filled with concrete after the steel skeleton is in place. Then the wooden form can be attached, and the lane cast. The edge beams are cast first. Network arches can be erected in many ways. In the future the light steel skeleton might be lifted in place by helicopters.

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COMPOSITE ROOFING MADE OF PIR SANDWICH PANELS: NUMERICAL AND EXPERIMENTAL APPROACH

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ABSTRACT

The PIR panels are composite elements made of an inner core of poly-iso-cyanide solid foam injected between two external sheets of fabric or polypropylene. When testing composite samples having such structure the obtained results (in terms of compression and bending resistances) usually reach relatively high levels. This suggests a possible use of panels in applications under distributed loading and not only as simple thermo-insulating layers. A large range of applications thus derives, i.e. cladding of timber roofing, sloping support for hydro-insulation in flat concrete roofs, or hydro-insulation support for trapezoidal sheeting flat or curved roofs. The paper presents an experimental and numerical study on two practical cases, i.e. flat concrete roof and trapezoidal sheet roofs respectively. Standard testing of samples taken from the composite core and from the membrane have been performed in the frame of present investigation together with testing of some composite samples in compression and bending. Typical roof loading as gravity (dead + snow) load or wind suction have been analysed in the numerical simulation (reproducing the test arrangement) in order to assess panel response and to evaluate practical applicability of these composites. Conclusions on stress distribution and deflections both under gravity and uplift load are presented. The high resistance of PIR composite panels (well beyond design loads calculated by the code) is confirmed, clearly indicating their practical applicability in the cases under study. This also meets the producer requirements who intends to obtain in the future an official agreement allowing to supply these particular composite solutions using PIR on the market.

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BUCKLING RESISTANCE OF REINFORCING BARS MADE OF STEEL WITHOUT DISTINCTIVE YIELD STRESS

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ABSTRACT

Prediction the behavior of reinforced concrete bar structures under the influence of seismic shocks requires the analysis of the work of plastic joints forming in beams and columns. The possibility of plastic rotation of the joints determines the ductility and the ability to dissipate energy through these structures, and thus their resistance to seismic loads. Experiences from previous earthquakes illustrating damages and destructions of reinforced concrete structures as well as experimental results of reinforced concrete beams and columns subjected to cyclic loads causing plastic deformations show that the destruction of these elements begins at the moment of buckling longitudinal reinforcement bars in the area of plastic joints. However, the assumptions for the design of reinforced concrete elements assume that longitudinal reinforcement bars do not bend during bending and compression. The paper presents the results of experimental tests and of reinforcing steel bars made of steel with no apparent yield stress. The tests were carried out for bars made of reinforced steel B400. The ratio of the distance between the bearing points and the diameter of the bars varied from 5 to 14. The results show that the decisive effect on the inelastic buckling of the bars has their slenderness. Critical force and shortening of bars at the moment of buckling of bars decrease with increasing bar's slenderness.

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PROCESSING DATA FROM VIBRATION RECORDINGS

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ABSTRACT

The purpose of research. The article aims to present a way of processing the data within a real-time transmission system of recorded vibration. At present, Romanian National Strong Motion Network for Constructions of URBAN-INCERC has 56 seismic / digital accelerometer stations, of which 46 are in territory and 10 in Bucharest. The seismic stations of this system are placed in some ground floor-buildings type, assimilated with the free-field, or in buildings with 1 ...3 levels. *Principal results*. First application of the real-time transmission system is related to the accelerometric records from moderate earthquakes which have shown a spatial distribution of PGA with NE-SW directivity, similar to that observed under certain conditions of seismic severity in previous strong earthquakes. Some charts illustrating the acceleration amplitudes recorded from the 2016 and 2017 earthquakes in the URBAN-INCERC network will be shown. The second application is referred to the structural response (structural behaviour under ambiental vibrations or moderate and severe seismic motions). Generally, the spectral analysis of these records leads to getting the natural frequencies, the influence of the general directivity of waves propagation specific to the Vrancea source on the spectral content of the seismic recording and on structural response, the influence of the local soil conditions etc. In this case, for a study building, the vibration modes, the drift/the relative floor displacement etc. can result from this processing, with a validation based on a structural modelling with finite elements. *Major conclusions.* The seismic wave propagation direction is the first option for determining the direction of propagation of severe effects on buildings. Correlation between them can be validated by existence of pre-event dynamic characteristics of those buildings (before a major seismic event) and at post-event time.

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SPATIAL ADVERTISING STRUCTURE ANALYSIS ON SELECTED EXAMPLES

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ABSTRACT

In the paper the static and dynamic analysis of spatial advertising structures with many degrees of freedom is presented. The computations for numerical models with different height-to-width ratio of the screen and variable location of the pole in the system are conducted. An attempt to model the time-independent wind forces and time-dependent external loads on the screen and way of effectively applying them to the structure is made. The influence of assumed geometry of the advertising banner on the obtained results of natural frequencies, displacements and internal forces is discussed. The difference in system behaviour under static loads and under dynamic force distribution within and outside the resonance range is examined. Comparison of the results of individual analyses showed that the pole is the most crucial element in the considered structures. It experiences the largest displacements and values of bending moments in relation to other parts of the system. At the same time, the pole cross-section changes most affect the values of first natural frequencies of the entire system and have a large impact on the obtained results of the dynamic analysis. In fact, advertising banners are often located on the open space and are exposed on the dynamic forces which are random loads that should be considered by using complex stochastic processes. However, obtained results from specific analyses allowed to draw general conclusions on the recommended geometry for the advertising structures so as to receive the high-capacity system and simultaneously to minimize the risk of negative effect of the resonance due to dynamic excitation.

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RESISTANCES OF METAL I-SECTIONS UNDER BENDING AND TORSION

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ABSTRACT

Interaction formulae for the resistance of I sections under the combination of the internal forces of the bending and the torsion. The resistances of I- and H-sections under combination of the bending and the torsion are investigated for the limit states: (i) elastic and (ii) plastic without strengthening. Simple interaction formulae for I- and H-sections convenient for the standard purposes are presented. There are investigated interactions: (i) the bending moment and the bimoment, (ii) the shear force and the St. Venant torsional moment. Results of the large parametrical study of the shear area I- and H-sections are presented too. The shear area and the shear torsion constant formulae are convenient for any shape of the open or closed cross-section. Metal (steel and aluminium) sections are investigated. The proposals are presented for the new generation of Eurocodes EN 1993-1-1 Design of steel structures and EN 1999-1-1 Design of aluminium structures. The formulae for shear area used in EN 1993-1-1: 2005 may give especially for small sizes HEA 100, HEB 100 and HEM 100 sections the values of the relative shear area up to 1.9. This is not acceptable. The relative shear area is defined as the ratio of shear area to web area $h_w t_w$. The experiments shown that the shear area is restricted by the value $\eta h_w t_w$, where $1{,}0 \le \eta \le 1{,}2$. The proposal how to improve incorrect formula given in the final draft prEN 1993-1-1, 2017 relating to the interaction of the bending moment and the bimoment is presented. The generalised formula valid for the all section Classes was accepted for the final draft prEN 1999-1-1 and it is presented too. The all analytical results and the formulae of the authors were verified and confirmed by the computer programs QST-TSV-3Blech (RU Bochum) and DUENQ (Dlubal Software). Comparisons of the elastic and 5 plastic resitances of the H-section under the combination of shear force and the St. Venant torsional moment, including one proposed by authors for prEN 1999-1-1.

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HORIZONTAL FORCES ON CRANE RUNWAY CAUSED BY SKEWING OF THE CRANE

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ABSTRACT

Horizontal forces between the crane and the crane runway girder occur during a motion of an overhead travelling crane on the crane runway. These forces can be caused by skewing, acceleration or braking of the crane. As a result of these forces wear of wheel rims can occur and drive ability of overhead crane can get worse. There are several procedures for determination of these horizontal loads varying both in physical model and magnitude of forces. Historically, these procedures have been developed. The first methods were based on empirical bases and experiences. The main problem of determinating of these forces is a large number of factors which affect a magnitude of these horizontal forces. These factors are in addition difficult to describe, to measure etc. However, with the increasing possibilities of science and technology some methods based on a scientific and experimental basis were developed. This paper summarizes some of the methods used in past and in present and also show possibility to calculate the horizontal forces between crane runway and the overhead crane by dynamic model.

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USE EFFECTIVE METHODS OF PROJECT MANAGEMENT METHODOLOGY BY IPMA THE REALIZATION OF INVESTMENT PROJECTS - THE STRATEGIC ROLE OF PROJECT MANAGERS

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ABSTRACT

International Project Management Association is an organization focused on Project management process which is understood as competence field of a Project Manager. The Project Manager is the main person of all the process with responsibility from the beginning to the end of the process. This article focuses on the tools, documents and project management procedures related to building projects and big investment areas. Based on practical experiences it describes the main role of the project managers in terms of competency skills. It refers to bottlenecks of the buildings projects, underestimating the risk management and it includes a short view on process solving with Theory of Constrains. On the end of the article is mentioned a team work as a tool for successful achievement of objectives.

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ANALYSIS OF COLLAR ROOF CONSIDERING DEFLECTION OF REINFORCED CONCRETE RIM WITH CRACKS

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ABSTRACT

This paper deals with the interaction between collar roofs and the bottom support structure made as a reinforced concrete rim. In present, the collar roofs are widely used for their ability to omit internal vertical support structures (columns, support walls), which might be sometimes a complication during a design of the layout of the building. Collar roof acts on the bottom support structure of the building by quite big lateral horizontal forces. For structure analysis of collar roof is often assumed the infinity stiffness of the reinforced concrete rim. The correctness of this assumption depends of the constructional solution of the concrete rim anchoring. When the concrete rim is anchored to the transverse wall only, the assumption of infinity stiffness of the reinforced concrete rim is not fulfilled properly. The paper shows the example of the collar roof supported on the reinforced concrete rim. There is made a comparison of internal forces in two frames. One frame has rigid lateral support; the second one has a flexible lateral support. The flexibility of the lateral support is due to the deflection of the reinforced concrete rim. The occurrence of cracks in the reinforced concrete rim is taken into account. This paper shows the possibility how to deal with the considering cracks in reinforced concrete beam in calculation without using software, which is able to calculate reinforcement concrete beams with steel reinforcement and cracks in concrete.

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ANALYSIS OF HISTORICAL RESIDENCE ON TERMS OF THE CURRENT STATE

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ABSTRACT

The paper points to the absence of maintaining the values of rural urbanism and especially architecture in South Bohemia. Particular attention is paid to the analysis of forgotten historical settlement Hodňov, which contain historically and architectonically interesting buildings, some of which are in a disrepair. This state of affairs could result in the gradual disappearance of buildings and historic sites and objects from the map of the Czech Republic. The aim of the paper is to describe and analyse the historical place in terms of the current state.

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DISORDERS OF THE BUILDING AND ITS REMEDIATION – STORAGE BUILDINGS PRAHA

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ABSTRACT

The aim of the paper was to provide information on construction deficiencies of storage facilities Libuš Business Park. The whole area used for storage with administrative parts. The buildings of the halls are two with different constructions: Building number 1 is a reinforced concrete skeleton with prestressed roof panels (ceiling) and brick filling and Building number 2, which sandwich panels PUR system solutions. The study of the situation and the subsequent construction and can again be used without problems in order to avoid further damage to the goods and repeated defects. Alternatively, suggest other procedures (remediation). This was mainly a failure of the supporting truss of the object 1 and the failure of the floor and the roof of the object 2.

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LOAD CARRYING CAPACITY OF HYBRID COMPRESSED STEEL MEMBERS

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ABSTRACT

The original calculation conception for hybrid compressed steel members having flanges from higher strength steels and webs from usual constructional steels is presented within the paper. The web of such elements is loaded in the elastic-plastic or plastic region. The calculation conception enables to appoint the load carrying capacity of the elements taking into consideration the elastic-plastic post-critical behaviour of thin webs. This conception is based on the results of previous experimental-theoretical research. Essential experimental findings and results of static tests of 16 welded I cross-section members are applied. Two 2 material combinations and 4 various web slenderness are applied. The calculation conception extends the concerned calculation method for the homogeneous compressed steel members used in actual standards for the design of steel structures.

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TECHNOLOGY FOR EFFICIENT MOTORWAY OVERPASSES

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ABSTRACT

Overpasses can play an important role in ensuring permeability of motorways for wildlife. Width and length are the principal technical parameters affecting overpass effectiveness. It is very important to ensure correct technology and a proper water management on its surface. Wildlife behaviour and their requirements for the mentioned technical parameters of overpasses also have been examined. In all cases, overpass functionality grows with increasing width and declines with growing length. The objective should therefore be to find a balanced compromise enabling sufficient functionality while maintaining reasonable costs. Data envelopment analysis (DEA) provides a way to identify “good” solutions in the sense of sufficient overpass functionality with reasonable total costs. Overpass functionality calculations were based on the original methodology developed by the author. Total costs were established according to actual construction work prices in the Czech Republic, including prices for preparations, design, construction, maintenance, and demolition. The results indicate that DEA has been found to be a suitable tool for finding good solutions and can be useful when planning measures to ensure motorways are permeable to wildlife.

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THE IMPACT OF MATERIAL SURFACE ROUGHNESS ON THE CONCENTRATION OF PARTICULATE EMISSION

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ABSTRACT

In this study, the influence of horizontal surface materials roughness is observed in term of the concentration of particulate emission in the indoors. The indoor particular matter concentration and it´s deposition depends on physical and chemical interactions between the indoor air and the material surfaces. The tested horizontal surface materials were glace ceramic flooring, laminated flooring, PVC linoleum, ragged ceramic flooring, cork flooring and plush carpet. The flooring materials were tested divided into three categories – smooth (R_a<100 μm), slightly rough (100 μm <R_a<1000 μm) and rough (R_a>1000 μm). The observed results illustrate that the concentration of PM_{10} is significantly larger for the smooth flooring surface material than for the rough and slightly rough material surfaces. The choice of building materials and their surface finish considerably affects the sense of comfort and indoor air quality of the buildings.

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MUTUAL CORRELATION BETWEEN SOFTENING POINT AND FLOW RESISTANCE AT ELEVATED TEMPERATURE ACCORDING TO BITUMEN MASS IN BITUMEN SHEETS

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ABSTRACT

Bitumen sheets are isolating materials that are used in the building construction, primarily as roof waterproofing, vapor barrier and waterproofing of the substructure. For civil engineering they are applied as the isolation of concrete bridge decks and they are used as the main waterproofing for underground construction. Currently, bitumen sheets mentioned above are modified by polymers of elastomer and plastomer. In the places where the bitumen sheets are exposed to UV radiation or to high temperature, the manufacturer is, according to the product standards, required to declare the flow resistance at elevated temperature. This paper deals with the investigation of the interdependence between the flow resistance at elevated temperature and the softening point of the bitumen matter in these bitumen sheets. In practice, the results of this dependence are often used in the production of bitumen sheets during the inter-operative check, where the softening point value determines the value of the flow resistance at elevated temperature. This allows to determine, whether the produced bitumen sheets will fulfill the values declared by the manufacturer with advance. Since the test for detection of the value of the softening point takes in average 30 minutes then it is possible to react quickly and efficiently during the production and to make the appropriate corrections. Reinforced bitumen sheets which are used for waterproofing of the isolation of concrete bridge decks were selected as the samples from various manufacturers. In practice, this aforementioned dependency is often cited but it is not explicitly documented by a sufficiently large number of samples. The authors of this article found during the previous research that the dependence is influenced by the temperature value – the higher is the temperature, the more obvious is the dependence. For this reason, it is very evident in the case of bitumen sheets modified by polymers of the plastomeric character. The hypothesis, that there exists some relationship between the flow resistance at elevated temperature concerning to bitumen sheets and the softening point of the bitumen matter, was confirmed only partially. The aim of the paper is to confirm or refute the hypothesis even for materials modified by polymers of elastomeric character. For this reason, the number of bitumen sheets modified by polymers of both plastic and elastomeric character was increased. Results were formulated based on the statistical evaluation of data obtained from laboratory measurements.

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INFLUENCE OF THE QUANTITY OF FILLERS ON CRUCIAL THERMAL-TECHNICAL PARAMETERS OF BITUMEN WATERPROOFING SHEETS

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ABSTRACT

Bitumen sheets are mainly used in the building industry as a waterproofing material. The waterproofing function in bitumen sheets is ensured by the bitumen mass and its quantity and composition. The important component of bitumen mass is the filler. An increased amount of filler reduces the cost of bitumen and thus the cost of a complete bitumen sheets. The amount of bitumen filler is mostly limited by the technological capabilities of the production equipment used in the production of bitumen sheets. However, the amount of filler can adversely affect some properties of the bitumen mass and hence the bitumen sheets. One of the basic features influencing the application of bitumen sheets is a low temperature flexibility. An increased amount of fillers also degrades workability in the work place. This paper deals with the analysis of the composition of the bitumen mass for the production of bitumen sheets used for the isolation of concrete bridges. The paper based on the analysis of samples of bitumen sheets selected from various manufacturers describes the usual amount of bitumen fillers. At the same time, the paper answers the question of the hypothesis - whether the increased or decreased amount of fillers affects one of the basic thermal-technical properties of bitumen sheets - the flexibility under low temperatures. The authors of this article found during the previous research that dependence is influenced both by the type of the bitumen mass and by the type of the surface treatment. It has been statistically proven that the decisive factor is not the amount of the filler but the type of bitumen in the terms of modification. The aim of this paper is to confirm or confute the hypothesis that there is some relationship between the flexibility at low temperature and the composition of the bitumen with an expanded amount of samples. Thus, new results can confirm or disprove previous research results. Results were formulated based on the statistical evaluation of data obtained from the laboratory measurements.

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TECHNICAL INFRASTRUCTURE OF THE AREA IN THE BROWNFIELD CATALOGING PROCESS

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ABSTRACT

The issue of brownfields is currently one of the frequently discussed topics both in the sphere of spatial planning and in related areas such as building construction, data models of buildings, or environment. This issue is not local in character, but is tied to human civilization on a global scale. Of course, brownfield issues can be divided into several separate sub-areas. These are, above all, the area of identification and cataloging, the area of exploration and rehabilitation of particular localities, especially in terms of remediation of ecological contamination, as well as the area of actual revitalization of individual localities and consequently further monitoring after revitalization. Parallel to these components is the implementation of the issue into the legislative framework of a particular state. The Legislative Base of the Czech Republic was dealt with as part of the contribution to the WMCEAUP Symposium in 2016. It was followed by a series of expert papers focusing on the cataloging of brownfield sites from various points of view - building technical condition, fire safety design of buildings, transport infrastructure and others. This article is a further continuation and deals with brownfield databases in terms of monitored phenomena of the technical infrastructure. Within the legislation of the Czech Republic, the cataloging is solved both by means of territorial analytical documents of municipalities and by means of territorial studies. In the case of municipalities' territorial analyzes, brownfields are classified as the observed phenomenon No.: 4a. However, it is not yet specified which data will be tracked (except location). In spatial studies, content is defined very freely, as it is a very general tool for spatial planning. Since, apart from the building law, the issue of brownfields in the Czech Republic is not legislatively treated, there is no uniform methodology for the identification and cataloging of brownfields. Therefore, the content of individual databases is always compiled solely according to the requirements of the submitter of the study. However, the areas of information that appear regularly in databases can be traced. One of these is information about the technical infrastructure. This information is initially divided into two sub-areas - information on the possibilities of connecting particular site and the area of inner structure of existing distributions.

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TECHNOLOGICAL AND ECONOMICAL - ECOLOGICAL CONCEPT IN THE CONSTRUCTION OF LINE STRUCTURES

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ABSTRACT

The proposed concept presented is a significant contribution (with economic impact) in the supporting segments of the strategic long-term solution of the development of the motorway and railway network in the Czech Republic. The content of this study and, above all, the clear recommendations in its conclusion on how to proceed in the field of compensatory measures for the design and construction of line structures clearly describe the methodology and procedures for achieving significant savings in the scope of planned construction in future projects compared to current approaches. The key parameters for success in achieving the presented objectives are the introduction of an environmental audit in the preparation phase and sustainable ecological functionality in the implementation and operation phases. The system correlates with the priority axes of economy and innovation, landscape, ecosystems and biodiversity and land development. The strategic framework defines the vision of sustainable development in the Czech Republic, defines the basic principles of sustainable development, measuring indicators and defines key priorities and objectives of sustainable development, divided into five interrelated priority axes. The implementation of the priorities and objectives proposed in the strategic framework is intended to ensure that the prosperity of the Czech society stands on the mutual balance of the three pillars of sustainable development - economic, social and environmental.

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A STUDY OF PERCEIVED AIR QUALITY AND ODORS

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ABSTRACT

Indoor air quality affects comfort, health and performance of buildings occupants. Chemical assessments and sensory assessments of indoor air quality contribute comprehensive knowledge on the state of the indoor environment. Fresh air without harmful pollutants is a prerequisite for a quality internal environment. This aim of the contribution is to emphasize the importance of ventilation intensity on the quality of the indoor environment. Chemical and sensory assessments of indoor air quality were done in the standard university classroom before and after the lesson. The impact of ventilation intensity on perceived air quality was studied. The experiment was performed for three levels of air exchange rate (0.50, 0.75 and 1.00 h^{-1}). Chemical evaluation involves monitoring the indoor air temperature, relative humidity, CO_2 and TVOC concentrations. Sensory quality assessment is based on air acceptability, odor intensity and percentage of dissatisfied. Air acceptability raised and odor intensity decreased when ventilation intensity was increased. Perceived Air Quality (PAQ) is an important factor in assessing the indoor environment.

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THE EFFECTS OF NOTCHES ON THE FATIGUE STRENGTH OF STEEL

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ABSTRACT

The paper informs about the research devoted to fatigue strength and life–time of welded steel structures. The experimental program comprises fatigue tests of constructional steel S 380 (QStE 380 TM). In the first stage 35 specimens were tested: 9 without any weld connection (NOW), 14 with transverse milled butt weld (BWM) and 12 with transverse rough butt weld BWR). The applied loading in this stage was harmonic with constant stress range. All tests ended by fatigue failure. The second part of the research comprised the tests with block simulated loading with variable stress range. The third part applied continuous recording of stresses and strains in critical sections that gave information about the local failure development in time. Data sets allowed to define fatigue properties of investigated steel and degradation effects of used welds including the initiation time of remarkable changes in stress-strain stage expressed through the total kinetic energy. The degradation effects of welds on fatigue strength of structural steels were confirmed, especially it was the case of rough welds - without additional milling. Additionally, the differences in the fatigue curves inclinations were indicated that can depend on the level of fatigue strength. The applied approach gives an opportunity to analyze the effects of actual loading process and improve the methodology of judgment of fatigue strength and life-time of steel elements. Reasonable fatigue properties of this steel suggest it for using also in severe technology structures.

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

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ABSTRACT

The article deals with the mapping of the remains of the Czech part of the České Budějovice – Linz line. The horse-drawn railway is a national cultural heritage and one of the first major logistic activities of the Czech Republic. The work has confirmed little or no use of track relics and also confirms that the track is neglected and abandoned, although its remains are often in close proximity to current communications and are therefore easy to access. The relics are mostly surrounded by racing green, dilapidated and do not lead to any marked trails. An exception is made up of all four buildings on the territory of České Budějovice. For the last few buildings in front of the border with Austria, there is an educational trail. You cannot talk about the rest of the relics. During the research, relicts lying close to each other were classified into four locations. These locations are: České Budějovice, Kamenný Újezd, Velešín and Suchdol up to the border. Locations are more interesting for visitors because they have several objects close together, which can be more easily visited. Some objects are far apart and have not been included in the locations. In the article, we focus on the section about Holkov up to the border with Austria. The aim of the thesis is to propose measures to increase tourism on these track debris. The main question of the work, to find out the possibility of revitalizing a part of the track to make tourist attractions more attractive, proved to be possible. The work proposes new educational trails on horse-drawn track on the remains of the track. These trails are located in the denser relic locations. Trails, positions, and stop counts are suggested for the nature trails, and they should be covered, but the panels themselves are not designed. It is also proposed to use modern technologies, usable in smart devices.

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ONTOLOGY AS A TOOL FOR BUILDING LIFE CYCLE MODELLING

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ABSTRACT

In this on research-based article, models presented further are representing complex concepts and facilitating their understanding. The models describe the categorization of the recorded knowledge obtained from the analysis of the monitored processes. Some of these models are descriptive (for example, the Venn diagram representing the interconnection of BIM spaces), others are predictive (e.g. a model representing the effects of BIM on the life cycle of a project), and others will be instructive-clarifying the sequence of actions that follow on to achieve a predefined output, such as a workflow model, representing authorization, identification, classification, aggregation, and usage. We can look at BIM as a framework modelling set of minimal sets of principles needed to model the basic building characteristics, along with a clear categorization of knowledge in identified and recorded models. Taxonomy is an effective and efficient way to organize and consolidate knowledge. A well-structured taxonomy allows for "meaningful gathering of experience". As we develop specialized taxonomies for organizing BIM domain knowledge, we will try to adopt the guidelines introduced by research. That is, the taxonomy is expected to be complex and complete; including classes that covering all the phenomena of our interest; based on decision-making rules, which are simple and stingy to assign instances to classes; and classes should be mutually exclusive. Moreover, because taxonomy is here as a tool for better understanding, these classes should be comprehensible and look natural.

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

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ABSTRACT

The essence of successful implementation of BIM in practice is knowledge about objects, their behaviour and other properties with higher overlap and throughout the life cycle of the building. In addition, other structurally and unstructured knowledge (historical experience, needs and requirements of users, investors, the need to perform revisions to some objects, etc.) is added to this. Taking all of these attributes into a building lifecycle management system requires the creation of both a knowledge management and knowledge management system and a time management system. Learning creates knowledge and "knowledge organization" is an organization that uses knowledge to develop and achieve (long-term) goals. In general, there is no guaranteed procedure, no universal set of tools to help build a knowledge-based organization. If knowledge creation is to be used to better achieve results, it should not be separated from other activities of the organization. Knowledge Management represents the establishment and subsequent managing special network structure that includes all existing knowledge units. Knowledge management is often perceived as a survivor of the company today, but managers often do not realize that it is a much more complex process than generating large tables in Excel for comprehensive reporting to senior management and owners. Well-organized Knowledge Management can create concepts of knowledge, review and consolidate them, prepare action plans to create, secure, combine and coordinate knowledge, as well as set up clear ways to extract them from knowledge bases at the time of need and hunger for quality.

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BEGINNING OF REAL WIDE US OF BIM TECHNOLOGY IN CZECH REPUBLIC

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ABSTRACT

As in all aspects of our lives, development and innovative solutions reveal every day. Life without progressive things, such as a mobile phone or the Internet, is unimaginable for man living in our modern age. Towards the current trend called Industry 4.0., which is the trend of data exchange and automation in manufacturing technologies, people are on the brink of big changes. Current digitization in our everyday lives helps us to enhance their quality. As many other branches, AEC industry also goes through the enhanced digitization process. As an effective tool following trend Industry 4.0 in AEC industry, Building Information Modeling (or Management) Technology has proven itself. Nowadays, in many not even European Countries, the BIM Technology is in different levels of using. Connected to it, BIM is on different phases of implementation into legislation these days. In some countries, using BIM Technology for new building design is compulsory for public service contracts, building infrastructures or for all building without the difference. In order to be competitive, in the Czech Republic´s Legislation, the trend is the same. But there are many barriers for BIM implementation, or the BIM adoption. Proper solutions for many key topics is necessary to find before the introduction of BIM for widespread use. Of course, finding these solutions take a lot of time, expenditures and failures to reveal the most optimal solution of implementation. The Czech Republic is one of countries which already started with processes connected to BIM implementation and adoption. At these days, country is solving many issues connected to BIM implementation. This paper is a brief presentation of them and it reveals the reasons and ways to achieve this.

Session Title:

Building Performance and Simulation

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EVIDENCE-BASED STANDARDS IN U.S. HOSPITALS
VENTILATION RATES vs INCIDENCE OF HOSPITAL-ACQUIRED INFECTIONS (1990-2015)

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ABSTRACT

The U.S. spends approximately $3-trillion on healthcare each year, or nearly 20% of its GDP. Many codes, standards and operational procedures are costly, yet may be ineffective or unnecessary. Of more than 800 ventilation and environmental control standards affecting the delivery of medical care and safety of patients, less than one-third are supported by scientific evidence. As a result, the average U.S. hospital spends 5-times more on energy than a comparable commercial building to maintain climate control and indoor air quality. Yet, hospital-acquired infections (HAIs) cost between $35.7-45.0 billion and claim 90,000 lives each year, nearly three times the number of U.S. automobile deaths. Early research on hospital ventilation standards consisted mainly of retrospective case studies and laboratory-scale experiments that in many cases, were inconclusive and poorly representative of actual healthcare environments. Coupled with rising energy costs, U.S. hospital ventilation requirements subsequently declined from the early 1970's to the late 1980's. Beginning in the early 1990's, however, a growing body of evidence led by simulation technologies help fuel an increase in ventilation rates through 2010. During this same time period, data on healthcare acquired pneumonia (HCAP) and other secondary hospital infections began to emerge from the U.S Centres for Disease Control (CDC). For the first time, changes in ventilation requirements could be compared to changes in infection rates and other ventilation-related healthcare outcomes using longitudinal study methods. Similar to clinical trials, longitudinal study methods are designed to control for bias, error and variability by the depth and breadth of the data. Using vast datasets over many years, longitudinal study methods have proven effective in uncovering causal relationships in clinical settings such as environmental predictors for disease. To test this theory, U.S. HCAP infections were compared to U.S. hospital ventilation rates from 1990-2015. U.S. hospital inventories were first segmented by age, floor area and other factors, and assigned ventilation rates based on standards in place at the time of design and construction. A weighted-average ventilation rate for general patient spaces was calculated based on the age-floor area distribution of U.S. hospital stock for each year, and then compared to the incidence of HCAP infections. Results suggest that annual HCAP transmission rates increased from 15,000 to 23,500 from 1993-2005, then, declined rapidly to fewer than 7,000 by 2014. From 1987-1993, U.S. ventilation rates *declined* from 2 to 1 ventilation air changes, and, from 4 to 2 total room air changes per hour (ACH). By 2001, U.S. ventilation rates *increased* from 1 to 2 ventilation air changes, and, from 2 to 6 total room air changes per hour (ACH). Normalized for the time required for new standards to be implemented in new hospital design, construction or renovation, a statistically significant relationship (r^2 -0.986) exists between ventilation rates and HCAP transmission rates. Specifically, transmission rates increased as ventilation rates decreased. Likewise, HCAP transmission rates decreased as ventilation rates increased. No attempt was made to normalize this data for changes in other infection control activities, the prevalence of airborne disease in the general population or any other of the many factors attributable to HCAP transmission in healthcare settings.

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GENERAL FORMALISM FOR THE COMPUTATION OF RADIATIVE HEAT TRANSFER INSIDE BUILDINGS

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ABSTRACT

Heat and moisture transport processes in building envelopes have been the subject of long lasting interest of building physicists and technologists. Especially, heat losses, i.e. ventilation, infiltration, exfiltration or heat conduction through envelope materials are under the permanent investigation. The common calculations of heat losses due to conduction through layered materials rely on temperature differences between interior and exterior and the total thermal resistance of the envelope. Taking into account the area of the envelope, such calculations together with ventilation losses provide us the resulted heat loss expressed in Watts and this value is considered as the minimum necessary energy output of the heating system installed in the building. In fact, it is possible to develop another model for calculating thermal performance of an interior space. Starting the calculations from the heater, all the three kinds of heat transport processes (conduction, convection and radiation) directed from the heater to the walls can be accounted for in the thermal analysis. The heat flow has to be in equilibrium with heat conduction through the envelope whose surface temperatures will be optimized within the system of equations taking into account convectional and radiant losses at the external side of the envelope as well. Although such a model may seem to be complicated, it offers optimization not only the surface temperatures but also the surface (interfaces) thermal resistances. The model consists of three main parts: (i) Theoretical solution of radiant heat transfer in the interior, (ii) Theoretical solution of convective heat transfer in the interior and (iii) Solution of the system of transcendent equations representing thermal equilibrium between interior and exterior. The present conference contribution describes the first part of this complex model, namely, the theoretical solution of radiant heat transfer in the interior. It is based on the concept of view factors, the system of radiosities and radiant heat densities. It provides a complete solution of *radiative heat transfer* in inner spaces of buildings.

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COMPUTATIONS OF RADIATIVE HEAT TRANSFER INSIDE BUILDINGS

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ABSTRACT

The present conference contribution is devoted to the application of the theoretical model of radiative heat transfer formulated in our preceding conference contribution entitled “General Formalism for the Computation of Radiative Heat Transfer”. So far, the thermal building technology has investigated heat losses prevalently as simple heat conduction through building envelopes along with ventilation (infiltration or exfiltration). Such an approximation avoids considering an alternative procedure taking into account a direct radiative and convective flow of heat from the interior heating system towards interior walls. In the preceding contribution a general model for radiative heat transfer in inner spaces of buildings has been developed and the present contribution illustrates its application to a simple room. The room consists of two surfaces, namely, the heated circular floor and arched ceiling and walls (cupola). This simple room has been chosen intentionally since it enables us to demonstrate functionality of the computational model straightforwardly and in an easy way. However, the developed model is capable of processing more complicated rooms consisting of many different surfaces. The processing of this two-surface room has been accomplished by two methods, i.e. by means of view factors along with radiosities and alternatively by means of mutual emissivities. The model based on radiosities is quite general and is not restricted to a certain number of surfaces whereas the second model based on mutual emissivities is restricted only to two-surface rooms. These two alternative computations offer not only the comparison of their results but also the comparison of their computational effectiveness.

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EFFECTIVENESS OF STACK VENTILATION IN A TWO-STORY HOUSE IN HOT AND HUMID CLIMATE

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ABSTRACT

This research was aimed to study the effectiveness of stack ventilation in a two-story house in hot and humid climate of Bangkok, Thailand. Openings at the roof top of the house was added to create different height between inlet and outlet. Heat in the attic was utilized to make temperature difference in order to generate buoyancy for stack ventilation. The method of the study was an experimental study in two existing houses which had the same physical and had the most similar environment. The first house without stack ventilation was a base case. The second one was designed to integrate stack ventilation. Scientific instruments were installed in the two houses at various points. Air temperature, relative humidity and wind speed data were collected minutely for two to three consecutive days for the evaluation of the experiment. It is founded that the house with stack ventilation had inside air temperature and relative humidity lower than those of the base case. The inside air temperature of the house with stack ventilation could be 0.73 Celsius lower than that of the base case. The relative humidity of the house with stack ventilation could have relative humidity of 12.05 % lower than that of the base case. Also the stack ventilation could make 1.06 air change per hour with only 0.01% effective opening of building area having stack ventilation system.

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EVALUATION OF OPTIMUM BUILDING ENVELOPE MATERIALS IN DIFFERENT CLIMATE REGIONS OF TURKEY

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ABSTRACT

Energy-related issues have been in the centre of the policies of many governments. Increasing the energy production or decreasing the energy consumption can provide significant economic support to countries. Thus, developments in energy industry are of prime importance for countries, especially for Turkey, where improving the energy efficiency is one of the key components of the 2023 national strategy objectives and energy policies. Energy efficiency in residential buildings can be obtained by a number of ways such as optimizing the building envelope. Design of a building envelope depends on a number of parameters including the window, wall, basement, and ceiling properties. The insulation properties of such components can radically impact the energy efficiency of a building. Selecting the optimum materials in designing the building envelope has been one of the fundamental issues in the academic field in the last decade. Providing cost efficient envelope design while satisfying relevant standards has been the common goal. The aim of this study is to find optimum materials for the building envelope design of a residential building in Turkey. Genetic algorithm is utilized for the optimization purposes. The decision variables are determined as the window type and the insulation materials to be applied on the exterior walls, ceiling, and basement. The properties and costs of the materials are obtained from the unit price list prepared by Republic of Turkey Ministry of Environment and Urbanization. The objective function is expressed as the minimization of the total cost of the building envelope materials. The constraints are stated as the limitations indicated by the Turkish Standard 825 (TS 825), “thermal insulation requirements for buildings”. The optimization environment including the genetic algorithm and heating energy calculations is generated in Matlab. A total of 30, 20, 60, and 27 alternatives are identified for the exterior walls, basement, ceiling, and window types, respectively. Optimum design solutions are determined for four climate regions of Turkey as defined by TS 825. The optimization environment could identify optimum design solution among thousands of combinations for each climate region separately. The optimization environment can be utilized by homeowners or designers to determine the building envelope with minimum cost satisfying the relevant standard. Also, the study is expected to encourage professionals in the construction industry to utilize such optimization tools to deal with design-related decisions.

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IMPROVING THE THERMAL PERFORMANCE OF BUILDING ELEVATIONS: ANALYSIS OF EXISTING AND SIMULATED BUILDINGS IN VIEW OF FUTURE ADAPTABILITY

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ABSTRACT

Energy consumption in residential buildings is rising due to increase in new construction as a result of population growth and economic development. One approach to reduce energy consumption is the development of new methods and strategies to construct building elevations. While there are technologically advanced building elevation systems, this research focuses on understanding and improving typical elevation construction methods that are economically feasible and exhibit useful passive climate responsive strategies. This study aims to generate and define design approaches for residential building elevation constructions applicable to Beirut and other regions sharing similar construction methods and climatic characteristics. With reinforced concrete as the prevalent building material in Beirut (i.e. building structure and elevation), three buildings from the 1920s, 1940s, and 1990s were selected representing three phases in the technique of cement construction of the elevations. To assess the contribution of each elevation type to climatic conditions, a digital model is developed for each condition using Energy Plus software that is validated by comparing the simulation results with actual readings. This would allow simulating various configurations of the building elevation incorporating different climatic settings in order to assess indoor temperature and relative humidity variations related to the construction method. The three buildings are all located on the same street and therefore, share similar outdoor climatic conditions and urban context. This analysis is complimented by site surveys that measure and document window opening, internal loads and occupancy in the three selected locations. Multiple simulations, based on the base-case model, will consist of changing elevation insulation values, window wall ratios as well as temperature variations. This study will help understand the relative impact of different existing construction methods in Beirut and the potential recommendations to improve their thermal performance. This research will contribute to understanding the potential of retrofitting existing buildings to increase their resilience to climate change.

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THERMAL IRREGULARITIES IN VACUUM GLAZING

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ABSTRACT

This document deals with the determination of thermal irregularities of wood-aluminium window with vacuum glazing. Test measurements were performed with guarded hot-box method at defined different temperature difference. They describe how the support pillars influence internal surface temperature distribution and how the edge vacuum glazing influence surface temperature around edge of vacuum glazing in wood-aluminium window. The deformation of the temperature field due to support pillars is surprisingly small and its range is from 0.20 K to 0.46 K with temperature difference on both sides of approximately 20 K. Decrease of internal surface temperature from the middle of the vacuum glass to edge is about 20.04 – 16.15 = 3.89 K, and so it is considerable effect. The effect of the edge on the glazing is not explicitly quantified in the term of heat flow in this document, but is implicitly documented by means od surface temperature. Thermography was used to check if there are touching points between glasses where distance is from 0.15 to 0.2 mm. The vacuum glazing measured in this work was a sample, which was fabricated in the Beijing Synergy Vacuum Glazing Technology Co., Ltd. The window was tested one year after delivery from the producer.

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PERFORMANCE OF THE BUILDING WITH THREE DIFFERENT RADIANT SYSTEMS

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ABSTRACT

Number of radiant system installations has been increasing recently due to their numerous advantages. However, there is a potential problem of combining radiant heating and cooling system with lightweight envelope. The outside weather conditions, solar irradiance, changes in internal heat gains and small heat accumulation of the light-weight facade can result in relatively dynamic changes in thermal balance of the building. If the building is not properly designed and controlled, the radiant system may not be able to respond to sufficiently. The experimental measurements for the model validation, computer simulations and optimizations were carried out for a new-type office building called the Energetikum. The two-storey living laboratory building, located in Austria has a light-weight façade with triple glazing in the parts of the building envelope oriented to the West-South-West and South-South-East. Three independent heat emission systems are installed in the building: a. Floor heating with pipes embedded in concrete, insulated from the concrete core; b. Thermally active core (TAC) with pipes embedded in the middle of the ceiling; c. Thermally active core (TAC) with pipes embedded near the surface of the ceiling. The long-term measurements revealed the problems with overheating during winter and transition period (EN 15251, 2007), mainly in the offices with W-S-W and S-S-E. Computer simulations of the reference room Single office 1 were done to examine the possibilities to minimize thermal discomfort and reduce the energy consumption. This study aims to investigate the possible improvements by optimizing the shading and HVAC operation. The model was developed within TRNSYS.The initial VAV and shading system setting was chosen the best variant from 10 strategies. The VAV system maintained the air supply at a constant temperature (22°C) while individual zone thermostats varied the flow of air to maintain the desired indoor air quality and zone temperature. The air change rate control depended on the CO_2 concentration of the indoor air. The blinds position was adjusted depending on the amount of incident solar radiation on the external wall. The simulations were performed for three heat emission systems installed in the building to investigate the effect of different emission systems on thermal comfort and energy performance. The floor heating system and the near-surface ceiling system were controlled by a PI controller sensing the room air temperature. Moreover, four control strategies were implemented to the model for the thermally active ceiling to examine their influence on the energy demand and thermal comfort: (1) on-off (three-step control); (2) thermal mass of the slab loaded with thermal energy at night; (3) loading of the concrete core based on the difference between supply and return water temperature. The application of thermally active ceiling in an office building may not be the optimal solution in the case of continual building operation. In such a case, space heating by a thermally active building element can lead to excessive energy consumption during the unoccupied time intervals. However, the thermally active element can be capable of creating thermal comfort at favourable energy demand when combined with a floor heating system.

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ESTIMATION OF HAT RETENTION INDEX BASING ON TEMPERATURE MEASUREMENTS

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ABSTRACT

The heat retention index is a function of thermal resistance and thermal capacity of the wall. When we know this index, we can accept the solution of Fourier equation in the form of Krisher equation. On this basis, the cooling time of the building envelope or the whole building is determined. In the paper, the authors have attempted to present the solution reverse to the presented problem. The estimation of heat retention index was accurately carried out by means of temperature measurements. For this purpose, a research stand in the form of a cube made of homogeneous material was built in a laboratory room. The measurement of temperature was carried out both inside the cube and on its surfaces. At the same time, the temperature of the external environment was monitored. Basing on the equalization time of temperatures of the internal and external environment of the cube, the index of heat retention was determined. To supplement the experiment and expand it onto other materials, the whole experiment was simulated in a virtual laboratory. The virtual laboratory was simulated in the ESP-r program.

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EVALUATION OF FLOATING FLOOR SYSTEM WITH STEADY STATE DYNAMICS SIMULATION IN THE CONTEXT OF IMPACT SOUND LEVEL

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ABSTRACT

Evaluation of floating floor at the design level imposes to take into account assumption of proper execution of this system, which means assertion of proper localization of dilation. Aim of this research is to analyse usefulness of Steady State Dynamics (SSD) simulation in the context of floating floor performance and execution errors such as global or local lack of circumferential dilatation. For this purpose, two storey building with one room at each floor was simulated. Floating floor system was applied at structural ceiling between upper and lower floor. Excitation of system was done by application of pressure with given frequencies at central part of floor. Three types of systems were analysed: system without floating floor, system with properly executed floating floor and system with floating floor short-circuited to walls. Application of dynamic bridge was done gradually - at each wall - till whole floating floor was short-circuited. In the result of correlation between akin in-situ test compatible with standards, normative prediction of weighted impact sound reduction index and SSD simulations results was evaluated. Moreover, influence of dynamic short-circuit on floating floor system was analysed. Finally flanking vibration transition between upper and lower room with different systems was discussed. Principal conclusion of performed analysis is fact that SSD simulation results are sufficient to show vibration velocity spectrum nature of changes between systems with and without floating floor. What is more application of dynamic bridges at circumference of floating slab makes given system similar structural ceiling only system, which meets with akin in-situ test in matter of acoustic performance – similar nature of results of impact sound level with and without floating floor. Nevertheless, SSD simulation results are hardly agreeable with normative prediction and in-situ test of weighted impact sound reduction index.

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THE DAYLIGHTING INTENSITY BY LIGHT GUIDES

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ABSTRACT

The issue of the efficiency of use and determination of the operational efficiency of the designed light sources is relevant during the process of lighting design. The contribution deals with the illumination of the interior by the tubular light guides during design and operation itself. The measurement of the luminance, the illumination of the exterior and the interior was carried out on experimental wooden building in Brno belonging to VUT FAST (Czech Republic). In one case, the brightness of the sky was also measured. The assessed tubular light guides Sunizer with the length of tube 2 m and with the diameter of 320 mm passes through the roof structure and through the ceiling structure into the interior corridor of the wooden building. Prior to the start of the measurement, the measuring sensors were placed in the center of the diffusers of the two measured tubular light guides at the floor level. Another one sensor was placed at the midpoint between the diffusers at the floor level. Subsequently, another sensor was placed on the roof of the building in the exterior. The sensor is placed next to the dome of the light guide so that it is not overshadowed. The sensors were connected to the datalogger and the 5-minute measurement was performed at all four locations simultaneously at time intervals after one minute. The values of the sky brightness always in four directions were determined were determined before the measurement, in the middle of the measurement and at the end of the measurement. The sky type was determined visually for some of the measurements. Finally, the measured data from the luxmeter was stored and the ratios of illumination of the interior and exterior were calculated. Subsequently, the measured data are compared with the simulations obtained from the software Holigilm and Velux Daylight Visualizer. The benchmark is the ratio between indoor and outdoor illumination, the so-called daylight factor. Finally, there is an evaluation, a graph showing the difference between these values and the explanation of the differences of results between the real measured values and the outputs from the simulation programs.

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POTENTIAL RESULTS OF USING CURRENT THERMAL REHABILITATION TECHNIQUES ON A CITY BLOCK OF TIMISOARA AND THEIR STRUCTURAL STRENGHTENING OPPORTUNITIES

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ABSTRACT

City blocks developed in settlements part of the Austro-Hungarian Empire and in Timisoara in particular, are still standing today and pose common rehabilitation problems related to energy efficiency and structural reinforcement. Moreover, many of the buildings are classified as monuments and are not compatible with current energy rehabilitation techniques. The paper explores possibilities of using techniques that would allow structural and thermal rehabilitation adapted to particularities of buildings external surfaces built during the 1800s. These techniques are in use today but have to be used and combined in a fashion that doesn't alter the characteristics of monuments and get maximum results. Using only one set of procedures would lead to losses in efficiency or would be damaging to the heritage aspect of the buildings. The analysis is done on a city block within the old walls of the fortress of Timisoara and ponders energy efficiency gains and structural reinforcement potential that could be derived from the intervention on buildings envelopes. The block is situated between the streets Janos Bolyai, Lucian Blaga, Carol Telbisz and the Ion C. Bratianu boulevard. It includes a church, two education buildings, a hotel as well as residential ones. Potential analysed interventions would be limited to surfaces situated on the thermal skins of the buildings (facades, windows, horizontal surfaces towards attic and underground cellar storage spaces). They would take advantage of the characteristics and levels of decoration used during the 1800s and 1900s to minimize the heat transfer while preserving the external look of the buildings towards streets and internal courtyards. Conclusions would be compared with results from a basic intervention with minimal or no energy efficiency goals.

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THE IMPACT OF HORIZONTAL DEFORMATION AND CURVATURE OF THE TERRAIN ON THE RIGID BUILDING'S LAYOUT - MINING SUBSOIL

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ABSTRACT

Effort of building's structure under the influence of mining exploitation, depends essentially on the horizontal deformation (ε) and radius of curvature (R) of the area. In accordance with generally accepted principles, at every stage of the impact of mining influences, the internal forces in the structure resulting from the effects of horizontal deformation of the terrain and the vertical movements of the substrate have opposing signs. This indicates that effects of those mining influences cancel each other out partially, although the magnitudes of this reduction are unknown. However, in practice, the most buildings are designed for independent effect of the horizontal deformation and curvature of the mining area. For this purpose, a numerical model of the rigid building – mining subsoil was made, which is the most complex approach to the solution of the task, but for scientific purposes it is the most desirable. This article will present the initial results of the numerical attempt to estimate the mutual reduction of internal forces in the building resulting from the horizontal deflection (ε), and radius curvature (R) of the area. The task was done using a 2d flat state fem method, assuming the elastic work for the building's disc and the ground area. The article aims to indicate the need to comply with certain rules for numerical modelling of the issue of building's contact with the mining substrate and the difficulties encountered in the numerical analyses of the problems associated with the use of the full fem model for both the building and the mining substrate in the task of traversing trough mining basin under the construction and using an engineering approach consisting of the independent modelling of the impact of the ε and R. Further planned studies require the use of more complex models of constitutive materials for building and mining substrate and primarily for numerical verification for actual in situ test situations.

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SOLVING OF MOISTURE BUFFERING PROBLEM AT CURTAIN WALL SYSTEMS: TWO-DIMENSIONAL HEAT TRANSFER ANALYSIS

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ABSTRACT

The study focuses on a common problem of moisture condensation on curtain wall and skylight's internal frame elements due to inefficient thermal insulation or incorrect material selection of certain sections. Despite high performance glass, like double or triple IGUs with low-E coating and well-developed frames, due to design or installation mistakes, moisture aggregation may be a significant problem. Usage of highly conductive materials often is causing short circuits, which are having minor impact on overall U-value of a system, but are triggering the buffering process. Condensation phenomena is driven by specific factors like relative humidity, outdoor air temperature and velocity, indoor air temperature and velocity. Currently the problem is being quantified by calculating condensation resistance in accordance to standards AAMA 1503 and NFRC 500. However, both standards are requiring precise conditions which need to be followed to achieve comparable results per standard. Any deviation from these conditions like higher humidity, air leaks and any distribution of air movements can lead to forming of condensation despite total low U-value of the system. The purpose of the article is to provide basic explanation of condensation phenomena and to present on few preselected basic details of various glazing system how condensation can occur by varying boundary conditions and showing that minor changes in material selection like glazing spacers, low-E coating and glass build up can have substantial impact on thermal insulation of profiles. Phenomena of condensation formation is a well examined problem. However, despite usage of high performance materials, issue can still arise due to not efficient design consideration and thermal analysis.

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THE SHAPING OF SELECTED ELEMENTS FOR A LOW ENERGY BUILDING

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ABSTRACT

Reaching the standard of low energy building requires fulfilling criteria of energy saving and thermal protection as well as humidity criterion on design and exploitation stages. The basic factors shaping energy saving construction include among other: building architecture, construction and material solutions of external partitions and building joints using modern thermal insulation materials (building casing), type and efficiency of ventilation, central heating and hot water preparation systems and integral management of a building in energy production. The choice of an appropriate material set (construction, insulation and finishing layers) enables to reach low values of heat transfer coefficient U [W/(m^2·K)] of a full partition and linear coefficient of heat transfer Ψ [W/(m·K)] as well as minimum risk for occurrence of surface and inter-layer condensation. The energy characteristics of a building constitutes its evaluation of its building structure casing, technical solution of installation systems (heating, preparation for hot water utility, ventilation, cooling or built-in lighting) and applied energy source (renewable or non-renewable). Procedures for setting and technical interpretation of basic parameters of energy characteristics certificate are often unclear and not precise. In this work there is an analysis of shaping of selected elements for low energy consumption. Physical parameters of selected external partitions and joints were defined using professional computer programs taking into account external and internal air parameters. Additionally, there was presented the influence of installation systems efficiency and energy source used on demand factor for non-renewable primary energy EP. Basing on performed calculations and analyses there were formulated design, executive and exploitation rules in shaping of building elements of low energy consumption buildings.

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PREDICTION OF CORBONDIOXIDE EMISSION VALUES FOR ENERGY PERFORMANCE RATE OF THE BUILDING USING BY ANFIS

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ABSTRACT

This study is designed to investigate the energy performance results of buildings in Antalya/Korkuteli 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 ANFİS 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.

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EFFECTS OF EXTERNAL HEATING SOURCES ON THE AIRFLOW AND VENTILATION EFFICIENCY

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ABSTRACT

Buildings are important sources of energy consumption, representing approximately 40% of the primary energy consumed in Europe. From it, the greater energy expenditure which occurs in buildings corresponds to the air conditioning of interior spaces. The effect of temperature of the heating system elements is a parameter that could affect the airflow in terms of buoyancy and thermal comfort and that should be studied to ensure the quality of ventilation. This study aimed to assess the air change efficiency and thermal comfort with three thermal conditioning systems (radiators, underfloor heating and radiant ceiling) in winter conditions, varying its position in the interior space. This can be used by architects and engineers when planning the position of the heating systems or refurbishing a room. The experimental analysis was developed in the test chamber of the Laboratory of Ventilation of the University of Valladolid, serving as validation of multiple CFD simulations. For this research, 8 case studies were assessed, with a reference case which did not include any heating system, showing only the behaviour of the air in winter when entering an interior environment; 5 cases with the arrangement of a radiator in five different positions inside the premise and 2 final situations which corresponded to the room equipped with underfloor heating and radiant ceiling. At the reference case, the results showed an air change efficiency of 47.50%, with a great feeling of discomfort caused by the low temperature of the outdoor air and the room, which forced in the air a downward trend through the centre of the room and not ventilating properly in the upper parts. The use of radiators showed a small improved efficiency between 47.67% and 49.90% and a PPD improvement of 12.18%. The low operating temperature of the underfloor heating did not correct the downward pattern of the air but provided good thermal comfort and, on the other hand, the radiant ceiling was able to temper the air flow and provide a more homogeneous temperature in the occupied volume. The results show that, being the thermal comfort achieved, the mean air change efficiency varied only 2.40% among all cases, which makes temperature not a significant influence, being the air change efficiency more influenced by other factors such as geometry, air velocity or flow. Even so, the trajectory of the airflow in the premise would be affected by the thermal action, due to the convective effect, presenting great differences according to the location of the thermal systems. Thus, the air trajectory could falter when it entered the room or rise towards the ceiling creating areas with lower temperature in its centre. With all the above, it seems that the position of the radiator below the air inlet seems to be the most appropriate since, even within the similarity of efficiency results, it provides the best air change efficiency and thermal comfort and therefore demonstrates the wisdom of constructive tradition and its choice to place the radiator in that position.

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CIRCULAR FREE JETS: CFD SIMULATIONS WITH VARIOUS TURBULENCE MODELS AND THEIR COMPARISON WITH THEORETICAL SOLUTIONS

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ABSTRACT

The theory of turbulent free jet is fundamental for the design of comfort ventilation, as free jets frequently occur in mixing and personalized ventilation systems and their characteristics strongly influence the air quality in the breathing zone of an occupant. The aim of this research is to provide recommendations that help researchers and practitioners improve the accuracy and reliability of their computational models of ventilation systems involving circular free jets. To accomplish this, a review of existing theoretical calculation models is performed, and these models are subsequently investigated by computational fluid dynamics. The theoretical solutions of free jets are compared with CFD simulations using various turbulent models such as k-epsilon standard, k-omega standard, k-omega SST, and Reynolds Stress Model (RSM). The simulated models are represented by profiles of the centreline velocity for a free jet emanating from a round nozzle, because such presentation of the data proved to be particularly helpful for the comparison and selection of the most appropriate turbulence model. The k-omega SST turbulent closure scheme with standard coefficients was found to produce results of the centreline velocity closest to the average of theoretical solutions investigated, whereas the discrepancy between the simulations and the theoretical models was highest for the k-epsilon standard turbulence model.

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A LIFE-CYCLE COST ANALYSIS FOR TURNOUT CROSSING NOSES

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ABSTRACT

Turnouts are the critical components of modern railway tracks where the vehicle movement is transferred between two continues track, resulting in high dynamic forces on turnouts. Therefore, turnouts restrict the operational limits (i.e. speed, headway) and require high maintenance works. The crossing area is the region of a turnout which contains the intersection point of two tracks. When one bears in mind that two tracks intersect at a point, the intersection point must be either removed (fixed nose) or built as adaptive (movable noses) to enable the movement. Commonly, the fixed nose is preferred, even though they produce high impact forces on turnouts in comparison with the others. Fixed crossings suffer from different types of forces which could be subcategorised as peculiar to turnouts and general. As well known in engineering, existing forces in a system naturally trigger damage mechanisms on components, which must be prevented since the system safety is crucial. Therefore, there are maintenance activities to keep the standards, and ongoing researches to eliminate or reduce the damages observed on the crossing noses. Nonetheless, before seeking the mitigation methods, it should be beneficial to conduct lifecycle cost analysis to observe how much the gain could be. Therefore, in this study, it is aimed to investigate lifecycle costs of turnouts, particularly the crossing noses, to assess the problem from economic perspective. The results show that a crossing nose has significant effects on the life-cycle cost.

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PAVEMENT QUALITY CONCRETE AS ENGINEERING AND DESIGN ALTERNATIVE FOR MUNICIPAL BUS-BAYS

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ABSTRACT

The article presents the application of cement composite to the construction of pavement within the area of bus-bays. The influence of bus traffic on the pavement condition was discussed and most frequently occurred types of damage in case of this type of pavement were described. The suggested solution was provided on the example of bus-bays performed, according to cement concrete method located within the area of Świętokrzyskie province.

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AN ASSESSMENT SYSTEM FOR THE OPTIMIZATION OF LOGISTICAL, OPERATIONAL AND ADMINISTRATIVE PROCESSES AT MULTIMODAL HUBS

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ABSTRACT

Seamless transportation is a strategic objective and key factor in state of the art cargo transport and multimodal hubs. It aims at achieving an improvement of effectivity and efficiency of the overall traffic system on a macroscopic level including system parameters, business models, involved actors, actor-specific claims and objectives towards the multimodal hubs. Due to the variety and wide range of logistical processes as well as local conditions (traffic connections, settlement structure, economic structure etc.) customized innovative solutions are required. Within this approach, the resource-orientated use of existing and planned cargo handling areas as well as the resilience of the traffic system is considered. Therefore, an innovative and standardized assessment and model-system for process optimization at the level of individual loading units and vehicles is developed. This model-system is able to simulate and analyze process sequences of logistical, operational and administrative types at any multimodal hub. The development and test application of the optimization system is carried out by means of a case study at the Port of Vienna. Based on the status quo it focuses on various kind of effects (infrastructure congestions, mutual obstructions etc.) resulting from the overlapping of formerly isolated processes including their spatial and temporal context within a simulation model. Special consideration is given to operational and overall economic aspects (environmental protection, welfare goals etc.) as well as the embedding of processes of water way affine types of goods in terms of space, traffic and organization. Consequently, new potentials for the use of the Danube waterway capacity can be identified. Within the assessment system a blueprint for analysing and optimizing multimodal hubs is developed. The key element of process optimization is a simulation model. For this purpose, spatial and traffic related conditions as well as logistical and organizational requirements are examined. By means of quantified infrastructural, super-structural, business-organizational, economic and environmental benchmark indicators including the market situation and actor-specific objectives and interests, capacities (incoming orders, loading units, priorities for order processing etc.) can be assessed and imported into the simulation model – different process operations (traffic movements, disturbances in access roads etc.) are simulated under existing spatial circumstances. Due to the ongoing localization of the vehicles and loading units and the determination of the temporal activities the simulation model calculates pre-defined performance indicators (movement times, waiting times, number of strokes etc.) which enable deducible performance statements, bottlenecks and other problems. Then, on the basis of the problems identified by the initial simulation, customized solutions are developed. Furthermore, proposed solutions are considered individually or can be bundled by means of additional simulations and visualizations in terms of variants. On the basis of the quantified indicators calculated by the simulation model as well as the comparison of the status quo and variant simulation, the suitability of one or several measures for problem solutions can be assessed and the occurrence of potential consequences (positive as well as negative) can be investigated. Finally, the proposed solutions can evaluate from a business and overall economic perspective.

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CHALLENGES IN TRANSPORTATION SYSTEM TO SUPPORT INDEPENDENT MOBILITY OF PEOPLE WITH DEMENTIA

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ABSTRACT

Dementia is an issue of increasing concern for an aging society. According to the World Health Organisation 35.56 million people worldwide suffer from some form of dementia and 2.3 million people worldwide obtained a dementia diagnosis in 2010. The Austrian dementia report reflects a similar trend. In 2013 64.307 people are suffering from a dementia disease. This trend challenges transportation systems of modern societies which subscribe to values of inclusion which allow for participation in traffic, also under conditions of disability and illness. A number of studies have addressed the limits of traffic participation, e.g. the effects of driving with a dementia disease (driving ability), the effects of driving cessation on people with dementia (burden on families and caregivers), or the dangers arising from cognitive impairments on people with dementia (e.g. wandering behaviour, traffic safety issues). The preservation of independent mobility of people with dementia (PD), however, is particularly important. It is expected that the promotion of (active) mobility would have positive psychological and medical effects (e.g. delay the course of the disease). This paper presents findings of a qualitative study in which barriers and facilitators for traffic participation have been identified from the perspectives of experts, caregivers, and patients. A qualitative research design based on case studies was used to investigate the mobility behaviour of PD. Biographic-narrative interviews and mobile methods (walk-along) have been combined in order to understand the relationship between individual change due to illness and the situations of traffic participation. To gain a broad overview of different mobility issues related to PD relatives, private caregivers, professional caregivers and experts are also included. The paper distinguished different forms of barriers and facilitators among them cognitive (e.g. information overload, spatial-visual impairment, situational complexity), social (e.g. stigmatisation, cognitively or emotionally induced conflicts) and physical barriers which are not specific for dementia. Facilitators are spaces which give PDs a feeling of security and which is structured by patterns of orientation which are in line with PDs cognitive capabilities. Findings suggest that caregivers and relatives indirectly influence mobility behaviour of PD. For instance, caregivers and relatives tend to control the general activities, social participation and self-esteem of PD which influences their psychological constitution.

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THE SPEED – FLOW RELATIONSHIP ON URBAN ROADS IN A ROMANIAN TOWN

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ABSTRACT

The paper is presenting a study regarding the Speed – Flow relationship on a major artery in the urban area. The study corridor is a two-lane road from the town of Seini, Romania, where the speed limit is 50 km/h. The route was divided in six segments according to the urban space characteristics and the traffic zones. The speed data base includes the speeds collected by radar – using the TrueCAM equipment, as well as by analysing second-by-second in-vehicle global positioning system (GPS) – using the Racelogic equipment. The traffic characteristics, including the volumes, traffic composition, and peak intervals were provided from the traffic census. The statistical analysis of the significant variables (instantaneous speed, operating speed, and free flow speed) against the traffic volume have highlighted the impact of the traffic characteristics in the shaping of the urban system. Therefore, the speed – flow relationship analysis is a basic component in the integrated planning process, connecting the important parameters of the urban model.

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ROAD PLANNING AND ROUTE ALIGNMENT SELECTION CRITERIA IN THE NORWEGIAN CONTEXT

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ABSTRACT

Road construction in Norway is moving at an unprecedented pace with record-high investments and a large-scale modernization process underway. This planning of roads follows a set of national and local guidelines that prioritize effective routes along critical and corridors in an attempt to optimize costs for users and road builders alike. While costs have traditionally been the main decision criteria for planners, other considerations, especially with respect to route alignment, have always been important in designing road infrastructure. Environmental and social costs are also considered as key factors in the planning, construction, maintaining and refurbishing of road infrastructure. This paper seeks to show the main factors and influences guiding the road planning process in Norway. The goal in this study is to discover what constitutes the main priorities for road planners, how these priorities are ranked when it comes to alignment selection, and how they are related to guiding factors identified in official planning documents and government transport plans throughout the life cycle of a road. This is done through a comprehensive literature and data search, involving published academic research in the road alignment design field, and by exploring Norwegian road planning documents and guidelines. Examples from a recently implemented road project are also included as a way to illustrate alignment priorities in theory versus how alignment decisions are made in practice. Particular attention is paid to how key factors influence environmental and social dimensions and how much importance these dimensions are given in the overall decision making process. The results of this study found that the dominating factors in road planning and alignment selection are the user cost and the environmental and socio-economic costs as they are directly related to the main national transport strategy of developing a carbon-neutral and resilient transport system. The results of this study can be used to reinforce existing road planning strategies and to understand where challenges for environmental and social responsible road planning and alignment selection are found.

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AUTOMATED DATA COLLECTION SYSTEM OF PAVEMENT DISTRESSES: DEVELOPMENT, EVALUATION & VALIDATION OF DISTRESS TYPES AND SEVERITIES

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ABSTRACT

This study presented an affordable and simpler technique that does not require complex technology and is suitable for middle sized road networks. This technique involves taking pictures of various sections of the road network using cameras that can be mounted on public vehicles and transmitting taken images to a processing center. Each image is processed using image filtering techniques to produce an initial estimate of the PI. A total of 5,070 images and 507 sections (4 x 10 m per section) were taken and tested on a part of Sheikh Maktoum Bin Rashid Highway E11 in Abu-Dhabi city (UAE) based on the quantity and clarity of the distresses. Six types of pavement distresses were tested; (1) longitudinal cracking, (2) alligator cracking, (3) block cracking, (4) pothole distress, (5) transverse cracking and (6) edge cracking. Three severity levels were considered: (1) low, (2) medium and (3) high. There were two distress measurement methods used to identify pavement distresses; semi-automated measurement (SAM) method and automated measurement (AM) method. In order to evaluate the accuracy of the AM method, two expert observers were used individually to extract the pavement distress by using the SAM method. The Cohen's weighted Kappa used to determine the agreement between the two observers. The overall agreement result of the pavement distresses between the two observers was 98%, which is almost a perfect agreement. The overall agreement result of the pavement distresses between the two measurement methods was 89%, which is again an almost perfect agreement. Also the AM method validated by using R2 method and was found to be 0.93. The weighted mean speed of all distresses and standard deviation were found to be 58.56 km/h and 28.24 km/h respectively.

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THE IMPACT OF ROAD TRAFFIC FLUCTUATIONS ON THE EMISSION OF ROAD NOISE

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ABSTRACT

An increase in intensity of road traffic causes an increase in noise emission. The authors present in the paper the results of scientific research related to the impact of road traffic fluctuations on the emission of road noise. The data from the measurements gathered on provincial roads of Małopolska region were used for analyses. The traffic data since 1980's has been utilized in calculations, using the applied and updated method. The results of the analyses show that the fluctuations in the intensity of road traffic can significantly affect the road noise emissions. Taking into account this phenomenon, it is possible to precisely determine the full impact of road traffic on road noise, especially on roads where large fluctuations in road traffic occur. The above phenomena constitute a significant problem in the form of negative impact on human health and comfort of inhabitants of areas adjacent to roads. Measurements of road traffic intensity and road traffic parameters were performed according to the Polish Instruction for conducting general traffic measurements of the General Directorate of National Roads and Motorways. Measurements were made at 15-minute intervals, speed and intensity of road traffic were recorded, taking into account the types of vehicles. The speed of vehicles was registered with the division into the light vehicles and heavy vehicles. At the same time, the road noise measurements were carried out in accordance with the Polish regulations of the Minister of the Environment. The results obtained were used to calculate traffic parameters using the Highway Capacity Manual 6th edition method and the Polish method for calculating the extra-urban road capacity. Based on the above methodologies, the values of traffic conditions' parameters were obtained, such as: percentage of driving time in the column, average speed of a travel and percentage of free travel. The results of measurements of the equivalent level of road noise were analysed at 15-minute intervals consistent with the measurements of traffic parameters. The values calculated were compared with the results of the road noise measurements. These results were divided into groups due to the participation of the heavy vehicles. As a result of the imposition of limit values of the level of service, the PSR influence on road noise was determined. Based on the analyses carried out and the results obtained, a significant effect of the variation of the traffic intensity on the level of road noise was noticed. Analysing the level of road noise at variable traffic, it was noted that the change in speed caused by the increased number of vehicles passing through the road section, and the change in the participation of heavy vehicles and their impact on speed on light vehicles should be taken into account. The omission of the relationship between the traffic intensity and speed as well as its change along with the increase in the traffic intensity in forecasting the level of road noise can cause significant errors in the calculations.

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ASSESSMENT OF INLAND PASSENGER WATER NAVIGATION IN BYDGOSZCZ-TORUŃ FUNCTIONAL AREA AND ITS DEVELOPMENT CONCEPT

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ABSTRACT

The article presents a brief analysis of functioning and development of passenger inland navigation in the functional area of Bydgoszcz and Toruń cities, as one of possible forms of urban ecological recreation. These forms are successfully used in some towns of Western Europe and are some additional tourist attractions for visitors and also for the city residents. They offer another form of transport to be used by passengers who travel around the city. The functional area of the analyzed towns is considered to be a Metropolitan Area of the Kujawsko-Pomorskie Voivodship and is situated in the central part of Poland. The authors have made a profound analysis of strategic and planning documents for the country and for the analyzed area in terms of the passenger water transport development directions. Bydgoszcz-Toruń Functional Area (B-TOF) is characterized by a unique, on a global scale, connection of two water trails, that is, E-40 and E-70 making up the so called Bydgoszcz Water Node which increases tourist attractiveness of the area. Toruń also plays a very important role in the region and is its main tourist attraction. Its historical medieval urban area was entered in 1997 into a List of World Cultural Heritage of UNESCO. Having in mind the results of analysis of the current water passenger transport potential within BTOF it has been found to be worth developing. Extension of water connection in Bydgoszcz has been proposed as well as launching a water tram connection in Toruń. Moreover, a concept of water ways development on the remaining territory of the B-TOF has been presented. The planned water connections require determination of localizations for new water marinas. These localizations depend on the plans of local authorities as well as the infrastructure and territorial conditionings. All new localizations have been precisely characterized in terms of their construction, modernization and maintenance. It was also necessary to make appropriate prognoses of potential passenger currents. The prognoses have been performed for three separate social-economic development scenarios: optimistic, stable and regressive within three timescales, that is, 2020, 2025 and 2030. For this purpose, a simulation transport model, developed by the workers of the Department of Road Engineering and Transport, has been used. The article includes yearly costs of functioning and maintenance of Bydgoszcz and Toruń Water Tram and costs of the planned investments. Also the costs of tourist rest areas construction and maintenance have been calculated. Implementation of the proposed solutions will involve significant financial means. However, this kind of investments do not have to be profitable as they are meant to improve the tourist offer of Bydgoszcz-Toruń Metropolitan Area. They are supposed to improve the image of these towns in terms of ecology, sustainable forms of transport and attractive way of spending leisure time by citizens and visitors. It needs to be mentioned that recently the interest in water transport means has been systematically rising which can contribute to promotion of this ecological form of travel and boost its development.

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CONCEPT OF A SYSTEM FOR INTEGRATED TICKETING AND TARIFFS FOR A GIVEN AREA IN POLAND

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ABSTRACT

The article presents a proposal of a system for integrated ticketing and tariffs for a given area in Poland. This area is the Bydgoszcz-Toruń Metropolitan Area which is situated in Kujawsko-Pomorskie Voivodship, in the central part of Poland. Its area has 3.4 thousand km^2 and population equal to 838.6 thousand people. The concept is based on extensive research and analysis on potential development possibilities of public transport in the analyzed area. The research on the current state included: rate of public transport means occupancy passengers and a survey among inhabitants concerning forms of transport they use, their preferences in the choice of transport means and assessment of the current system of ticketing and tariffs. Transport prognoses were analyzed using results of simulation calculations carried out by means of prognostic transport models. These models were developed taking into consideration all real social-economic and transport conditionings of the area and for three development scenarios: optimistic, realistic (sustainable) and pessimistic (passive). Results of prognosis of the demand for public passenger transports show that in the most probable scenario (realistic), further drop in the number of passengers, carried by the public transport, will occur by 2030. Conclusions drawn from these analyses confirmed a necessity to take immediate actions to improve attractiveness of the transport system in the considered area, including implementation of modern solutions for integrated ticketing and tariffs. The proposed concept of integrated ticketing and tariffs of public transport is inspired by similar solutions implemented in other metropolitan areas of Poznań and Katowice in Poland and other agglomerations of Europe. The system involves using electronic tickets and paying from a 'virtual wallet' of the ticket user. The concept assumes integration of public transport in the two largest towns of the analyzed region with train connections between these cities and regional passenger transports functioning on the territory of the entire area. An important element of the system is implementation of gradation of prices for single journeys (multi-change), depending on the length of the journey or e.g. range of a given transport corridor. The study presents characteristics of internal (inside transport means) and external infrastructure to be provided for the purpose of the system implementation. In the opinion of the authors, implementation of the system is expected to increase attractiveness of public transport services with simultaneous reduction in the number of journeys by individual transport means.

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CONDITIONINGS OF REGIONAL RAILWAY TRANSPORT IN POLAND ON THE EXAMPLE OF A SELECTED AREA

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ABSTRACT

The share (modal split) of passenger transports in the railway transport in Europe including Poland, accounts for ~7%. This reflects rather low share of this sector in the passenger transport. Therefore, the transport policy of the European Union aims at increasing the number of train transports considering it to be the most ecological. Due to some typical features of this transport branch it provides transport services over medium and long distances (more than 300 km). In this context a question should be asked: does development of regional railway transport means which travel over distances several dozen kilometers make sense in Poland? The analysis was performed for an administrative region in the central part of Poland. This region is typical in terms of social-economic and macroeconomic development and spatial development. It covers an area of ~18 thousand km^2 and has ~2.1 mln inhabitants. In order to answer the question, extensive research has been conducted concerning conditionings of the analyzed region in terms of railway transport development, including a survey among the inhabitants and people travelling by car and those using public transport means (including railway transport). The research included both 'a travel journal' of the respondents on a typical weekday, and transport means preferences as well as assessment of passenger transport functioning as part of public transport system in the analyzed region of Poland. Major analyses of transport demand prognoses are based on simulation analyses results for which transport models were used, constructed for three social-development scenarios: optimistic, stabilization and pessimistic. The results of analyses showed that current conditionings are not beneficial for the development of regional railway passenger transports. It is caused by many factors, including: relatively small access to railway transport, small population density, constant drop in the number of inhabitants, aging of the society, very small occupancy of this transport means, very low predicted values of passenger currents, rising costs of these transport maintenance, small interest of inhabitants in the development of this transport system with simultaneous preference for travel by car. The results of analyses showed that regional railway transport system in Poland are uncompetitive as compared to regional bus transport system which are characterized by better availability and flexibility of connections, shorter time of travel, 10-times lower maintenance costs and smaller harmfulness to the environment (taking into consideration that regional railway transports uses mainly diesel locomotives as they are cheaper to run as compared to electrical tractions; whereas in regional bus transports more and more often new, ecological transport means which meet ecological norms of cleanliness of exhaust fumes).

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INFLUENCE OF INTERSECTION TYPE ON SAFETY OF ROAD TRAFFIC

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ABSTRACT

Analyzing places of road collision occurrence, it can be noticed that a great majority of accidents concentrate on intersection. Moreover, it can be observed that many accidents happen on intersection of some types. Hence, a question arises: which types of intersection are considered to be safer and which more dangerous? It must be noted that the authors have not found such an analysis of intersection in literature and therefore, designers have no source of information on this subject. Thus, the study aims at determination of risk degree posed by a given intersection type. The risk degree was defined to be an average number of accidents per 1 vehicle, one traffic lane on the entrance roads during one year. The authors divide intersection according to geometry, number of traffic lanes, and traffic organization manner. Data on road accidents which happened in selected towns in Poland in the period of 3 years were used for the study. In order to increase diversity of intersection groups each group consists of intersection with minor or major importance for the city transport system which involves different traffic intensity levels. An average risk rate and dependence between the number of road collisions and the variable characterizing risk level on a given intersection, have been determined for each intersection type. Multi-lane roundabouts and intersections with a central isle with extended access roads without traffic lights (both with priority of way for one direction and the necessity to give way at each entrance road) have turned out to be the most dangerous type of intersection. Priority to the right intersections are relatively dangerous too, especially these on which there are isles channeling the traffic. Potentially the safest intersection turned to be unchanneled ones with multi-phase traffic lights. The research also shows that one traffic lane roundabouts are potentially safe intersection for which the risk level is 2.5 times lower than for multi-lane roundabouts.

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THE ACCESSIBILITY PERFORMANCE EVALUATION OF IZDENIZ PASSENGER BOATS

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ABSTRACT

This paper evaluates the accessibility performance of passenger boats, particularly boats in marine public transportation on Izmir Bay around which the city is located, so the water is an integral part of urban transportation network. It aims at answering the following question: are the boats accessible for everyone and how their accessibility can be improved? It is known that a single journey on the sea covers seven phases: 1. finding information and buying passes, 2. travel to vessel, 3. waiting for sailing, 4. getting on vessel, 5. sailing, 6. getting off vessel and 7. travel to the destination. Accessibility performance evaluation is briefly the test of boats, therefore 4th, 5th and 6th phases are included in the study and the test is simply a checklist of requirements for all passengers including vulnerable users - people with temporary or permanent disabilities, pregnant women, elderly people and children, prepared by the Ministry of Transport. The test is applied to three type of boats in navigation recently: a car ferry, a catamaran and a steamboat operated by Izdeniz which is a separate body under the authority of Izmir municipality. With its categories: access to the boat, car park on the deck, lifts, accommodation, corridors and doors, deck and floors, signs, alarms, toilets and sinks, the checklist enables to have a rating, thus, to compare the boats to each other as an evaluation. As a conclusion, enhancements are proposed to improve the accessibility of each boat type, for instance: if the requirements in lifts, accommodation and signs categories are met for both catamarans and steam boats, they may become more accessible.

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CHARACTERISTICS OF THE LOCATIONS OF INCREASED ROAD TRAFFIC INCIDENTS IN URBAN ROAD NETWORKS

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ABSTRACT

The results of studies carried out by a great number of researchers around the world indicate that man is the most important and – at the same time – the weakest link in traffic processes, and therefore most of road traffic incidents are caused by human error. A majority of such errors leading to traffic incidents are made for specific reasons. These often include an inadequate physical ability to respond to a traffic situation, a deliberate harmful action and a faulty road environment. The spatial distribution of road traffic incidents is not random – it follows a specific pattern with most incidents concentrating at the 'weakest' points of a road network with identifiable shortcomings, making it more difficult for the road users to assess the circumstances and take appropriate action. Such points are referred to as 'hazardous locations'. Defining these locations and a proper evaluation of the causes and effects of road traffic incidents in such locations should provide a basis for seeking solutions to optimise road infrastructure from the point of view of its users' safety. The purpose of this paper is to describe the places of concentrated road traffic incidents in the road network of Poland. The analysis utilised a modern IT system, WZDR, supporting the management of roads and traffic, currently implemented in a few cities in Poland. It comprises a number of themed subsystems operating together, the most extensive of which – in terms of analytical possibilities – is the Road Traffic Safety subsystem. The RTS includes a graphical and descriptive database of road incidents, including historical data, and analytical blocks. The subsystem also uses data obtained from other subsystems, describing the properties of roads, traffic and road environment. This paper presents the structure of the locations of concentrated road traffic incidents and defines the most dangerous intersections and spots on urban road network sections between interchanges. The most important analytical part of the study contains a detailed description of the relationship between the characteristics representing an increased hazard to road traffic users in the hazardous locations and incorrect behaviour of the users caused by the considered faults of road infrastructure and the exact location where particular road incident types concentrate. This analysis enables identification of typical faults of selected elements of a road network from the point of view of road traffic safety. It provides a basis for improvement of current principles of design applied both to intersections and to elements of road infrastructure located between intersections.

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THE ANALYSIS OF URBAN TRAFFIC FOR VARIOUS GROUPS OF VEHICLES

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ABSTRACT

The paper presents the analysis results of traffic flow measurements recorded by road traffic and noise monitoring station. The station is located in a medium size town in Poland (Kielce) situated at the national road to Cracow. The traffic flow was measured over the period between January and December 2013 for twenty-four hours a day. The measurements were documented at one hour intervals throughout the entire 24 hours of the day (1:00-24:00). Statistical analysis methods were used to determine the variability and uncertainty of the results. The measurements from two vehicular lanes running towards the town and two lanes running towards Cracow were analyzed. Different vehicle types were taken into account: cars, trucks, vans and motorcycles. The variability of the results was described using parameters such as the coefficient of variation, positional variation and the quartile coefficient of dispersion. The coefficient of variation and positional variation of traffic were proposed for the analysis of data scattering. It was found that in some cases the distribution of the tested variable was not normal. Differences in traffic intensity on opposite road lanes for particular groups of vehicles were demonstrated. Box plots were used to assess whether outliers' data occurred in the recorded results. The times of the day in which the parameters describing the variability of the recorded traffic had stabilized values were identified. The results obtained for the data recorded on working and non-working days were compared. Type A uncertainty was evaluated.

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MODELLING SIGNALISED INTERSECTIONS RELIABILITY OF FUNCTIONING

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ABSTRACT

The article addresses a fundamental aspect of traffic, i.e. the operation of traffic signals at intersections, in reference to the reliability theory. In many cases, when intersections carry substantial amounts of traffic, selecting control parameters to produce satisfactory traffic conditions is quite difficult. Design methods do not cover all possible situations which are the result of intersections geometry and location within the city. Neither do they account for reduced capacity in bad weather. Inefficient signal-controlled intersections have a strong influence on motorists, causing frustration and fatigue and eventually leading to risky behaviour in road traffic. Sustained congestion in urban areas has a negative effect on the residents and how they function in the urban environment. As a consequence, big city dwellers who drive grow accustomed to poor traffic conditions and are ready to accept some time lost at peak times. When designing traffic signals, the methods should relate to the size of the city and levels of traffic overload that are acceptable to motorists, rather than identify inferior levels of free flow only. This particular field of study is suited for the reliability theory as presented in the article. When analysing the reliability of groups of traffic lanes, we must be clear on boundary traffic conditions where the reliability state transitions into the unreliability state. The state of reliability is when a intersection operates seamlessly and traffic volume Q is below capacity C (periods in between peak times or at night-time). The article will show the division of the reliability state into levels. This helps to define the boundaries based on boundary values of selected measures of those traffic conditions that are of particular importance to us when managing junction traffic. Once these values are identified and geometry and weather factors are included, traffic signals can be designed more efficiently and urban traffic will improve as a result.

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ROAD RESTRAINT SYSTEMS AS A BASIS FOR ROADSIDE SAFETY IMPROVEMENT

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ABSTRACT

Roadside-related crashes occur when vehicles run off the road. The majority of the crashes have severe outcomes, especially when an object is hit (tree, pole, supports, front wall of a culvert, barrier). These accidents represent app. 19% of all of Poland's road deaths. Roadside crashes involve: hitting a tree, hitting a barrier, hitting a sign or utility pole, vehicle roll-over on the roadside, vehicle roll-over on a slope and vehicle roll-over in a ditch. Understanding the effects of roadside factors on road safety requires in-depth research. The problem was partly addressed at the WMCAUS conference in 2017 (Budzynski et al. WMCAUS 2017). Key to understanding the needs and tools of road infrastructure management for preventing run-off-road crashes or minimising their consequences, is to identify the hazards and sources of hazards caused by wrong or improper use of road safety devices. It is also important to identify errors in the design, structure, construction and operation of road safety devices. Studying such an extended scope of the problem required fieldwork. Site tests had to be conducted such as hitting a wire rope barrier and a steel barrier on curve (test TB32), light and heavy vehicles hitting a bridge parapet (tests TB11 and TB51), hitting a transition between a steel and wire rope barrier (TB32) and crashes into a lighting column placed within the barrier's working width. In addition, the project includes numerical tests validated on the basis of site tests. This helps to assess the behaviour of road restraint systems when selected parameters are changed. The work is part of the RID Programme (Development of Road Innovation) and the RoSE project (Road Safety Equipment). In the article the authors present the effects of building a road restraint systems database for a selected test site (about 3,000 km of Poland's national roads). An outline of new road restraint systems guidelines could only be developed after understanding the effects of restraint systems, the design, additional elements, type of road and safety barrier location on a road or engineering structure and the road and traffic conditions on their functionality and safety. The paper will present the preliminary results of this research. Once complete, the research will offer tools to help with the implementation of road restraint systems. The tools will ensure that road infrastructure is safer and that the most common mistakes are eliminated.

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SYSTEM DYNAMICS APPROACH TO TRAFFIC CONGESTION MODELLING

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ABSTRACT

Road infrastructure is the essential component of city's traffic system. It is highly influential on urban traffic system performance often measured as congestion in urban traffic system. Traffic flow is affected by parking spaces, signals, junctions and other infrastructure elements that affect the smooth flow of traffic. The paper presents an attempt to use a system dynamics (SD) approach in traffic network modelling. System dynamics has been proved to be a useful method to model processes of complex systems. Mainly due to its ability to combine both qualitative and quantitative variable and feedback loops in the system to represent its performance. A simple system dynamics model of a road infrastructure interactions and its influence on traffic flow on a chosen route in Bristol, one of the most congested cities in the United Kingdom, is provided. Model represents an ambulance route from Southmead Hospital to Exhibition and Conference centre at University of the West of England in Bristol.
The proposed research addresses the growing need to implement innovative methods of traffic systems analysis. System dynamics offers a holistic approach in modelling traffic network capacity. SD models can be used to estimate inefficiencies in the transport network design. Moreover, the system dynamics model can be used to study multiple strategies and scenarios for traffic control, transportation planning or road infrastructure design.

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ANALYTICAL AND NUMERICAL APPROACHES FOR DESIGN OF STONE PAVERS IN URBAN SHARED AREAS

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ABSTRACT

Existing statistical data show that the use of pedestrian block pavements is increasing. This paper compares two approaches used to analyse a block pavement in an urban shared area. In presence of occasional heavy traffic roads, the pavement should be verified using methods currently used for road pavements. Fatigue and rutting verification was performed respectively for bound and unbound pavement materials using analytical curves available in the literature. The analytical theory of Westergaard and the commercial finite element (FE) software Abaqus® were used to calculate the response of the pavement when subjected to different loading, construction and geometrical configurations (i.e. type of analysis, shape and size of meshes, boundary conditions, and bonding contacts between the pavements layers). In all cases, the results obtained from the analytical theory of Westergaard were higher than those obtained from a finite element model (FEM). Therefore, a parametric study was performed in order to use the analytical method as an alternative to the costly FEM approach. The results of comparison gave a correction factor, valid for hexagonal pavers: it permits to analytically estimate with good approximation the stresses induced by heavy loads applied to natural stone blocks. This is an interesting result since the analytical theory provides an inexpensive procedure for the analysis of block pavements exposed to occasional traffic conditions.

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DESIGN OPTIMIZATION OF LIFTING MECHANISMS

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ABSTRACT

The design of the lifting device (mobile crane vs tower crane) has big influence on construction efficiency and the whole building process. That is why we made this design optimization of lifting mechanisms for many types of building site. Basic algorithm of this metodology was made with respect to structure of the area, time and technology. Construction, shape and dimensions of the designed building are also necessary be taken into consideration, as well as shape and weight of the load. We also included building site characteristics and required deadline. The decision between two basic types of lifting devices, i.e. mobile crane or tower crane, also depends on economy, ecology, time and spatial demands. After collecting information from many building sites, we made computer software, which could be accessible for laymans and even for specialists in building engineering. This software is also approachable for smartphones, what makes it more accessible. Every user inputs basic information (building site location and characteristics, area, building construction, deadlines, heaviest load). Very important are deadlines of particular procedures - foundantion construction, vertical support constructions, horizontal support constructions, staircase, roof. The choice between mobile and tower crane will be made by this software after inputing all this information . The lifting devices are also compared in compliance with economy and ecology and subsequently sort from the most suitable to the most inconvenient. This methodology and software should help with selection of the most suitable lifting device for every specific construction and solve problems with building material transport as well. This problems can result in project delay, what often means cost incerase.

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GIS-BASED TRANSPORT ACCESSIBILITY ANALYSIS TO COMMUNITY FACILITIES IN MID-SIZED CITIES

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ABSTRACT

Transport accessibility is an important issue for the sustainable development of cities. This work presents a GIS-based accessibility analysis approach that can be applied to assess accessibility to community facilities in medium-sized cities using publicly-available data. For that purpose, a case study was developed using the road network and public transport data from Covilhã city, in Portugal. Data collected on websites were treated and organize to build the network dataset and perform network analyses with the aid of the ArcGis® Network Analyst extension (creation of service areas and Origin-Destiny (OD) cost matrices). Four accessibility evaluation analyses were performed for two transport modes: accessibility to the municipality main community facilities by private and urban public transport (isochronous and OD matrices), by inter-urban public transport (time); and accessibility by private transport between parishes (isochronous and OD matrices). The population and the territory covered by different travel times were also determine. The case study results showed that the accessibility in the city of Covilhã is quite reasonable, either using private transport inside the municipality (maximum 20 minutes for covering nearly 95% of the resident population), or urban public transport inside the urban perimeter (maximum 50 minutes). However, the periphery parishes of the municipality have lower levels of accessibility for inter-urban public transport (reaching 115 minutes). The utility of the approach was validated through the results obtained in the case study, where it was possible to observe patterns of accessibility across the municipality for the considered modes, allowing to improve the overall accessibility through the identification of priority areas of intervention.

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ANALYSIS OF ROAD TRAFFIC FLOW IN THE IMPACT ZONE OF BUS STOPS USED BY VARIED OPERATORS

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ABSTRACT

As a result of increased motorization and de-monopolisation of public transport, bus stops are being increasingly more intensively used by numerous private operators specialising mainly in interurban and suburban routes. With the substantial share of interurban communication vehicles standing at the bus stops, there are some disruptions in the fluency of public transport. Bus stop may be treated as a service system. With the increase of the time spent by buses at a stand, the probability of a bus having to wait before driving at the bus stop rises because of a stand being blocked by the previous bus. That leads to lowering public transport speed as well as waste of time incurred by public transport buses, passengers or sometimes also other users of the system. A significant diversification of the character of services among various operators at the shared bus stops causes deterioration of public transport traffic conditions. That can also affect other vehicles. Due to the high interurban transport vehicles, taxi and other non-authorised vehicles intensity, the bus stops are blocked, especially those located near the signalized intersections. The aim of this paper is to analyse the basic parameters of traffic flow with the use of computer simulation techniques for the urban street segments with localized bus stops. The traffic and passenger service processes will be the subject of research for bus stops used by various operators and users with neighbouring street segments. The analyse of the time lost at the bus stops used by various operators as a result of the following: standing in the queues, buses joining the traffic and buses waiting for the passengers to reach the vehicles of interurban carriers will be included in this paper. It is vital to define and point out those factors that affect the amount and probability of the time lost, in order to set the guidelines on location and sizes of bus stops for various operators, including quality criteria. Theory of probability and mathematical statistics were used for the sake of this research. This paper presents the simulation of passengers boarding and alighting process at urban bus stops used by varied operators, basing on measurements in the area of urban bus stops in Poland. There have been analyses carried out, concerning changes in the average time lost by the urban and interurban transport buses and minibuses, depending on: possibility of bypassing other buses standing at the bus stop; and the possible number of servicing canals for different variants of bus stop utilisation (service regulations) for the registered vehicle traffic and passengers exchange time. There have been proportions defined of buses' time lost caused by other transport system users such as taxis and remaining non-authorised vehicles, depending on their intensity and bus stop location.

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TRAFFIC CALMING AS A COMPREHENSIVE SOLUTION IMPROVING TRAFFIC ROAD SAFETY

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ABSTRACT

The purpose of the article is presentation of various aspects of improvement of traffic calming solutions on traffic safety and the results of implementations of these solutions. The paper is a review of methods and means on improving traffic safety. Selected results of influencing of implementation of traffic calming solutions for road traffic safety in Poland will be present, too. The idea of calming traffic connects the various aspects of the functioning of urban areas, including urban planning, transportation, road safety and social and environmental aspects. The calming of traffic according to authors of Integrated Programme of Improvement of Road Traffic Safety in Poland the GAMBIT (1996) is define as „the solution about organizational, building and legal character, reducing the difficulty of car traffic by implementation of limitations and the change of transportation service of chosen areas. The means of traffic calming can have the character of planning and structural solutions, detailed solutions of elements of roads and the organization of traffic". The main implementation criterion of traffic calming solutions to improve the state is often urban traffic safety. Traffic calming solutions significantly reduce the number of accident victims. The key to achieving these effects is reducing speed, adjusting speed to street character and function, and transforming road and street infrastructure, which forces to drive slower and improves the quality of the urban environment. The implementation of the area conception of traffic calming is often linked to the process of urban transformation and revitalization of the area. Analysis of existing solutions in Polish Cities confirms the experiences of developed countries with a high level of motorization. They indicate very favourable influence into the decrease of car traffic, improvement of traffic safety, promotion in the increased of cycling, public transport and pedestrian traffic. Solutions of traffic calming in Poland in all forms including: zones 50, zones 30-40, inhabitants' zones (20 km/h) as well as shared spaces improve the traffic safety, reduce the accident risk and simultaneously improve the environmental conditions of residence, as well the aesthetics of the urban landscape. The best results bring solutions of traffic calming on the implementation on the transit roads passing through the small cities and solutions in urban centres. The effectiveness of solutions of traffic calming in the aspect of safety must be systematically evaluated, due to their relaxation, because drivers get used to it and increase the speed of travel.

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THE IMPACT OF SPATIAL DEVELOPMENT ON TRAFFIC SAFETY IN A MEDIUM-SIZED CITY - CASE OF CHELM LUBELSKI (POLAND)

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ABSTRACT

The purpose of this paper is to show the influence of spatial development on traffic safety in a medium-sized city (65.000 inhabitants) on the example of Chelm Lubelski situated in the Lublin Voivodship, - in the so-called area of Eastern Poland. This paper is based on the analysis of city planning documents and the study of the state of spatial structure of the city of Chelm and traffic safety statistics from 2012-2014 made available from the Polish Road Traffic Observatory. The level of individual motorization was in 2014 - just over 470 passenger cars/ 1000 inhabitants Analyzes carried out indicate that Chelm is a safe city against the background of the country, there are many places in its area where the state of road safety indicates a disturbance of the balance between the social space and space for transport. In Chelm, in the analyzed period there were up to 25 accidents and 830 collisions per year. The number of accidents/ 1,000 vehicles in the analyzed period was 0.69, and the rate of accidents/ 1000 inhabitants was 3.87. Indicators for the city of Chelm were significantly lower than in the Lubelskie Voivodship and in relation to the whole of Poland (1.42 and 1.7, and 6.77, 9 respectively). The most endangered by accidents were collective and local roads, and collisions most often occurred on main roads, as well as on collective roads. The high level of traffic safety in the city against the background of the voivodship and Poland is indicated by estimated accident density ratios per 1 km of road. This indicator for main roads amounted to 0.31 (in the Voivodship 0.56 and in Poland 0.47), and for collective roads 0.30 (in the Voivodship 0.53 and 0.07). In terms of administration, national and provincial roads are clearly safer than the average in the Voivodship and Poland (0.31, 3.94 and 5 and 0.34, 1.53 and 3 respectively). Least at risk of accidents in Chelm there are district and municipal category roads that lead significantly lower traffic flows than higher category roads (0.19 and 0.03 accident/ 1 km of road/ year). The main area of concentration of the number of accidents in Chelm is the city center and some residential areas located near this zone. In Chelm are several areas with ratio large accident or collision. The main reasons for this are the high concentration of service areas in one place as well as the multifunctionality and high availability of roads (numerous intersections and public entrances). The road safety is also influenced high traffic volumes on some streets and the state of road surfaces, too. In Chelm in the coming years is planned construction of the northern bypass of the city. Infrastructure for cyclists and a zone of traffic calmed down in the historic center and in housing estates are developed. These investments and activities should result in further improvement of the city's traffic safety.

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MODELING BICYCLE DEMAND USING AUTOREGRESSIVE AND MOVING AVERAGE MODELS

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ABSTRACT

Bicycle transport is gaining importance in modern cities, therefore the modeling of its demand is most needed for sustainable city development. In this paper the measurement of number of bicyclists at one of the Czech Republic street was conducted. Monthly data in hourly periods was used. The autoregressive and moving average models of bicycle demand was calculated. Depending on ARMA parameters, to estimate the relative quality of statistical models, the Akaike Information Criterion (AIC) was used for a given set of data. In order to verify the correctness of the ARMA model, the residual autocorrelation analysis was carried out. The verification of the model's fit to the real data was made using the correlation coefficient.

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ECONOMICS OF TRACK RESILIENCE

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ABSTRACT

Nowadays, railway infrastructure is a valuable asset throughout the world. Due to the increase in railway traffic, these may lead to the increase in the possibility of railway track deterioration. Thus, the investment in railway infrastructure improvement is growing to prevent disruption, deterioration and reduce maintenance. There are many methods to mitigate these problems. The use of elastic materials has been proposed as an alternative method to improve track resilience. It is seen that if these materials are used properly, track deterioration is decreased. This lead to expand the service life of railway track and its components. However, track maintenance still needs to be carried out to maintain a railway asset. This paper presents the benefits of rail pad, under sleeper pad, and under ballast mat. Firstly, this study aims to discuss the main method of mitigation for those matters using elastic materials. The main features of these materials is to modify the vertical stiffness of the track, increase damping, reduce vibrations and noise, reduce impact load etc. It should be noted that different types of each elastic material are used for different locations and purposes based on stiffness of material. Moreover, elastic materials have a short life span as the temperature can affect their properties. This paper analyses the life cycle cost over a 30years time span of railway track with and without elastic materials. The construction and maintenance costs are considered. Based on previous project, the use of elastic materials can significantly reduce the overall maintenance cost. The result shows that the use of elastic materials can give a fast payback within 4 years, which are still in the service life of elastic materials. However, it is recommended to consider more factors for further research.

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ANALYZING THE INFLUENCE OF ENCROACHMENT ANGLE AND MEDIAN PARAMETERS ON SAFETY OF RURAL HIGHWAYS USING VEHICLE DYNAMICS PERFORMANCE

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ABSTRACT

Cross median crashes are among the most dangerous types of highway crashes, especially for trucks, which should be more considered by highway engineers. Skidding and roll-over are the important factors which affect trucks' cross median crashes. In this research, the median safety is evaluated through TruckSim dynamic simulation and violations of running off from the median; also, statistical analyses are carried out. The results of this research show that encroachment angle is the most effective parameter for skidding and roll-over. The side friction factor increases as the speed increases, which means that more side friction demand is produced for trucks at high speeds. From the viewpoint of rolling, the most critical situation is found at 25° of encroachment and 0.8 m shoulder width. It can be seen that the unpaved shoulder is more critical than paved shoulder and two-way slope cross-sections are more important than the one-way slope. The result of this paper could be used for designing safer roadways.

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DYNAMIC MODELLING OF THE EFFECTS OF COMBINED HORIZONTAL AND VERTICAL CURVES ON SIDE FRICTION FACTOR AND LATERAL ACCELERATION

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ABSTRACT

In this study, multiple simulations were conducted using CarSim and TruckSim dynamic simulation software, along with SPSS software for statistical analysis. The simulations were conducted on different types of vehicles: a sedan, SUV, and truck. Speed, delta, grade, and position (location of horizontal and vertical curves relative to each other) were the parameters considered in the simulations. According to the results, a sedan and SUV experience more side friction than a truck in the beginning and at the quarter of the vertical curve. The side friction factors in critical situations are higher than the values in AASHTO 2011. A truck is more likely to roll over because of its high lateral acceleration. The statistical analysis showed that the grade and position did not affect the side friction factor for the sedan and SUV, and could thus be neglected. The results of this study could influence the design of safer roadways.

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USAGE OF COPPER SLAG IN SUBBASE COURSE OF LOW VOLUME RURAL ROADS

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ABSTRACT

Use of industrial waste materials in road construction has been in vogue in India for quite some time. Due to growing environmental awareness, as well as strict regulations on managing industrial waste, the world is increasingly turning to find the properties of industrial waste so that these can be used as construction materials. Copper slag is a byproduct obtained during smelting and refining of copper. Copper producing units in India leave thousands of tons of copper slag as waste every day. Based on U.S. environmental protection agency regulations, governing solid waste characteristics, copper slag can be classified as a nonhazardous material. Granulated copper slag is more porous and, therefore, has particle size equal to that of medium sand. A pavement structure can be designed either as a flexible pavement or a rigid pavement based on its structural behavior, with flexible pavements being widely preferred in India due to its advantages over rigid pavements and in economical point of view also. The flexible pavements are composed of wearing course, base course, sub-base and subgrade layers. The sub-base layer in a pavement improves the supporting capacity, provides drainage, minimizes the detrimental effects of frost action, and provides uniform support to the upper layers. Therefore, in this study, Copper Slag has been used in sub-base layer to check its feasibility. Copper Slag has been used in the up gradation of two *Pradhan Mantri Gram Sadak Yojana* (PMGSY) roads in Tuticorin district, Tamilnadu, India. Soil has been collected at different chainage, from these two roads and laboratory tests were conducted. Copper Slag was collected from Sterlite Copper Pvt. Ltd., Tuticorin, Tamil Nadu. In this study, a comparative study on strength properties of copper slag and sand has been done. An optimum proportion of Copper Slag has been determined for sub-base layer by using gradation. California Bearing Ratio (CBR) has been determined for the GSB material with copper slag and compared with that of conventional material. Economic Analysis has been carried out for sub-base with Copper Slag and compared with conventional cross section. Based on the results it is concluded that Copper Slag is a suitable waste material that can be used in the construction of sub-base layer.

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RHEOLOGY OF BINDERS AT PAVEMENT SERVICE TEMPERATURE IN INDIA

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ABSTRACT

In India, most of the pavements is laid by bituminous road and the consumption of binder is high for pavement construction and also modified binders are used to satisfy any specific pavement requirement. The service temperature in India varies from 0°C to 65°C. Binders for flexible pavement are viscoelastic material which is having the mechanical properties of binder transitions from viscoelastic solid at lower and intermediate service temperature range to viscoelastic fluid at higher service temperature range (40°C to 65°C). At higher temperature the pavement is susceptible to rutting failure. In this paper the interrelationships between temperature, viscosity, Complex Shear Modulus, and Phase angle have been analysed by using different protocols to study rheological behaviour of binder. Three different binder samples have been considered for study Viz. unmodified binder sample (VG 30), Polymer Modified Binder sample (PMB 70) and Crumb Rubber Modified Binder sample (CRMB 60). Basic tests of bitumen (penetration test, flash and fire point, softening point test, viscosity test) has been carried out to determine the consistency of binder samples. The experimental investigations are carried out to find the Rheological behaviour of corresponding binder samples by considering the different protocols available in Dynamic Shear Rheometer (DSR). Original binder grading protocol (AASTHO T-315) and MSCR protocol (AASTHO TP-70) have been used to study the rutting behaviour by determining various rheological parameters with respect to temperature i.e. Complex modulus, phase angle, total dissipated energy as well as the rutting parameter $|G^*|/\sin \delta$. The comparison of various binder parameter has been done for the binder samples with respect to temperature. It has been found that PMB 70 has higher value of complex modulus, dissipated energy, rutting parameter and pass/fail temperature. This implies PMB 70 is more rutting resistant than other two binder samples. The traffic designation of binder has been determined using MSCR protocol. It is found that PMB 70 can accommodate extremely heavy traffic i.e. traffic >30 msa at 64°C.

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AUTOMATED DATA COLLECTION SYSTEM OF PAVEMENT DISTRESSES: DEVELOPMENT, EVALUATION & VALIDATION OF DISTRESS TYPES AND SEVERITIES

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ABSTRACT

This study presented an affordable and simpler technique that does not require complex technology and is suitable for middle sized road networks. This technique involves taking pictures of various sections of the road network using cameras that can be mounted on public vehicles and transmitting taken images to a processing center. Each image is processed using image filtering techniques to produce an initial estimate of the PI. A total of 5,070 images and 507 sections (4 x 10 m per section) were taken and tested on a part of Sheikh Maktoum Bin Rashid Highway E11 in Abu-Dhabi city (UAE) based on the quantity and clarity of the distresses. Six types of pavement distresses were tested; (1) longitudinal cracking, (2) alligator cracking, (3) block cracking, (4) pothole distress, (5) transverse cracking and (6) edge cracking. Three severity levels were considered: (1) low, (2) medium and (3) high. There were two distress measurement methods used to identify pavement distresses; semi-automated measurement (SAM) method and automated measurement (AM) method. In order to evaluate the accuracy of the AM method, two expert observers were used individually to extract the pavement distress by using the SAM method. The Cohen's weighted Kappa used to determine the agreement between the two observers. The overall agreement result of the pavement distresses between the two observers was 98%, which is almost a perfect agreement. The overall agreement result of the pavement distresses between the two measurement methods was 89%, which is again an almost perfect agreement. Also the AM method validated by using R2 method and was found to be 0.93. The weighted mean speed of all distresses and standard deviation were found to be 58.56 km/h and 28.24 km/h respectively.

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PEDESTRIAN ENVIRONMENT QUALITY ASSESSMENT IN PORTUGUESE MEDIUM-SIZED CITIES

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ABSTRACT

The features of pedestrian spaces contribute to urban mobility sustainable performance and consequently to improve the quality of the built environment. A pedestrian space free of obstacles, with slight slopes, continuous, agreeable, attractive and safe, is definitely a space that invites to enjoyment and socialization. With the aim of improving the pedestrian circulation conditions, the present paper describes a set of approaches for assessing the quality of pedestrian environment. Land use, pedestrian facilities and road/traffic attributes are the most common topics addressed in those approaches. For Portuguese medium-sized city, the Pedestrian Environmental Quality Index (PEQI) was adopted, adapted and tested through a case study in Covilhã city. The main steps of the adapted methodology include the definition of relevant data, preparation of survey forms, training of data collection teams, data collection, database organization, PEQI calculation, GIS data visualization, management and thematic maps production. Obtaining PEQI scores and their spatial distribution enhance the decision making process of pedestrian system improvement. The case study focused on the areas that have a significant pedestrian flow, either because of commercial, services and recreation activities, or because they are important links of the public transport system. As main findings it was possible to conclude that the selected approach allows a great flexibility in the incorporation of new attributes and weights according to specific technical goals and scenarios (calibration).

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DETERMINING FRACTURE MODES ON TURNOUT CROSSING NOSES

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ABSTRACT

Turnouts are the critical components of modern railway tracks where the vehicle movement is transferred between two continues track, resulting in high dynamic forces on turnouts. Therefore, turnouts restrict the operational limits (i.e. speed, headway) and require high maintenance works. The crossing area is the region of a turnout which contains the intersection point of two tracks. When one bears in mind that two tracks intersect at a point, the intersection point must be either removed (fixed nose) or built as adaptive (movable noses) to enable the movement. Commonly, the fixed nose is preferred, even though they produce high impact forces on turnouts in comparison with the others. Crossings suffer from different types of forces which could be subcategorised as peculiar to turnouts and general. As well known in engineering, existing forces in a system naturally trigger damage mechanisms on components, which must be prevented. Plastic deformation, wear and fracture are observed mechanisms on crossings and moreover, these mechanisms are interrelated. Thus, to solve the problems originating from these mechanisms, the dominance of one mechanism must be considered. On fixed crossing, the fracture could be accepted as the dominant damage mechanism. Fracture problems are mostly elaborate problems. There is a common sense of fracture mechanics that modelling a fracture must be presented merely to solve the problem and complicated as possible to represent the problem. From the fracture mechanics' points of view, the effective forces on crossings should be defined firstly so as to determine the dominant fracture mode. In this study, it is aimed to investigate the forces acting on the crossing noses and identify the dominant fracture modes to establish the first step of the solution. The results show that a crossing nose has a mixed fracture mode of mode I, mode II and mode III due to impact forces and bending moments, despite the neglecting the thermal and braking forces.

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REVIEW OF CONTACT CONDITIONS ON TURNOUT CROSSING NOSES

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ABSTRACT

Even though railway systems are becoming more preferred transportation concept regarding high speeds, punctuality, safety, availability, which are appealing for passengers; cost-effectiveness, environmentally friendliness and less soil occupation corresponding to other transportation modes, which attracts the governments and operators, it still suffers from two major drawbacks: first investment and high maintenance costs. Life cycle costs analyses show that maintenance costs have significant effects on the total value as well as early investment costs. The reason for high maintenance costs in railway systems is that critical components (i.e. turnouts), which are the weak points of a railway system, require frequent detailed inspection and maintenance associated with high safety standards. For instance, it is widely known for a turnout that European countries have conducted a series of projects such as Innotrack, IN2Rail, S-code in order to lower the maintenance costs. Moreover, turnouts also restrict the design limits of a railway system, which results in lower operational speeds. Consequently, studies on turnouts have been increasing. In general, the studies focus on track stiffness along the turnout, environmental effects on configuration, conversion problems and the contact problem. Among these issues, the contact is the most premature problem due to its nonlinear nature, which could not be solved analytically. Having increased computational power, sophisticated methods for the contact problem have been developed. In contact problem, contact patch, forces and positions are of interest substantially. From the aspect of turnout crossing noses, there is a contact patch evolution on crossings from single to double and double to single contact patch, which affects the vehicle dynamics notably. Numerous studies have been presented for the problem. However, these studies, commonly, consider one type of turnout, mostly standard turnouts. Regarding the absence of collective study, in this study, the aim is to review the contact conditions depending on turnout types from a wider perspective. As result of the study, it has been found that crossing nose types such as fixed and movable have significant effects on lateral and vertical movements of the contact patches. Moreover, different layouts of turnouts have different effects on the contact conditions.

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START-UP LOST TIME ESTIMATION AND ANALYSIS AT SIGNALIZED INTERSECTIONS IN IRAN

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ABSTRACT

Signalized intersections play a key role in the urban traffic network. Saturation headway and Start-up lost time are the important items in the analysis of the capacity of signalized intersection and its performance. as obtained results from different countries are seriously affected by user's behaviours, it is necessary to have some local studies in each country to determine fundamental traffic parameters like saturation headway and start-up lost time. the released researches show that four or five primary vehicles in the queue have delayed and they can be considered to estimate the start-up lost time. In this study, ten approaches from five signalized intersections located in two big cities of Iran, Tehran (capital of Iran) and Rasht (biggest city in the north of the country) were investigated by camera recording in peak hour of traffic flow and the Saturation headways at inlet legs of intersections were collected to calculate and analyse the start-up lost time using the microscopic method. The results show that saturation condition is established from fourth or fifth vehicle to the end of the queue. in other words, three or four primary vehicles in the queue are involved in the start-up lost time. In addition, the average value of start-up lost time in Iran calculated by present study shows more amount compared to the proposed value from highway capacity manual (2 seconds).

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EFFECTIVENESS OF ROAD CHICANES IN ACCESS ZONES TO A VILLAGE AT 70 KM/H SPEED LIMIT

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ABSTRACT

The development of motoring has increased life quality and pace. As a result, not only cities but also smaller towns and villages with roads face transportation challenges. The fundamental problem in smaller towns and villages is to ensure road safety at pedestrian crossings on through roads. The guidelines of road building recommend to introduce traffic calming devices at places where traffic enters a built-up area, to reduce speeds at the entry of a city or village. Chicanes curve the trajectory of traffic and consequently cause speed reduction. The authors conducted a series of speed measurements in free and continuous traffic flow conditions on major local roads with different types of road chicanes. For each case, additional data regarding road characteristics in the vicinity of a chicane were gathered, including the contour of the town visible while approaching the chicane, the distance from the chicane to the nearest buildings in the village, how visible the road continuity behind the chicane was, developments of the greenery and the type of traffic arrangement used. The paper analyses road sections with 70 km/h speed limit before the chicane, as on B-33 road sign. For comparison purposes, speed measurements were also conducted at the entry to the village, where although no chicanes were built, there was B-33 road sign with the speed limit of 70 km/h. The comparative tests aimed at determining whether drivers reduce speed when they see the road sign, because of the chicane or following another determinant. Comparative analysis showed that given B-33 sign (which introduces 70 km/h speed limit) at the entry zone to the town, drivers' speeds significantly exceed 70 km/h in free traffic flow. Even in continuous traffic flow, speeds usually oscillate around 70 km/h. The speeds are significantly lower behind the chicane. The maximum reduction of speed at the entry to the village was achieved for other determinants recorded in the study, including a clearly visible silhouette of the village, closely located houses, a horizontal curve behind the chicane with limited visibility of the further section of the road. >90% of motorists behind the chicane drive with speeds <70 km/h. At the entry zone which was an open space, with a well visible silhouette of the village, with the chicane approximately 200 m away from the nearest houses or at the entry zone covered with forest and poor visibility of the built-up area, 70-77% of motorists behind the chicane drive with speeds <70 km/h. If the access to the town is preceded by a long stretch of straight road section, with poor visibility of the silhouette of the village, only approximately 50% of drivers enter the village with speeds <70 km/h. Depending on the determinants recorded in the study, motorists in most cases exceed 70 km/h and enter the village with much greater speeds if there is no chicane.

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WAYSIDE CROSSES AND SHRINES AS SIGNS OF SPACE AND MEMORY IN THE CULTURAL LANDSCAPE OF POLISH VILLAGE

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ABSTRACT

This article concerns the issues of investigating the role of the wayside crosses and shrines in cultural landscape of Polish rural areas as well as its functioning as the spatial and memorial signs in the awareness of local communities. The article is based on the ethnographical field research and publications. In the investigation, there was used authorial method in the anthropology field, cognitive mapping method -mental maps, which enables the researchers to describe and knowledge many cultural landscape dimensions - sacral, historical, legendary-mythological, social and to identify significant elements that create the rural space. The thesis was that the wayside crosses and shrines are multi code and complex macro-signs that serve multipurpose function in the lives of the countryside residents. The aim of this paper is to show the possibilities of reading the encoded cultural meanings of these small sacral architecture forms created as a result of direct or earlier life experiences of the village inhabitants. The article points out the need of documentation to protect, preserve and maintain these archetypical elements that influence the clarity of cultural landscape and the identity of the local communities.

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ARCHITECTURAL CREATIONS RELATED TO LANDSCAPE: EXAMPLES OF DIPLOMA DESIGNS OF ARCHITECTURE STUDENTS

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ABSTRACT

The paper discusses the examples of architectural solutions related to the natural landscape and built environment that were presented in students' diploma designs. In the architectural and urban design, it is important to try to give timeless value to the creations. That is understood as meeting the needs of the contemporary and future users, and paying respect to the tradition. The paper analyses the architectural and urban designs that have commercial, educational and recreational functions. The facilities were located in urban (Kielce) and extra-urban (Chęciny) areas. Subject matter of the paper affects the quality of architecture and urban planning. In their work, future architects and town planners must be responsible and socially oriented when creating spaces in the built environment and natural landscape. The designs discussed in the paper demonstrate that modern architecture and natural landscape can both belong to the region's tradition. Such an approach is both a value and a challenge to the designer and the user.

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ABOUT HISTORICAL RELATIONSHIPS AND NEW SACRED FORMS IN THE LANDSCAPE OF THE MODERN CITY OF KIELCE

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ABSTRACT

The article presents selected issues concerning relations of sacred forms, their role and significance in the inner structures and landscape of the modern city. Research interests were concentrated on the historical and modern buildings of sacral architecture in Kielce. In the XXI century the city of Kielce possessed a complex urban structure, which has been subject to frequent modifications for centuries. Sacred architecture has played a significant role in shaping and defining the language of spatial forms. Historical forms of sacred form which have so far been dominant over the environment, today in a much smaller scale, dominate in the urban tissue. These objects are still recognizable to a certain place, strongly formulate and define urban public spaces. It is a valuable substance and cultural heritage in the space of modern city. In turn, among the buildings that have been created relatively recently, there are also noted works that are part of the public consciousness and are clearly identified with the city. It became the symbol of the place and the characteristic points of reference in the city. In turn, among the buildings that have been created relatively recently, there are also noted works that are part of the public consciousness and are clearly identified with the city. It became the symbol of the place and the characteristic points of reference in the city.

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FLEXIBILITY AND ADAPTABILITY OF THE LIVING SPACE TO THE CHANGING NEEDS OF RESIDENTS

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ABSTRACT

Today, in times of huge social, economic and urban changes, in times dominated by modern technologies, electronic media and communication, people have large and constantly growing, often changing needs, which must fit in ever smaller residential spaces. The need for flexibility in the housing area has become very urgent. It starts to be an essential feature of architecture. People live in a greater hurry and their needs are constantly changing. That's why architecture is challenging to meet all users' needs. Designers are experimenting and creating spaces full of innovative ideas crossing the border in the traditional approach to house design. This article, based on the examples, explores and systematizes the subject of flexibility and adaptability of residential architecture. The author discusses the subject on various levels from the macro to the micro scale, ranging from buildings, their construction, through interiors, mobile furniture, to modern electronic solutions affecting the ability to easily adapt the space to the changing needs of users. The flexibility of housing architecture is considered in the context of the needs of young people living very quickly, but also as adaptability to the changing lifecycle of contemporary family, or to the needs of the elderly and the disabled people. Based on the presented examples, the author proves that the flexibility and adaptability of the living space to the changing needs of residents is a determinant of the times in which we live now. It is a universal and individual approach at the same time. Flexibility allows users to choose the most suitable solution from many possible ones and easily or at low costs re-adjust it again, which is also part of the idea of sustainable development.

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THE CREATION AND PERCEPTION OF UNDERWATER BIULT ENVIRONENT OR ARCHITECTURE

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ABSTRACT

It is obvious that the underwater architectural space is formed as the result of the contemporary human construction activity. Underwater exist built environment available to the modern man. Below the surface of the water is a space that is shaped in a way that makes an architecture. The creation of underwater space has lot of ways and methods. There are a significant desperation between the imagination of designers and the real construction made underwater. Also the problem of different perception of underwater spaces are significant problem. Human body is used to live in the air at the normal pressure of 1at, and in the environment of air. The water is not the natural environment for people so there are important differences of perception of architectural space existing below the surface. Physical conditions of underwater facilities are very different from the ground conditions and it must be considered by visionaries and concept makers to have a chance to implement them. The space of water below the surface is full of stuff which is placed or constructed by the people. Most of them are very simple construction, placed for the recreation purpose. There are dozens of futuristic visions of underwater habitats, but at present times, it is not possible to notice that designers find the way of development, which follow their imaginations. There are not exist the futuristic structures or glass domes. Most of the constructed underwater architecture is available only with the SCUBA equipment. The author as the licenced architect (since 1994) and the designer of several objects connected with water, and the instructor of the Underwater Activity Committee trying to find the purpose and the reason why the human being must (or try) to live at the enemy environment of underwater.

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TRANSPARENCY AS A COMPONENT OF PUBLIC SPACE

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ABSTRACT

Transparency is an element that establishes indoor space and outer space relationships; and determines the existence and strength of this relationship, as well as the ability to transmit light and contribute to visual interiors. However, apart from all these, transparency allows buildings to be an urban element, except the buildings which require privacy at a higher level, such as housing. While transparent facades used in the houses integrate the building with nature; transparency in public buildings gives the message that everything is clear and it offers the possibility to fuse with other urban elements. For this reason, in the scope of the study, transparency is regarded as a recreating element of public space; and its ability to attach the interior space to urban life is focused on. The theoretical part of the essay is based on the meaning of transparency in terms of architectural and urban space and how transparency is conceptualized in the literature. The meaning of transparency as an element that defines architectural and public space physically, symbolically, and socially and the way in which this meaning takes place in architecture is examined in detail through three main headings based on the research in international literature. These are; literal, phenomenal and experiential. Literal transparency indicates how clear the visual boundary between the interior and the exterior space is, depending on the physical characteristics of the material. Phenomenal transparency is a type of architectural organization rather than the visual qualities of material used on the facade. Briefly, it describes the layered structure of the facade elements, voids and even the form and their existence in a certain harmony without interfering with each other. Finally, experiential transparency is concerned with how easily the user can access the building and how the structure relates to the urban space. In this context, Yapı Kredi Cultural Center in Istiklal Street-Beyoğlu, one of the most important Streets in Istanbul-Turkey, is selected as a case study. This new-to-old project is discussed within the framework of the concepts of “literal, phenomenal and experiential transparency”. The building which is designed and renovated by Teget Architecture is located in a street, where social life vitality became increasingly questioning during the recent years. In this context, it is observed that the building will contribute to the public character of the Istiklal Street. It has been observed that transparency has made the building an important component of public space by making street users feel the continuity of the outdoor inside. At this point the study reveals that public and cultural experiences and urban continuity can be achieved through transparency and it contributes the literature in this respect.

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REVIEW OF EXTRAVAGANT PROJECTS BY SANTIAGO CALATRAVA

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ABSTRACT

The topic of the article is a review of the most interesting and extravagant projects of Santiago Calatrava from the moment of his architectural beginning in civil engineering to the present. I focused on structures that caused the greatest wave of admiration and at the same time criticism of this known in the world architect. I chose objects, e.g.: buildings, structures, bridges and footbridges. I described the most important information, e.g.: construction time, construction costs, functionality, architectural style, technology and curiosities. The idea for the paper arose from my trip to the United States of America, where I had the opportunity to see one of the most interesting buildings - The World Trade Center Transportation Hub in New York. In addition, Santiago Calatrava's projects I discussed during lesson that in my university. The first part of the paper describes the author, his education, fascination with architecture, ideas for work and the future. In addition, I have included trivia related to childhood and adulthood of the architect. I described Calatrava's approach to projects and the entire implementation process from concept to finished construction. The following parts describe specific projects that I chose for analysis, these are: Stadelhofen railway station in Zurich, Bac de Roda bridge in Barcelona, Puente del Alamillo Expo 92 in Seville, Atrium of Brookfield Place in Toronto, Gare de Lyon Saint Exupéry railway station in Lyon, Gare do Oriente in Lisbon, Milwaukee Art Museum in Milwaukee, Auditorio de Tenerife in the Canary Islands, Science Museum in Valencia, Museum of Tomorrow in Rio de Janeiro, The World Trade Center Transportation Hub in New York. In the article, I've also placed interesting pictures that perfectly illustrate the architectural style, the scale of the building, and assess whether the object fits into the surroundings. In summary, I checked all the information and expressed my opinion on Calatrava’s projects, its approach to architecture and described future plans for new buildings.

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THE REBIRTH OF MULTICULTURAL IDENTITY IN PUBLIC SPACES OF LVIV (UKRAINE)

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ABSTRACT

The general aspect of the national identity is understood to be a specific stability of the national or civilizational parameters and their self-identity. The problem of the national identity in the modern globalized world includes, first and foremost, the cultural identity, which enables the nation to define its place in a transnational space. However, nowadays, we should, obviously, speak about the multicultural identity as the phenomenon of peaceful coexistence of the different cultures within a certain society. The purpose of the article is to show the problem of the national identity representation as a multicultural brand of a city public space in an author's view. The formation and revival of a national identity have been considered by the example of an architectural environment of Lviv – the city, which was developing in the crossing of different (often opposite) geopolitical priorities, permanent rise and fall of the identification projects against the backdrop of a natural amplification or forcible reduction of a national diversification. The peculiarities of a contemporary level of the national identity forming in Ukraine are determined, on the one hand, by the need of the national idea realization on the basis of Ukrainian values, but, on the other hand, by the necessity of realizing the interests of citizens of other nationality despite to their class, ethnic, religious and political definiteness. This manifests itself in the architecture and public space of the city. Today, the public space of Lviv – a mono-cultural city according to the census (89% of the population consider themselves to be Ukrainians) is treated as a multicultural project, which provides for the organic insertion or revival of the elements of other cultures in its cultural area. It is manifested in a solicitous keeping of the «inherited identities» – the Austrian or Armenian visualization of the mythology concerning the «Polish Lviv» as well as in the formation of a new dialogue about the «Jewish Lviv». Architecture plays a key role in the design of the city multicultural identity, representing the appropriate symbols, myths and values in the buildings, monuments and memorial places.

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A BENCHMARKING STUDY ON SPACE EFFICIENCY OF SUPER SKINNY SKYSCRAPERS

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ABSTRACT

High-rise buildings constantly develop and adapt itself parallel to technology due to being a product of technological progress. Therefore, different terminologies are used for today's high-rise buildings since 19th century, when these buildings started to be constructed at the first time. Nowadays, buildings higher than 300 meters are called "supertall buildings" and higher than 600 meters are called "megatall buildings", although there is no consensus on which building can be considered as a high-rise building. Recently, depending on slenderness ratio of high-rise buildings new terms have been emerged. High-rise building with high slenderness ratio are called as "super slender", "super-slim" or "super skinny" skyscrapers. These buildings are constructed as an answer to increase in new residential and commercial building demands as a result of decrease in the available urban land and increase in the land value in metropole cities. The aim of this study is the investigation of parameters affecting the design of super-skinny skyscrapers and their relationship to the space efficiency. In this context, five super skinny skyscrapers are comparatively examined. The parameters including function, building height, number of floors, structural system, construction material, vertical circulation, slenderness ratio, lease span, floor-to-floor height, site area, floor area ratio (FAR) etc. are used to help analysis of space efficiency in selected buildings. In addition, the economic advantages provided by space efficiency is also evaluated with respect to construction cost and rent value of building. As a result, it has been found that almost all of these buildings are located in and around Central Park, where the upper income people live, in New York. This is particularly the result of rising land prices in Manhattan and increasing demand for a flat in these buildings. Furthermore, according to functional comparison, super skinny skyscrapers are overwhelmingly used for residential function, rather than for commercial use. Also it is determined that planning of vertical circulation and structural system design are the main parameters affecting space efficiency of these buildings. Thus, huge economic advantage can be obtained by increasing the usable space in small quantities. However, space efficiency shows less increase when the number of floors and the height of the building increase. In conclusion, the planning of the spaces as meeting the needs of the users is very important for functional sustainability besides provided economic gain.

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FROM THE HORIZONTAL GARDEN TO THE VERTICAL GARDEN: AN ARCHITECTURAL AND ENVIRONMENTAL PERSPECTIVE OF THE "GREEN" ELEMENT

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ABSTRACT

Throughout human history the gardens comprised many purposes. With the evolution of society, there were villages, towns and cities, organized according to geographical, economic, social and cultural characteristics of each epoch. Throughout the history of mankind, the "green" element has always been present. The gardens accompanied this development depending on the theories in vogue and possessed several purposes: were sacred spaces, leisure spaces or spaces of healing; were architectural elements in characterization of outdoor spaces; were field of trials. After the Industrial Revolution, the urban areas have expanded dramatically, occupying large amounts of rural soil replacing natural vegetation with the modern urban structure. At the end of the 19th century and beginning of the 20th century the acquired garden concept has been challenged, stretching over a horizontal surface, in the form of green roofs which characterized many of the modernist buildings. In fact, from the modern movement appear horizontal covers that will lead to various experiments in the context of green roofs and garden, which may be usable and enjoyed by its inhabitants or only covered and accessible for maintenance purposes. Through the end of the 20th century and early 21st century the horizontal roof was then an experimental ground on which architecture could respond to a new challenge: the green facades or vertical gardens. In this way the built environment can be the support for a new concept of green structure and urban or rural "green", that is, a vertical garden: a green façade. This new "green skin" of the building can benefit to regulate the temperature, air quality, and can also control the amount of light inside the building or be an aesthetic element of architectural coating. New architectural elements are created which adverse environmental conditions are mitigated, either on new construction or on architectural rehabilitation.

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CONTEMPORARY ON REHABILITATION OF POPULAR ARCHITECTURE

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ABSTRACT

As architects, we must respect and protect the identity and the Genius Loci of the place to intervene. The popular Portuguese architecture, as one of the references chosen for this investigation, consists of housing clusters whose need arose from the population growth. This type of construction uses local materials that lose their identity when removed from this context. Ruins of shale or granite, only with its imposing walls, located in strategic places due to subsistence reasons, with a subtle history and culture, maintain intact its essence and character to inhabit. It is increasingly important, necessary and urgent to protect the heritage, where there are precious lessons from coherent and harmonious villages, with a functional simplicity, framed in the landscapes that surround them. Recovering the heritage, being many of these places in the phase of ruin, allows architects to conjugate new concepts with the existing ones. Starting from the analysis of all these premises and of the need to rehabilitate these places, a modular system in a metallic structure with an L-shaped profile was developed. This conceptual and constructive system consists of loose elements, for a better adaptation to each place, client and topography, gaining an identity in each composition. The choice of steel profiles allows the architectural project to acquire aspects such as the lightness of the conceptual language, resistance to internal efforts and minimization of the selectable area, easy transport and handling in the assembly in construction. These are some of the characteristics that justify the use of these steel profiles in the rehabilitation of ruins, creating a repetitive modular system, as if it was a "living organism" that interrelates to the existing one.

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STEEL AND LIGHT IN THE REINHABIT OF RUINS WITH A SCENOGRAPHIC CHARACTER

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ABSTRACT

In the Popular Portuguese Architecture, there is a large number of buildings that we should have as a reference, analysing their essence during rehabilitation or development of the project, thus creating a connection with the place and keeping their identity. These places, full of history and memories, give us the idea of scenarios, which can be traversed and which present us with light and the surrounding nature in each opening. The introduction of the New involves its characterization in modern architecture, as being the one that should be able to establish a connection to the past without destroying it and without renouncing to its means of expression. This way, these concepts reflect the importance of connecting in the same urban mesh, as a living organism, two periods, in which one does not override the other, but that, in turn, add value to each other. In popular architecture, the dwelling space is adapted by man through his way of living and feeling the place, and it can be compared to the 'Living Machine' of Le Corbusier. Both had to respond to the psychological, functional and spiritual needs of the people, through the constructive simplicity and the study of light entry in the spaces. The lighting of the spaces was not designed to the meet human needs, not even those for domestic purposes. Inhabiting immediately assumes the relationship with the surroundings and the orientation of the sun, and, in this sense, lighting is one of the most important elements in architecture. The Light is the "soul" of architecture, thus giving life, movement, and different dimensions and depths to it by using natural lighting during the day and artificial at night. Lighting should be part of the conceptual process of the project, as the structural part is, and of everything that is part of an architectural project and its peculiarities.

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CIRCULAR PLANS IN CONTEMPORARY HOUSING ARCHITECTURE

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ABSTRACT

Residential buildings on the central plan are not constructed too often, however they are a part of architecture since prehistoric times. The aim of this article was to study already constructed contemporary single-family houses on circular plans (and circle derivatives) to create and systematize the typology of such buildings and to determine the methods for shaping the space of residential interiors, as well as to investigate the reasons for using such a building shape. The study was carried out by analysing technical drawings, plans and sections as well as photographic materials. 24 buildings constructed in the last 8 years (after 2010) all over the world were examined. During the study, 7 basic types of buildings were defined, distinguished on the basis of the manner of their layout arrangement (1. Circle, 2. Deformed circle, 3. Circle with cut-out, 4. Circle with add-on, 5. Multiple circles, 6. Negative and 7. Arc), and also 4 ways of organizing the living space were defined (O Orthogonal, R Radial, C Circle in circle and NP No partition). The following features of residential buildings on circular plans were noticed: most of the examined buildings are houses with a large living area, mostly located within the landscape or suburban area with low development density, the main reasons for using the plans in the form of a circle in the examined cases were: maximum outdoor view, fitting the building in the surrounding landscape and saving energy. The most commonly used way of organising the space inside a researched circular houses is the orthogonal way. Residential buildings on circular plans are not popular and it results from design difficulties, technological difficulties as well as construction costs. If such buildings appear, these are individual designs, tailored to the needs of residents and they are designed for a particular location.

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THE RELATION BETWEEN PRIVATE AND PUBLIC SPACES OF COLLECTIVE HOUSING AT THE EXAMPLE OF BRATISLAVA AND TBILISI

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ABSTRACT

This paper stresses the importance of semi-private and semi-public spaces of the residential areas. The social aspects are defined in the contrasting example of the iconic settlement from Bratislava and representative settlement of the socialist period from Tbilisi. The research explores the different approach of inhabiting semi-public spaces which comes out of the local context. The main factors are based on typology which have the influence on the quality of life in the residential buildings.

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LOW RISE, HIGH DENSITY RESIDENTIAL DEVELOPMENT IN POLAND IN THE YEARS 2007 - 2017

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ABSTRACT

The main purpose of this research is demonstration of occurrence of low rise, high density residential development in Poland in the years 2007 – 2017. The main results can be concluded as followings. In Poland, a new type of housing development taking the form of low rise, high density residential development has been observed. Such investments are realized under legal regulations reserved for single-family housing, in particular on the provision which allows to single out two dwelling premises (flats) in one building or single-family segment, that is part of a compact single-family housing complex - twin or terrace. Low rise, high density residential development is characteristic for its height up to four floors with two flats within one unit, arranged in one of the two ways: back to back or over and under. The above characteristics allow higher density of population and intensify the development. As a result, the forms obtained are similar to multi-family buildings with the advantages of solutions typical for multi-family housing, e.g.: underground parking, a common place for the storage of permanent waste, shared interior and exterior passageways and infrastructure. The research has shown a significant increase in such a type of housing on the real estate market, with an upward trend in the last two years. Investments are being located mainly on peripheries and suburban areas and are in the form of larger complexes of buildings, among which, buildings in the over -and –under flats arrangement have gained greater popularity. Typically, they have independent, external entrances to residential premises and parking spaces outside the building. There is a shortage of developments with common recreation areas but, at the same time, those with a shared waste storage area have become more frequent. Low rise, high density residential development can be observed in Poland. The number of implementations and a variety of locations is increasing. A design is based on law regulations reserved for single-family housing with the elements of regulations on multi-family buildings. Therefore, there is a need for adequate legislature, that is currently missing, which would enable an introduction of appropriate regulations on common areas, home plots, buildings and flats as well as on the form and size of housing estates for such type of housing development.

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PLANNING AND FUNCTIONAL-SPATIAL TRANSFORMATION OF THE CITY OF SZCZECIN IN THE PERIOD FROM THE 2ND HALF OF THE 19TH TO THE 21ST CENTURY: REMEDIAL SUGGESTIONS

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ABSTRACT

In the last century, Szczecin underwent three major planning and urban transformations. These transformations were the result of historical, system-political, economical-economic and social factors. The aim of the current study is to present the stages of functional and spatial changes of Szczecin during the last century, together with an indication of their causes and their effects. At the same time, guidelines will be proposed for the recovery program aimed at enabling further cohesive development of the city while maintaining its identity. This is particularly important in the context of the deepening spatial disorder in the city. The first stage of intense development of Szczecin was initiated in 1873 by the decision to liquidate the fortifications surrounding the city, which allowed for quick expansion of the city area and development of post-fortress areas according to plans established in 1874. In 1912, a new spatial development plan was approved, which was implemented successively. As a result, parts of the city were created with different functions and character: industrial, workers, residences of middle and upper class, etc. The provisions of the plan included the issues of maintaining spatial order and establishing green areas. The next stage of spatial transformations was triggered by the huge destruction of World War II. Along with the annexation of German Szczecin by Poland, a new direction in the history of the city's development was initiated. The continuation of pre-war plans was abandoned, while new guidelines were established based on Soviet experience in shaping housing developments. The space left by destroyed town houses was occupied by large-panel housing estates, the spatial layout of which did not, in most cases, continue the former building lines. The estates were designed according to the newly adopted indicators and guidelines, and their structure and management was based on the idea of a "neighborhood unit". Decisions made in the 1950s and 1960s irrevocably damaged the historical structure and character of the city from before World War II. After 1989, the city of Szczecin is undergoing another planning and urban transformation. The change in the political system of the Polish State resulted in subsequent changes to the land development plans. The slow process of adopting local zoning plans in the years 2000-2010 caused another chaos in the city space. According to the regulations, the newly created housing communities independently decided on the appearance of buildings and their surroundings, which leads to the urban space being de-urbanized. This is a contradiction of the city's spatial policy adopted in the study of the conditions and direction for spatial development of Szczecin. The action that could help in solving the problems would be to divide the city into a number of zones independent of the administrative division. These zones would cover typologically similar areas of the city, such as a residential zone with predominant pre-war buildings, a zone with dominant buildings from 1945-1989, and a zone with buildings developed after 1989, industrial and post-industrial areas, areas for investments, etc. The study of conditions and direction of spatial development of Szczecin should contain separate guidelines for all zones, because each of them has specific conditions and priorities. It would be advisable to set up urban and architectural commissions consisting of specialists in various fields that would help in setting the guidelines.

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REDEVELOPMENT OF BROWNFIELD SITES: CASE STUDY-BILED VILLAGE, ROMANIA

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ABSTRACT

Brownfield redevelopment is gaining ground in Europe, and more and more Member States are searching for sustainable measures to deal with those sites in order to reduce their negative impact. Brownfields in Romania are mainly connected with the decline of industry from the communist era. Timisoara is one of the biggest cities in Romania, where the increasingly demand for land for housing and industrial use encourage the urban sprawl. In this paper, we approach the problem of brownfield sites and we are trying to highlight the importance of interdisciplinary team of experts in making cities more resilient to local challenges. Initial site assessment is mandatory for further redevelopment of a brownfield site, and the surveyors have an important role. Many issues have to be taken into account, such as the site location, ownership, costs (as purchase of land, costs with demolition of existing facilities or soil decontamination) or risk and vulnerabilities. But the advantages of brownfields redevelopment are considerable and can represent gains on many fronts: on the environmental, social and economic development side. Land use changes provide very beneficial information for local planners and decision makers. The future land use type of each existing brownfield could be identified by making as many scenarios needed using GIS and 3D simulation softwares. Simulations or projection of the future urban growth are made by urban planners and architects. We consider that it is necessary to realize that land is a finite resource and it should be used in a sustainable way. A priority is to protect the unblended habitats, the good land for agriculture, and for this we must ensure that the land is used in the most efficient way.

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SPORTS ARENA – A KEY PLAYER IN CHANGING MENTALITIES IN A COMMUNITY

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ABSTRACT

Football represents a universal leisure activity – being spread all over the world and thus becoming the king of sports. This game brings together families, communities, but also strangers eagerly supporting their favourite – local or national – team. Such a sport gives rise to both friendships and rivalries between supporters. Yet, the partially justified association between football and hooliganism led, implicitly, to new problems that reflected upon the architectural object as well. The stadium can, beside resolving the problem that raised from hooliganism, be the very starting point in a process of image changing through the impact it has at a social scale – equally through its representativeness inside a locality and through the role the accommodated spectacle plays. In this paper, we shall present different ways in which the built space of a sport arena can become a helpful instrument in the process of moulding the mentality of the community, ascertaining the fact that the legislative measures having the same scope are not always sufficient or efficient on a long term. Thus sports arena can become more than just a space dedicated to performing sports competitions. It can become a space which facilitates social and cultural negotiations, it is an urban landmark and symbol that can improve the action of a community (this feature is perhaps most visible when the arena accommodates other events besides sports events like concerts, fairs etc.). Its transformation from a space dedicated solely to football into a space with multiple services can lead to a permanent use and could draw a heterogeneous public (by including services like: museum, cinema, mall, administrative community space etc.). The proposal for designing multi-sportive and multifunctional modern arenas combines several principles together, satisfying multidirectional social needs: the needs of the users (of recreation, relaxation, entertaining and so on), and the needs of the institutions involved (political, economic needs etc.). The variety of services that can be accommodated into such a space can have a great social, economic, cultural impact etc. The modern sports arena must be the result of much more in-depth understanding of the communities (of fans, users, nearby community etc.), of their current practices, needs and desires. The role of the architect, in this context, is not only that of conceiving the architectural object, of making it functional, but also of linking different elements thus making a building which responds to various needs without considering the arena a boundary.

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EXCEPTIONAL CASES OF "HOUSE": EXPLORING POTENTIALS OF SPATIAL CREATION

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ABSTRACT

The concept of "house" refers to a basic spatial formation in context of parts forming a whole, beyond the usual meaning of housing. Although it has a meaningful spatial connotation alone, articulating to other concepts that point to different social structures it provides a framework that characterizes space. In this sense, the concept of "house", which gives name to a number of different spatial structures such as jailhouse, workhouse, bedehouse, boardinghouse, house of worship, tradinghouse, constitutes the basis of the series of spaces establishing social structures. However, due to the reference given to the established social structures, the content is shaped in the direction of the social and cultural codes formed by the power mechanisms that shape the society. In this context, this study proposes to purge the spatial codes that the "house" concept implies and to transform it into a conceptual framework for the architectural quests beyond the spatial constructions that domesticate and organise society. In this respect, it is aimed to use "house", which is considered as a basic spatial creation structure, as a tool to investigate the dynamics that create "incompatible spaces". Since "incompatible spaces" allow the development of creative formations in the direction of their self-reproductive tendency regardless of the established structures, the restructuring of the concept of "house" in this context provides a new insight into spatial creation. Within the scope of the study, the studio works carried out by Atelier Z under the theme of "Fishes floating against the current: Cases of House 1" are determined as case-study. Accordingly the spatial creations developed with different contents in context of the framework of the"house" are examined from the contextual, structural and programmatic aspects. With reference to the examinations made, the "house" is evaluated in terms of its potential of spatial creation and its spatial content is restructured. Conceptualizations and examinations made in the context of the "house" throughout the study offer insights into the contextual arrangements that settle into the incompatible flow patterns within the city, the structural arrangements that make up unusual, multi-layered urban and spatial connections and the programmatic arrangements that relates to unspecified instantaneous action groups. Raising the subject of this kind of unexamined design practice, constitutes a productive sequences of references for spatial creation.

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ELEMENTARY FORMS AND MEANINGS IN CONTEMPORARY SACRED IMPLEMENTATIONS IN POLAND

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ABSTRACT

The simplicity and elementarity of the forms of contemporary sacred objects is the expression of a modern approach to architecture. Monasteries, churches, tombs and chapels shape spaces about cohesive structures in their ideological assumptions. It is often possible to find references to objects or thoughts taken directly from religion in them. The coherence of the external structure and the interior of sacred buildings is certainly another leading feature of their idea. A light, which through its game emphasizes the importance and influence of space on human emotions, are playing an important role. Inserting the landscape into the temple through large glazed areas, especially in the altar area, makes the users reflect on about the unity with the nature, as well as causes that the expression the interior of the building never be the same. The seasons are changing, an arrangement of green is changing, and hence a man is changing himself. Passing is a part of ourselves, so it is worth reminding about it in the spatial structure of churches or chapels. The simplicity of expression can also be enhanced by other factors, such as adequately selected facade materials or elemental land development. Contemporary sacred architecture is not only chapels, churches and religious orders. These are also objects of smaller scale. The power of their message also lies in the elementary nature of form and meanings. Simplicity that gives a lot of space to the man for interpretation. On the one hand, it shows the way and on the other it gives freedom. Exactly the way a religion makes it. The architecture of little forms, such as chapels, is the elementary of meaning expressed with the very straight transmission. Idea which it is possible to read out in a very short time, going or passing that kind of objects through beside. The sacred contemporary architecture in Poland aims in very good direction, however the number of the realization about high architectural advantages isn't still too large. This is mainly due to the small architectural awareness of people managing religious property. However, some projects are showing that the creative potential is very high and can positively turn the general word of Polish sacred architecture.

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A PROTOTYPE FOR PRIMARY HEALTH CARE IN DEVELOPING COUNTRIES

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ABSTRACT

This paper tries to demonstrate the transmissibility of a prototype for primary care in several marginal areas through the historical awareness of the reference context. The role and the concept of the prototype in architecture has been investigated for its critical function ad its potential assignment in defining a conceptual and experimental structure of space. Firstly, the article defines the prototype as a synthesis operation addressed to a shareability, repeatability and transmissibility of the design concept ideas, both from the theoretical point of view and its physical construction. Its conceptual attitude in being more open to acquire different operative solutions (according to the place, context, material or construction's methodology) more than a single proposal (such as a completely defined project) involves one of the possible analytical and experimental ways of dealing with the practice of creativity in some circumstances of precariousness. At the current juncture, it is more than ever necessary to propose a strategic vision. Moreover, the goal of sustainability, at the centre of the interests of international research institutions, requires overcoming modelling solutions. On the contrary, it is about identifying solutions on elements that have generalizable characters (starting from those of the chosen sample area) and which must guarantee the replicability of the approach in similar situations. Secondly, the location of the prototype in a particular context can be achieved through an organic approach that involves simultaneously both the aesthetic field connected to the figurative and spatial aspects and the technical field linked to the constructive aspects. In other words, the related areas and structures are a "resilience reserve" able to preserve, in the first place, the characteristics and settlement values of the places. In this respect, it is necessary to experiment with a revitalization strategy that intervenes as well as on the single product on a larger scale with a more inclusive strategy of the economic and social aspects and not only on architectural capital. Then, the essay tries to verify the generalization of the prototype in a rural area of Brazil paying attention to some aspects of the context, such as the typological aspects, the cultural and social conditions and the local building techniques, the traditional material and technologies, so as to involve in the proposal all the opportunities that can arise from the specific site. Finally, it can be said that the construction of the prototype was made trying to bring together the figurative and constructive aspects according to a scale that is no longer local, but which can be generalized in its main base, and declined with respect to local resources.

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WHO OWNS OUR FUTURE? HOW TO FIND A HOME?

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ABSTRACT

While the contours of the next few decades were partly clear 50 or 100 years ago, it is a daring attempt to predict the future nowadays. The marketability and influence of the rapidly evolving innovations of technology are often uncertain, our vision of the future may seem to be dim as well. We do not only desire to satisfy our basic human needs regarding our living space, but our intentions to live comfortably and our attraction towards everyday experiences have also become a fundamental part of our life. We frequently replace our objects with newer and newer ones, even with smart devices that make our work and free time much simpler. The direction in developing these smart equipment is rather obvious; the goal is to solve everything right now or possibly in the future by means of the same object. It is a sensible question to ask how these improvements will affect our everyday life in the future, and it is also a rational possibility that we will not carry a mobile phone in our pocket, and our home will function perfectly without a desktop computer. How will this development manifest and influence our habitat? Numerous eye-catching houses are built on a daily basis. Contemporary architects experiment with designing extraordinary forms and spatial connections, as well as they use surprising materials. In some cases, the architecture of the present is rationalized merely in interesting proportions and exaggerated spaces. In order to build these individually unique buildings, solvent clients are needed and a spacious estate, which is not really natural. On the other hand, it is also visible that architecture has reached a turning point according to which a nice form is not enough in itself. The aesthetics have to match the possibilities (advantages, disadvantages) and technological innovations of the era, thus we have to discover beauty, excitement and system again. The challenge of the cities today and in the future is to solve the problems of affordable housing. Our current apartments are compact and reflect creative ideas in most of the cases. The topic of small living spaces has to be examined from two perspectives, on the one hand, the number of newcomers to a certain area, and on the other hand, the increased price per square meter. The optimized, and by that also minimized living spaces make us consider not only the fundamental human needs, but we also have to take the aforementioned altered lifestyle into account. It is a fact that a few square meters should be enough to have an affordable solution. A flat has to be simple and easy to use, and it also has to be the reflection of individual needs and demands, in order to form our spaces by ourselves for a reasonable price. The article represents a possible apartment concept for the future and its effects on the environment with its urban context.

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THE MYSTERIES OF THE COURTYARDS OF LODZ AND VILNIUS- SIMILARITIES AND DIFFERENCES

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ABSTRACT

At the turn of the 19th and 20th centuries, both in Lodz as well as in Vilnius, tenement houses began appearing, which were always accompanied by a bigger or smaller space which constituted a semi- public courtyard. The size of these interior courtyards underwent change along with the evolution of these cities and their construction laws. Today, the courtyards of Lodz and Vilnius uncover the true tale of the city. All of them bustled with life in days past, being the places of residents hustling and passing each other by, the places of trading for street merchants, and playgrounds for children. Today, many courtyards have gone empty, changing their function and most often becoming a parking space for cars belonging to local residents. Some dark, cobblestone ones with buildings in bad shape deter people, while others – restored, well-lit, throbbing with life – invite people in. Unfortunately, most of the courtyards are in very poor shape, which requires immediate intervention. The most common cause of this passive approach is a lack of funds. One can only hope that still, step by step, changes for the better will be taking place. Perhaps courtyards will become the business cards of these beautiful, interesting cities; maybe they will become places which are worth admiring, and which are worth spending time in. The classification of the courtyards in Lodz and Vilnius allows us to consider the similarities and differences in their appearance and management. Through this article, the author aims to allow for a closed look at these spaces, which play an important role in the city. She attempts to answer the question of how these courtyards affect the cities' residents. The changes which are taking place are pointed out, their influence on the environment, the residents, and their modern-day function is shown.

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THE MUSEUM CLUSTER AS AN URBAN DEFIBRILLATOR

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ABSTRACT

In the 21st century, the regeneration and expansion of cultural areas, based on sustainability, memory preservation and aesthetics, is considered to strengthen the international presence of the city. This study focuses on museum clusters and explores their involvement in the evolution of the city. The urban design of museum clusters redefines the public space and potentially enhances the social, cultural and economic development of the city. The radiance of a museum cluster springs from the material and intangible values both in the museum content and in the urban and architectural environment. A museum cluster is engraved in the collective consciousness as an innovative site for knowledge communion and culture, as a special quality element of the city. Many museum clusters connect multiple networks, and they develop into impressive urban gestures, thus creating the city of museums as a cultural and educational landscape in the new city scale

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SOCIAL INTEGRATION AS AN ELEMENT OF THE CREATION OF ARCHITECTURAL SPACE IN EDUCATIONAL INSTITUTION FOR CHILDREN

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ABSTRACT

Social integration can be and even should be an element creating architectural space in educational institutions. This is the general thesis put in the article and refers to a man, a recipient in this case not an adult, but a child who has a specific perception and establishes social relations with peers. The article aims to draw attention to other, then education, equally important goals such as social integration and upbringing, which should be implemented by an educational institution within pre-school, early school and school education. Analysis of the architectural space under this account will show whether typical architectural solutions enable and facilitate this type of activity. Providing alternative solutions in shaping the education architecture will be outlined in the contemporary design and didactic search. The child's perception differs significantly from the perception of an adult human being. His attention is focused on other areas of architecture and space, not only because of physical conditions, but also because of the level of psychological and emotional development. Designing architecture should be adapted to its users, knowledge about the perception of the recipient should be particularly important for the designer. Designing the education space or in the areas of education space is particularly important, because the child has specific goals there to acquire, there is a significant time in his childhood and to a large extent there is a future adult. Architecture influences the current behavior of a young person and shapes visual codes, matrices of patterns that he will use in the future. The study will also be an attempt to draw attention to the educational institution as an object being a part of a larger area of development, which can be a place of social integration not only for children but also for other local social groups.

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CONTEMPORARY POSSIBILITIES OF CONCRETE APPLICATION IN SACRAL ARCHITECTURE

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ABSTRACT

Defining the contemporary sacred space is connected not only with the search for the sacredness of the interior, but also the balance between the selection of the most appropriate construction systems, which are made of concrete and reinforced concrete, together with the possibility to create the whole building, the form which is the intention of its creator. New kinds of materials, which are now less and less constrained by structural obstacles, have broadened directions of exploration and development of new forms in architecture. Undoubtedly, the invention of reinforced concrete, in the second half of the nineteenth century, was also the beginning of a revolution in architecture and the source of new challenges in creation of the sacred space. The use of concrete and reinforced concrete, as well as its combinations with other building materials, can be traced on various buildings. Having considered more than a century of experience in the use of these materials in the construction of architectural objects, including sacred space, the selected churches from different time periods of different scales were analysed. In order to compare the way of using the potential of concrete and its application in the construction of sacred objects, the analysis began with the church of August Peretta in Le Raincy. The author of the construction used thin reinforced concrete supporting columns and a vault as a reinforced coffered ceiling. The latest example of such a building is the church of Lech and Wojciech Szymborski in Warsaw, which is currently being built using the combination of technological and technical possibilities, as well as the most suitable selection of concrete mixtures. All that in order to create a unique building with a main nave structure both in a frame and plate system. The changing role of concrete and reinforced concrete is evident in the creation of new forms of sacred buildings, regardless of their scale. Moreover, the ongoing transmutation of concrete is visible through the creativity-enhancing fascination with this material, which has become, not only readily available, but also commonly used as a replaceable, multifunctional substitute in fine arts, technology and decorative elements. Furthermore, it has been repeatedly used as a construction material, which, when left without further finishing, results in being either an internal or external finish. The article is an attempt to answer the question how the approach to the use of this material has changed in the creation of the form and its interior, while paying particular attention to its internal and external exposure.

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APPLICATIONS OF LINEAR SYSTEMS IN CONTEMPORARY URBAN DESIGN

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ABSTRACT

One of the fundamental disputes in the contemporary urban design is principal of shaping urban systems. The main focus of disputes and research is the clash of urban interior (and its multiplication – residential quarter) systems with freestanding building urbanism. The issue is also discussed from perspective of neighbourly bonds, contact with nature and access to transport. The concept of linear systems was supposed to be an alternative solution to the dispute. The father of the idea of linear cities was Arturo Soria y Mata. The first drafts about the concept appeared in 1882. Its priorities were based on transport accessibility and green zones. In the Polish urban design, the original concepts of linear systems were created by Oskar Hansen (Linear Continuous System) and Włodzimierz Gruszczyński (Ribbon City of Conjugate) at the turn of 60's into 70's. The theory of Hansen predicts creation of four stripes North-South across Poland. The theory was based on demographical and geographical research. To certain extend, Hansen managed to achieve some aspects of the theory. The examples can be seen in the housing estate Przyczółek Grochowski in Warszawa and in the housing estate Lubelska Spółdzielnia Mieszkaniowa in Lublin. The article tackles upon the strengths and weaknesses of linear systems. Their main assets are: transport accessibility, contact with greenery and ability to counteract the urban sprawl. However, the basic weaknesses are schematism and dullness of buildings and the problem of residential cell divided into two parts by long transport belt. Another discussed aspect is comparison between urban interior systems and linear systems. Transforming the structure of linear systems includes three processes – reduction of the scale of systems, naturalisation of the central transport belt and individualisation of the structure of building range. One of the methods opposing the dullness is integration of various types of buildings – "hybridisation." Besides the enumerated above transformation processes, I think that it is crucial to break the schematism of the linear systems. The parallel belts of residential areas should be replaced by networks. Such networks would leave the enormous fields to untamed and natural space.

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SPECIFICATION OF BROWNFIELD'S REVITALISATION IN POLISH LEGAL FRAMEWORK: DISCUSSION ON CURRENT LEGISLATURE PROBLEMS BASED ON CASE STUDY

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ABSTRACT

Problematic issues of post-industrial areas in the urban structure gained significance after 1989. It was related to restructuring of industry in Poland and economic shift in Eastern Europe after downfall of communism. As a result, on the maps of many cities arisen post-plant landmarks demanding revitalization and reintegration within the urban structure. The lack of appropriate frames of urban politics in terms of post-industrial areas often contributed to extension of the restructuring process of such areas in Poland. Revitalization becomes a phenomenon which meets mentioned process. The author defines revitalization as a constant land recycling process and reintroduction of the functions. It enables economical, housing and social dimensions of regeneration and acquisition of new investment areas – frequently in the downtowns. The first records concerning revitalization in Poland grounds to government's program for the post-industrial areas (2004). National program envisaged realization of the sectorial politics by the voivodeships. As a result, only the Silesian voivodship, within significant industrial heritage has undertaken the industrial policy - covering Upper Silesian and Dabrowa Basin Metropolitan Area (Upper Silesian Industrial Region). Conducted examinations concerning shape and conformation of model-based revitalization process of post-industrial areas leaded to authorial elaboration of the post-industrial areas transformation scheme. It is still corresponding to discussed models of brownfiled's profitability models, such as ABC (Ferber, Grimski, Millar, Nathanail 2006), ABCD (Frans, Gules, Prey 2008), along with the model of recycling stage according to Glass-Geltman (2000). Unveiled scheme is based on Polish experiences (Huculak 2009, Domanski 2011, Lesser 2012, Klimek 2013) and also deepened case study of Aluminum Ironworks in Skawina, located in Cracow's Metropolitan Area (Cracow's Industrial Region). Case study was based on research, which embraces four researching tools: urban inventory, surveys concerning conditions of economics prosperity conduction (40% responds), direct observation during seminars and exterior workshops, in the course of borough elaboration of Municipal Revitalization Program and three interviews with City-Hall representatives. Prosperity of Aluminum Ironworks leaded to significant pollution of the environment, of the city as well as a whole region. Increased in ecological matters, in the 1970s leaded to plant's closure, and in the next decade, opening the process of self-acting revitalization of this area. The regeneration process of the area still continues, although it does not translate into improvement of economic prosperity conditions, quality of the environment and spatial order. Representativeness of the case is based on clear indication of effects of the lacks in legal regulations, which leads to the disablement of the complex revitalization process and proficient prosperity of such areas.

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WOODEN ORTHODOX CHURCH ARCHITECTURE IN A COUNTRY LANDSCAPE AFTER WORLD WAR II - IN THE AREA OF THE FORMER EASTERN GALICIA

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ABSTRACT

For hundreds of years, villages and small towns - dominating in the Polish landscape - were built in wood, with dominant monuments crystallizing in the form of iconic buildings. The attachment to the local tradition was prevailing - opposing foreign influences. Foreign influences usually underwent modification and specific "taming" in the existing cultural environment. Among the wooden temples of south-eastern Poland distinguish Greek Catholic churches, which are characterized by a great variety of architectural forms. Their specificity has its genesis in the place of their formation - it is the borderline of the Latin and Byzantine cultural circle. It was also here that the influences of numerous, ethnically diverse regions of Poland, Russia, Slovakia (Upper Hungary), Bukovina, Moldova, etc., were crossed. Forced displacement of the Rusins (Ukrainien) population from her previous places of residence, has condemned to leave and exterminate nearly 300 wooden temples - not counting many ruined villages. Few valuable wooden churches were surrounded by conservation and restored. Originally wooden churches, usually with roofs and walls covered with shingles, topped with intricately wrought iron crosses, were usually located on small hills, surrounded by old linden trees or oaks. They were accompanied by wooden or stone fences, wooden belfries and picturesque gates. The square of the church, some distance from the center of the village, accompanied the daily life of local communities. It was a constant and "homely" element of a rural or small-town landscape. In renovations or in the construction of a few new church buildings at the turn of the 20th and 21st century, new materials were increasingly sought after - especially using steel sheets to cover roofs and walls. Today, thanks to the support of the conservation authorities, the traditional cover is restored to the church. Some of the churches that survived the turmoil of war, today are deprived of care and only the most valuable objects are undergoing renovations. Thanks to joint efforts of Poland and Ukraine, the group of the most valuable surviving wooden orthodox churches was inscribed on the UNESCO World Heritage List.

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SEALING LOG HOUSES

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ABSTRACT

In Poland, the traditional method of sealing log houses is known as *mossing* (mszenie), and the word comes from the oldest known method of chinking: inserting layers of moss between the logs. Moss was the cheapest and most widely available raw material, it had good insulating properties and the method of filling in the gaps between the logs did not require great skills and was also relatively quick. Another inexpensive and simple method was sealing the beams with clay – also a widely-available and cheap material. Other various organic fillers were also used: chaff, hay or oakum. Another traditional method of chinking wooden houses, favoured particularly in the mountainous regions, is the use of wood wool known as ***wełnionka***, i.e. wood slivers cut from spruce timber. The slivers are gathered in the form of decorative braids and inserted into the gaps between the logs. Nowadays, in addition to traditional solutions, also modern methods of chinking are used, with such materials as: a. polyester unwoven fabric (effective with narrow gaps); b. bands of synthetic felt; c. expanding tape; d. wood wool or oakum; e. mineral wool with a waterproof seal from the outside; f. hemp rope; g. specialist putties or fillers. Each of these methods has its advantages and disadvantages; however, they all fulfil their intended purpose if the gaps between the logs are for the most part uniform and quite narrow. An innovative method of chinking log houses with the use of a low-pressure sealant and adhesive for polystyrene elevations reinforced with fiberglass is described at the paper. After using many different solutions, this method was found to be the most effective and also cost-effective. A building which was sealed using this method does not show any traces of damage to the chinking two seasons later. This method of chinking was employed, which uses a low-pressure sealant and adhesive for polystyrene elevations. It is less labor intensive than traditional chinking with wood wool, while thermal insulating and sealing properties of the structure as similar. A key advantage of this technology is its relatively low cost and the ability to perform this task without professional help. To complete the chinking, the rendered joints made using the sealant were coated with exterior paint in the color of light clay, which gave the building a look as if it was sealed with clay. This made it possible to preserve the structure's appearance, despite the employment of unusual and exceedingly contemporary materials.

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THE HUMAN FACTOR IN THE REVITALIZATION OF THE HOUSING ESTATES

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ABSTRACT

The article presents the issues connected with revitalization of the housing estates built in the industrial technologies, regarding it as one of the key elements of the transformation process of the modern cities in Poland. The phenomenon of a systematic decrease in the resources of urban building development areas forces us to think about the existing housing spaces and the invested land and the ways of how to use them more efficiently and how to improve the quality of housing environment and technical conditions of housing dvelopments. The foundations for thinking about the revitalisation of the existing housing estates of the second half of the 20th century are found in changing social needs and housing standards, but also in the development of modern technologies. The economic growth of the level of social life and willingness to live in a functionally attractive and easthetic housing environment have aroused bigger interest in the knowledge of inhabitants' needs. The most essential issue of the revitalisation of housing spaces is the creation of projects and modernisation addressed directly to the users of the space, as the key derminant of the transformations. The aim of this work is to draw the attention to a very important element of revitalisation- a ' human factor', which is the basis of any changes in the urban and architectural spaces of modern housing estates. The first aspect of transformations relates to searching for a suitable scale and an urban character of the building development, together with the available area and the functions of residents' service. Second essential element is a social participation of the residents, taking part in the project decisions, which range from the issues of spatial planning to the choice of specific solutions, furnishings and other details, but also participating in any works conducted for the housing estate. Participation of the residents increases their chances for happiness, a sense of identity, the bond with neighbourhood community and a better assessment of conducted architectural and urban transformations. In Western European countries, the issue of huge housing estates is commonly known and the rich experience in revitalisation covers both the more conservative methods but also to the demolitions of an urban tissue and changes of the structure of building development. The aim of such changes is to achieve suitable proportions, the buildings' easthetics, new forms of exploitation, and also their 'human' scale. It is indispensable to conduct social consultations related to the use of common spaces and building the places of mutual integration. The idea of copying the western standards of transformations in Poland is not possible for a bigger scale, however, some aspects of revitalisation and the problems connected with these changes may be put under public debate. Do form and structure of originally shaped housing estates have a chance for a new presentation, taking into account the participation of inhabitants and their preferences, providing the return to the greatness of build-up areas, shaping friendly and attractive housing environment and creating the identity values of the place according to the expectations of a modern society?

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ARCHITECTURE AND LANDSCAPE ON CHURCH PREMISES IN CZESTOCHOWA

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ABSTRACT

The paper shows rare indications concerning site planning of church premises, and describes how areas adjacent to shrines were used; first as graveyards, then as green areas and gardens. Focusing on areas surrounding three different churches in Czestochowa, this case study aims at presenting contemporary tendencies in developing church premises. The first example which is provided is St. Stanislaus Kostka Roman Catholic Parish which was built on a small plot of land in the centre of the city and is surrounded by buildings. All these factors contributed to the lack of landscaping elements, a garden and a parking lot. It also does not provide a possibility for a procession to walk around the church building. The paper presents solutions used by the designer to make the church building look exceptional and different from all the residential buildings that surround it, and for all the greenery to give the impression of a shrine being immersed in it. The next example that is presented in the paper is the Church of St. James the Apostle located in the city centre of the city, built on a midsize plot, with well-planned communication routes, rich in tree stand planted in the XIX century. Elements of landscaping, such as benches, fence, parking lots are also present. The designer properly used the size of the plot and the atmosphere provided by the XIX century tree stand to create a place suitable for both prayer and rest for city dwellers as well as pilgrims and visitors. The last example concerns a church built on a sizeable plot of land, that is the Church of St. Jadwiga Queen of Poland which is located in the proximity of the city centre. It was build and developed at the turn of the XX and XXI century. The size of the plot was sufficient to accommodate the church building, a chapel with a parish office, meeting rooms and a funeral chapel. The building is surrounded with a pathway enabling a procession to walk around it. The size of the area provided a possibility to plant it with a variety of plants and trees and a hedge which together create a modern church garden. The work presents contemporary trends used in landscape architecture design of church premises which transform them into gardens with a rich tree stand, a variety of bushes and colourful plants. All these elements encourage meditation and rest. It was shown how, regardless of the size of a church plot, it is possible to integrate a plot land surrounding a church with its surrounding and the architecture of the church building itself.

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AREAS ADJACENT TO JASNA GÓRA AND THEIR ARCHITECTURAL AND LANDSCAPE VALUE FOR CONTEMPORARY PILGRIMAGES

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ABSTRACT

The subject of the following work is the architecture and landscape architecture of areas adjacent to Jasna Góra and the Monastery. The paper describes the first two decades of the XXI century. The author characterizes the Błonia Commons, i. e., a public area situated at the foot of the Monastery which is the main destination of both pilgrims and inhabitants of Częstochowa heading towards the Jasna Góra Pauline Monastery. The author analyses two historic parks, the 3rd of May Park and the Staszic Park, which have been restored. The paper presents objects and places of religious worship, monuments, and historic buildings situated in the area of the Monastery. The monuments which can be found in the parks are also described, i.e., the monument of Stanislaw Staszic, a priest, philosopher, scholar, botanist and a pamphleteer of the era of Enlightenment, and a leading Polish composer of the period of Romanticism, Stanislaw Moniuszko. Revitalised museums are also characterised in the following paper, for instance the Peasant Homestead, The Mining of Iron Ores Museum, and a former astronomical observatory which is now a museum available to visitors and offering a variety of programmes, both artistic and scientific. Such places and objects contribute to the attractiveness of the area at Jasna Góra, they also encourage pilgrims and tourists to learn about the history of this place, trigger respect towards the past and towards history as well as increase historical knowledge and cultural, religious awareness. The paper also discusses the land development, composition of the area, building materials used and the elements of landscaping. The descriptions of planting, species of trees and bushes indicate their influence of the microclimate and the visual appeal of the area. The tabular overviews included in the article depict the scale of contemporary mass pilgrimage movement to the Jasna Góra Pauline Monastery from the beginning of the XXI century until the present. The article contains the site survey and height plan of the analysed area, photographs, information tables, charts containing the information on the number of pilgrims based on statistics provided by The Jasna Góra Press Office, as well as bibliography.

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ABU DHABI'S DOWNTOWN AREA, AN EXAMINATION OF MODERNIST APPLICATIONS OF THE INTERNATIONAL STYLE; SUPERBLOCKS IN A MODERN ARAB CITY, IMPROVING VISIBILITY AND SOCIAL SPACE

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ABSTRACT

Today Abu Dhabi is expanding along its shorefronts and urban Islands creating many iconic buildings and social spaces, however, the downtown area is in need of regeneration, it remains popular for a multi-cultural community because it was shaped by the modernist/International style and abstract Arab ornaments namely in the form of screens on the facades that attempted to fit within the climatic context of a desert city. The 'modernist' designs of the downtown buildings reflect practicality and pragmatism supported by Abu Dhabi's grid street pattern that created rectangular land plots on which high-rise buildings were constructed-known today as downtown 'Superblocks'. Abu Dhabi's downtown architecture reflect the ideas of Le Corbusier, Walter Gropius and other influential theoreticians of the International Style, the architects invited to participate in creating a modern Arab City in the 1980's did not attempt to create a post-modernist pastiche of a Arab/Islamic vernacular expression, in contrast facades of the concrete high-rise buildings reflect attempts to deal with the hot humid environment of the Gulf. Buildings such Al-Ibrahimi, Obeid Al-Mazrui and Hamid Centre reflect ideas that range from metabolism architecture to adaptations of brise-soleil as many international architects participated in designing a city within a master plan created by the architect Abdelrahman Makhlouf. Today many of these buildings and he spaces between with face deterioration as many residents move to the newly created buildings in Abu Dhabi's urban Islands-Al-Reem, Maryah, Saadiyat and Yas Island. This research examines means of regeneration of Abu Dhabi's downtown area, through the study of modernist buildings and the spaces between the superblocks. The area of study is the zone between Zayed the 1st street and Hamadan Street in the downtown area. We study selected buildings in downtown Abu Dhabi and offer recommendations for improving the social experience and liveability of in-between spaces, especially in the large asphalt parking lots created by the superblocks. We study the solid to void ratios of the downtown-high-rise buildings and specific buildings in relation to sustainable design and contextual integration as part of a reconciliation between Arab identity and modernization. The methodology will use photographic survey, literary review and digital modelling as means to offer solutions for improved visibility and sustainability of the downtown area in Abu Dhabi.

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AFFECTIVE SPACES IN URBAN TRANSFORMATION'S CONTEXTS

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ABSTRACT

The paper intends to address the topic of urban transformation within the framework of the concept of "affective space". The central research question will be: what is the influence of the affective sphere on changes that take place in the city and vice versa how much does the changes affect the emotional sphere? By placing subjects at the center of the research, the paper intends to study the relationship between individuals - as well as groups and communities - and urban spaces they inhabit. This can be done by guaranteeing centrality to the pre-reflective emotional impact that spatial situations produce on subjects, where for "spatial situation" it is intended the inclusive description of a specific condition, including both the material articulation of space and its intangible qualities that influence the subject's emotional sphere. Several authors in different fields of environmental psychology, human geography, philosophy etc. have produced a new paradigm for the understanding of the subject's experience of the space, in which a wide sphere of emotional resonance, lived by the embodied subject, becomes important. Nevertheless, in our specific field of architecture, the affective dimension of urban space is still underexplored, while it can provide an alternative way of addressing the human and social component of urban transformation processes. Concepts such as "atmosphere" and "empathy" become central in our way of experiencing space, alongside with "memory" that has been one of the carrying concepts of late 20th century urban theory, from Aldo Rossi's classical book *L'architettura della città* (1966) onwards. However, the discussion has mainly concerned the historicized acceptations of memory, while less attention has been paid to the temporal extension of feeling. This is another field of research that would highlight the idea that the spatial externalization of emotions - as sustained by contemporary phenomenology - can be embedded into physical space. Thus it is possible to study the changing urban spaces at the present and in a historical perspective: residents who have witnessed the urban transformation and recent inhabitants who may witness the presence of historicized feelings through their traces. Focusing on selected cases studies in the perspective of affective space theory, the paper intends to develop in a double direction: "top down", from theory to the real changes in urban life, and "bottom up", from the architectural re-design of specific sites back to the paradigm of theoretical approach. To achieve this goal, the paper analyzes some of the de-industrialized areas in the city of Turin, Italy, in its dramatic transition from a fordist city to a post-fordist city. In some cases, these areas have been already regenerated with the developing of new urban spaces and landscapes; in others, the areas are undergoing revitalization or are awaiting urban transformations. It is above all in these last cases that the consideration of emotional sphere becomes important, as a tool for prefiguring space and future use: not only entrusted to the functionality of "effective" space, but also to atmosphere, empathy, memory of "affective" space.

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SOCIAL PARTICIPATION AND EXPERIMENTAL SPATIAL INTERVENTIONS AS EFFECTIVE METHODS OF ACTIVATING PROBLEMATIC URBAN AREAS

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ABSTRACT

In difficult economic and political times, cities will have less funds for public programs, including revitalization of unused and neglected urban spaces. It will be necessary to involve various, not only formal and public authorities, in order to ensure positive changes in the urban space, provide attractive places for residents and build a positive image of the city. The aim of the work is to show the impact and benefits of bottom-up social initiatives and low-budget spatial interventions as effective methods for urban renewal in a short time and at low cost. In this work the author analyzes and classifies examples of social, cultural and pro-ecological activities, consider a number of alternative possibilities of reviving urban spaces that are different to traditional practices of top-down urban development strategies. The author shows the importance of spatial and social relations resulting from the real needs and preferences of user and from current potential of place. The article discusses the issues of activating urban space and integrating residents, as well as the advantage of versatility over aesthetics of place. In addition, attention was focused on the decision-making and design process with the involvement of the local community. Participation of citizens in the design process itself often became more important than the final architectural effect. Moreover, the primary role of the architect and the investor are changed, the new competences of the participants of the design process penetrate each other. In this process, the potential of space users themselves is revealed. They are the initiators, organizers and participants of the process of creating a public space customized to their specific needs.

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ARCHITECTURAL SPACES OF THE LIBRARIES IN THE EXPECTATIONS AND OPINIONS OF THE LIBRARIANS OF KRAKOW'S PUBLIC LIBRARIES

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ABSTRACT

Public Libraries in Krakow – Poland's second-largest city – operated as four independent cultural institutions up to January 2017, each with a main library and over a dozen smaller branches. The organizational structure stemmed from the previous administrative division of Poland (1975-1998), in which the city of Krakow consisted of four large districts. In July 2016 the Krakow City Council decided to merge the four public libraries into one institution to be operating under the name of Krakow Library (Biblioteka Kraków), with one main library and nearly 60 branches. Preceding the consolidation process, the Krakow Municipality commissioned the Malopolska Institute of Culture (Małopolski Instytut Kultury, MIK) to conduct a research & consultation project in order to diagnose the existing network of libraries and to formulate recommendations for strategic planning of the new institution. Librarians' expectations regarding the architectural space of libraries and their opinions on the space of existing branches were surveyed by means of a participatory workshop for the library employees. The paper presents the findings of the participatory workshop for the librarians and discusses them in the context of current library design guidelines.

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BASES ON “PHASES OF PROPOSAL” TO FIND A SOLUTION TO THE HOLLOWIZATION IN ATYPICAL ANCIENT VILLAGES

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ABSTRACT

With the list of traditional villages are constantly updated, more and more traditional village has attracted attention from society, but there are many atypical ancient villages, out of the "traditional village list". They are lack of enough protection and sufficient funds to develop, resulting in depopulation and vacant house. Under these circumstances, the hollowization of these villages is becoming increasingly serious problem. But these villages are large and universal, forming the basement of Chinese characteristic rural historical environment in the period of rapid urbanization. In fact, these villages have a lot of vacant houses which are also part of the architectural heritage. There are three reasons for this: First, they are states of existence between new-born and lost-transmission, and they tend to die out as time goes by. Second, they are testimonies that gather people's memories of old and new. In addition, they are sociality from the perspective of property rights. But in terms of cultural value, it would become a reality for all people in this world. How to adequately reuse architectural heritage is a difficult problem. Therefore, this article aims to explore ways to "activate" vacant house to protect and re-use the architectural heritage. The author takes Huanghua village as an example, analysing the hollowing out problem of atypical traditional villages, and compares them with Japan's "empty home" problems. By using the” phases of proposal” in Huanghua village design workshop, to explore a different activation method with architectural heritage in the typical traditional village.

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THE MODERN SUBURBANISATION PROCESSES IN CONTEXT OF HISTORICAL GARDEN CITIES

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ABSTRACT

The idea of a garden city was created in response to the growing problems related to air pollution, diseases and dirt prevailing in cities. The main purpose of the creation of city-gardens was to relieve the main urban center. Also known as satellite cities, they were intended for approx. 30,000 residents. The ratio of built-up areas to green areas (including those designated for cultivation) was 1: 4. The most important asset of such a satellite city was its self-sufficiency. Based on the assumptions of Ebenezer Howard (1850-1928) at the beginning of the 20th century, in Szczecin there were created residential estates. The three analyzed estates called New WestEnd, Ackermann Hill and Głebokie Housing Estate have been changed not only in terms of thermo-modernization of the façade for 100 years, but also taking into account changes in the spatial layout. What in the assumptions of garden cities was as important as space, in the 21st century is marginalized? The possibility of filling the gardens with new buildings is so common that less and less these housing estates resemble those from projects from 100 years ago. The way in which the standard of living has changed, the communication needs, the number of cars, the lack of parking places as well as the lack of time to use the common space is more and more visible observing urban changes. This is also influenced by the social aspect - the anonymity of neighbors, lack of care for the common good and lack of awareness of the quality of common spaces. What needs to be done in order to regain the former splendor in the following years and fit the function and form to today's standard and lifestyle. How education and raising awareness of new residents will allow the city garden to be maintained in the face of climate change and demographic change.

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METHODOLOGY FOR THE PREDIAGNOSIS OF RESIDENTIAL BUILDINGS IN VULNERABLE AREAS IN THE CITY OF BARCELONA

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ABSTRACT

In a paradigm of raising urban economic and social inequality among south European cities, public administrations are confronted with the challenge to foster the improvement of the most deprived residential vulnerable areas. In the framework of the implementation of a building rehabilitation program on vulnerable residential neighborhoods by the Barcelona City Council, the current research presents a technical and experimental approach on 16 of the most vulnerable areas, with the aim to obtain a qualitative evaluation of the residential vulnerability as well as the identification of buildings with a most deprived physical state. The purposed methodology approaches a first prediagnosis of the building state and the detection of buildings that present a major need for rehabilitation actions, providing prioritization criteria. Rehabilitation is here considered from a wide and integral perspective, taking into account both socioeconomic aspects that describe the housing community and specific physic conditions of the built stock. Such methodology is complemented with the interchange of information with local actors, both from the social tissue and the neighborhood local administration. The results of the present research provide the public administrations with the identification of data sources and a systematization of technical and social qualitative information onsite on a database, as well as the elaboration of a GIS analysis and cartography in a compendium of maps. The actualization and testing of quantitative information on specific areas provides the public administration with a set of very relevant tools in order to address specific and complex vulnerable areas and to efficiently invest public resources with the aim to improve both physical and social conditions of deprived neighborhoods in long term.

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SOCIO SPATIAL CHARACTERIZATION OF LARGE HOUSING ESTATES IN THE METROPOLITAN AREA OF BARCELONA

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ABSTRACT

Fifty years after the construction of Large Housing Estates in the periphery of the Barcelona urban continuum, public administrations face the need to redesign polices and tools aimed at improving living conditions in each of these specific areas. The need to improve the current living conditions of the housing stock according to habitability exigencies, maintenance and repair of building pathology, the improvement of energy efficiency and the research of a better social integration of their population, are some of the issues that call for being addressed when aiming to improve Large Housing Estates. The current research provides a socio spatial characterization of 20 study cases according to the evaluation of both socio demographic, socio economic and spatial indicators and their evolution along 5 time periods since their construction. Even if all study cases originally had many common characteristics, their very different evolution in time calls for a specific analysis of the current state of each area. Moreover, the characterization of the different evolution of the studied indicators on each specific case is a very useful tool to identify and describe past and ongoing complex social and urban processes. The applied methodology provides a detection of risk parameters, allowing to identify the most vulnerable cases in comparison with the analyzed cases as well as the city average indicators. The transversal capacity of considering simultaneously social aspects as well as urban, architectonic and technological aspects, provides an integral view on the current state of Large Housing Estates in the Metropolitan Area of Barcelona. A result consisting of relevant information in order to design effective integral tools that refer to the particular social and physical contemporary conditions and ongoing processes on each site.

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EXCEPTIONAL CASES OF "HOUSE": EXPLORING POTENTIALS OF SPATIAL CREATION

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ABSTRACT

The concept of "house" refers to a basic spatial formation in context of parts forming a whole, beyond the usual meaning of housing. Although it has a meaningful spatial connotation alone, articulating to other concepts that point to different social structures it provides a framework that characterizes space. In this sense, the concept of "house", which gives name to a number of different spatial structures such as jailhouse, workhouse, bedehouse, boardinghouse, house of worship, tradinghouse, constitutes the basis of the series of spaces establishing social structures. However, due to the reference given to the established social structures, the content is shaped in the direction of the social and cultural codes formed by the power mechanisms that shape the society. In this context, this study proposes to purge the spatial codes that the "house" concept implies and to transform it into a conceptual framework for the architectural quests beyond the spatial constructions that domesticate and organise society. In this respect, it is aimed to use "house", which is considered as a basic spatial creation structure, as a tool to investigate the dynamics that create "incompatible spaces". Since "incompatible spaces" allow the development of creative formations in the direction of their self-reproductive tendency regardless of the established structures, the restructuring of the concept of "house" in this context provides a new insight into spatial creation. Within the scope of the study, the studio works carried out by Atelier Z under the theme of "Fishes floating against the current: Cases of House 1" are determined as case-study. Accordingly the spatial creations developed with different contents in context of the framework of the"house" are examined from the contextual, structural and programmatic aspects. With reference to the examinations made, the "house" is evaluated in terms of its potential of spatial creation and its spatial content is restructured. Conceptualizations and examinations made in the context of the "house" throughout the study offer insights into the contextual arrangements that settle into the incompatible flow patterns within the city, the structural arrangements that make up unusual, multi-layered urban and spatial connections and the programmatic arrangements that relates to unspecified instantaneous action groups. Raising the subject of this kind of unexamined design practice, constitutes a productive sequences of references for spatial creation.

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CONTEMPORANEITY: A COMMON SPACE-TIME-INFORMATION FOR EXPERIMENTING WITH ARCHITECTURE THROUGH DESIGN

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ABSTRACT

The article problematizes the concept of contemporaneity to open up a discussion on the experimental creation of architecture through design. It asserts that to interpret and to problematize the changing dynamics of architectural creation in actual conditions, the contemporaneity opens a new field of comprehension. Accordingly, the article endeavours to conceptualize the concept of contemporaneity in terms of its temporal, spatial and informational qualities in context of architecture with reference to the related discussions in philosophy and art. Far from fitting contemporaneity into a particular definition, the article uncovers the possibilities that the contemporaneity provides to experiment with architecture through design thanks to its experimental nature. The article interprets the contemporaneity as contextual becoming that provides a common theoretical and practical field for architectural design. And it develops the concept of "interval of delay" to describe a spatio-temporal informational context of experimentation within contemporaneity. In line with this, the article firstly conceptualizes the notions of contemporary and contemporaneity in relation to architecture and design. Secondly, to provide references to its claim, it portrays the critical processes that contribute to the understanding of the contemporaneity within the context of architecture. Lastly, it conceptualizes "interval of delay" in relation to architectural design. It discusses the opportunities provided by "the interval of delay" for experimenting with architecture through design within contemporaneity. Interrelatedly, it brings forward the experimentality of contemporary architecture in relation to contemporary design.

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ASSESSMENT OF THE QUALITY OF THE LIVING ENVIRONMENT BASED ON INTERDISCIPLINARY RESEARCH METHODS: SELECTED EXAMPLES

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ABSTRACT

Like most European cities of similar size, Cracow is growing dynamically. Newly created objects are not only of public importance but also housing, whose standards due to the architectural form, technologies and finishing materials are increasingly high. However, spatial solutions do not necessarily allow to assess new estates as high-quality housing areas. The article concerns the analysis of contemporary housing estates with regard to sociological issues, which is a vital supplement to basic urban research. It allows obtaining opinions on how residents perceive their place of residence, what elements they appreciate the most and which require corrective measures. The interview creates an opportunity to determine the needs of the residents of the housing estates and to identify factors affecting their sense of comfort, safety and satisfaction with their place of residence. The key objective of the study is to check the sociological and urban research methods for assessing the quality of the housing environment on the example of the Chełmoński housing estate in Cracow. Moreover, the author also wanted to obtain the residents' opinion on the area in which they have lived for several years – taking also into account changes in architectural and urban solutions. For this reason, the tests were performed twice. The first interviews were carried out in 2015, while the second, three years later. Such methodology created the possibility of making comparisons regarding different opinions of the residents as well as transformations introduced in a residential environment. The main research tool included a survey containing questions requiring either a detailed description or short answers - yes/no, I have no opinion. The choice of the test method resulted from its wide range of topics because the housing environment and its quality research are a broad issue covering the subject matter of many fields of science, such as architecture, urban planning, sociology, and psychology. The results of the conducted research indicated that the most important factors associated with the immediate surroundings are contact with nature, close access to local services, including shops and medical facilities, educational facilities and recreational areas. Due to the analysis, the research results may be useful for the units managing the housing estates, for the local government authorities, planners and urban planners deciding on introducing changes and imposing guidelines in the spatial structure of the cities. They can also lead to reflection and change in the behaviour of investors, developers and architects who have an impact on emerging housing estates. The research methods used in work are universal and can be applied to housing areas regardless of their location.

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IMPROVING CONDITION OF PREFAB MULTIFAMILY HOUSING STOCK: USER PERSPECTIVE ASSESSED VIA DIRECT SURVEY

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ABSTRACT

Multifamily buildings of the mass prefabrication era (1960-1990) have a considerable share in Polish housing stock. These assets, though still valued due to good location and shortage of other affordable flats, tend to become obsolete. So far, efforts to maintain their value were limited to reducing their heating energy demand by insulations. To go beyond obvious repairs and investment measures enforced by stricter and stricter regulations on energy demand, and to prevent depopulation, the facility managers need to think ahead and prepare for improvements that would satisfy the users. To find out what the users think on possible improvements, the author decided to undertake regular opinion surveys among the inhabitants of selected housing estates. The surveys are based on direct questionnaire-based interviews. The paper presents findings of the survey conducted in a particular estate in Lublin, south-eastern Poland. The most frequently mentioned issue was lack of parking spaces. Although the inhabitants seem to long for social integration and would have equipped the spaces between buildings with some infrastructure to facilitate outdoor social life, they are reluctant to the idea of hands-on participation in improvement works. As for the buildings, some functions designed before nineteen-nineties (like common laundries) are not used any more, which opens discussion on how to use spare areas. Building accessibility is considered a problem: buildings of 5 storeys have no lifts, and taller buildings are equipped with lifts accessible only form the ground floor level (which means climbing one flight of stairs). Larger balconies would be welcome. However, the inhabitants are generally not willing to pay more towards the improvements, though they would accept construction of an extra floor on top of their blocks if the sales of new flats would pay for new facilities. Similarly, further measures to reduce environmental impact of the buildings would be welcome if the savings on energy consumption could be used to repay their funding; urgency of energy-saving measures is considered low as buildings were recently insulated. The users are not satisfied with the size of flats (too small) and quality of finishing. Many decide to improve flats on their own (individual owners). However, in spite of shortcomings of their dwellings, the majority of respondents declare they would rather stay than move to other housing estates – unless they could afford a detached house. The results of the survey provide a clear guideline for the facility managers: the inhabitants, if approached directly, are willing to discuss improvements. Only cooperation between the facility managers and the users is likely to provide viable solutions to maintain the estate's value. The proposed questionnaire can be used as a practical tool in defining products of improvement projects.

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THE EFFECT OF THE PRIVATIZATION AND COMMODIFICATION INTO THE FUNCTIONS OF PEDESTRIAN PUBLIC SPACE: CASE STUDY OF THE CENTRAL PLAZA AT 'MANUFAKTURA' SHOPPING CENTRE IN LODZ (POLAND)

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ABSTRACT

In XX century the new model of social relation based mainly on consumption was introduced (Bauman, 2006) (Ritzer, 2001). This change in social life inflict also the urban space – the City become a field of investment game. Even the pedestrian open space become the commodity, which been used for investing and accumulating of capital. This change leads to creation of the new type of pedestrian city spaces, called by some authors hybrid spaces (Kohn, 2004), (Nissen, 2008). These urban spaces have become a place for meetings and strolls for the new generation of urban flaneur. We can observe that the consequence of the commodification of public spaces is the creation of the specific amusement parks for adults. Access to such hybrid city areas is restricted, and activities are limited by private owners. Some authors (Kohn, 2004), (Sorkin, 1992), (Mitchell, 2003), (Low and Smith 2006), (Harvey, 2012), (Lofland, 2007) claims that commodification and privatization of urban space is a threat to the functioning of the public space by limiting the activity of users, especially some important social functions - from unstimulated and uncontrolled meetings with the "other" and "foreign", up to public gatherings, social protests and conflicts. Limitations and access reduced to selected social groups are the essential origin of conflicts and tensions, as exemplified by the 2011 events at Zuccotti Park [Shiffman 2012]. The article analyses the privatized pedestrian space the "Manufaktura" shopping centre in Lodz (Central Poland). It is one of the largest private city plaza in Europe. This text should allow to better understanding of the functions of the hybrid spaces in the contemporary city. Author focused on evaluation from the users' point of view, as well as in a broader social and urban context. buildings (this includes: the large shopping gallery, amusement park, hotel, cinema, theatre, two museums, numerous clubs, cafes and restaurants) located around the privately owned plaza. According to some sources it is the largest private city plaza in Europe. The purpose of this text is to allow a better understanding of the specificity of the hybrid space in the city (its functions, advantages and disadvantages evaluated from the users' point of view, as well as in a broader social and urban context). It also should contribute to the search for a proper balance between private and public open spaces in the city.

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ARCHITECTURE AND ANTHROPOLOGY. WORKING IN BETWEEN CONCEPTS

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ABSTRACT

Architecture and anthropology have become more and more intertwined, making place to what I call an anthropo-architecture – an architecture centred on its social outcomes, an architecture that understands and creatively interprets sociological and anthropological inquiries to a level that exceeds a basic multidisciplinary approach. This article puts together related fundamental concepts in architecture and anthropology (like spatial vs. social relations, boundary vs. limits etc.), underlying their distinct role but also their intersection and, what is most important, (new) overlapping concepts that can’t be considered to pertain to one discipline or another, but to both regarded together – as an antropo-architecture. The new concepts (or new meanings given to fundamental concepts) as results of this research speak of: an architecture that accommodates the ever-changing social needs; of socio-spatial interactions as interactions fostered by design; of the boundary as a dynamic relation between spaces and – more than that – between their social components; of the in-between as the most socially, emotionally, experiential and transformative contemporary space through the creativity and the performances it facilitates; of antropo-architecture as an equilibrium between architectural perception and anthropological field research. This research wishes to emphasize the contemporary need for an antropo-architectural approach and it provides a conceptual frame for reading, understanding and interpreting the built space and its use. It takes a look into various theories in search of shared/related/new overlapping concepts and it investigates their role through examples and research-by-design proposals coordinated by the author. Such approaches lead to a better understanding of the urban space and of the ways in which it is being used, as well as of social realities and issues. They invite users, spectators, viewers to question, to imagine, to interact, intervene, propose and not only use space and everything in it. Anthropo-architectural interventions foster the active engagement of its users, it embraces and it encourages its users to embrace diversity (of background, of opinion, of experience and experiencing etc.) and ideas of multiplicity (of identities, realities etc.) through creative appropriation and interpretation of the built environment.

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TRADITIONAL MARKET DESIGN TOWARDS COHESION BETWEEN SOCIAL SUSTAINABILITY AND BIOCLIMATIC APPROACH

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ABSTRACT

Traditional markets have its significant cultural, functional, and socio-economic values, which reflect the main pillars for an effective sustainable development. Traditional markets are places which show the community lifestyle, culture and heritage that's why it has a strong rootedness to its local people. By relating space to culture, a relationship between historic and contemporary design decisions can be achieved. Most of the Arabian Cities are undergoing continuous development through different qualities of expression in terms of economy, culture, and global outlook in the old cities 'centres. Nowadays sustainable development has become an essential intervention in the capital cities. However, sustainable solutions should not concern themselves only with utilizing technology, but also with respecting a community's social, cultural, historical, and environmental aspects. Traditional souqs (market places) are centralized as an iconic inherits in the historic old quarter of the city. The research problem arises from that some of the current traditional markets in the Arab region do not promote social cohesion as they have been developed without consideration for local identity and lifestyle. The question then becomes how to maintain the relationship between the spatial, social and environmental aspects in renovating traditional markets. The importance of the research is derived from the need of applying a critical study for traditional markets' architecture with pre-existing cultural values. The aim is to reach appropriate sustainable solutions that facilitate the integration of socio-bioclimatic requirements, qualities of the spaces, and culture identity in developing sustainable traditional markets. This study examines and employs a descriptive qualitative and quantitative research strategies for one of the oldest traditional markets in Riyadh's city old center "Al-zall souq", to explore the impact of change in the old center, through deriving a typological formation analytical framework which asses; morphological language, socio-cultural and bioclimatic aspects. This study comes out with a complete vision tracing the lifestyle and the cultural values of the society, to end up with a group of suggestions and recommendations that helps in the design decisions taken to create an integrated cultural sustainable market.

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ON THE RELATIONSHIP BETWEEN ARCHITECTURAL AND LITERARY NARRATIVE

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ABSTRACT

The article presents the relationship between architecture and literary narrative. In architectural culture, it is neither obvious nor commonly understood. Traditionally understood, these two fields of art operate with various means, – a word and a building substance. They also have different purposes – conveying cultural content and protecting human life. They apparently relate to different areas of life and show such fundamental differences that they cannot be compared at all. However, as the article proves, after a thorough analysis, close links do appear between them, the characterization of which would enrich the thinking about contemporary architecture. As in the bygone days, also in the 21st century, contemporary architecture conveys ideas through the arrangement of space, used materials used by its designer and a formal reflection of interpersonal relationships and cultural goals for which it is created in space. This is how the "substance" of its narrative looks like. It is created in specific cultural realities, in accordance with certain mental processes. This element renders the architectural narrative similar to the literary one which is defined as a story – a sequence of events. However, literary narrative is also a form of representation – related to a succession of events in space and time. What is more, the term "narrative" is also understood as the "structure" of a literary work, i.e. a specific way of combining parts in order to create a coherent whole and selecting them in a way that will enable to exert the intended emotional effect on the reader. Structural thinking is an element that binds architectural and literary works most. In the narrative, the text constitutes a material form of the message – a whole consisting of characters. A story is the content of the text, and the plot – a sequence of logically and chronologically related events. In architecture, one can find similarities to the structure of a literary text. An architectural work can also be understood as a multi-layered one: it has a material, formal and semantic level. "Stones-words" composing forms, create a "building-story". Just as many stories can adopt the plot of a fairy tale or myth still drawing from one archetype, buildings with a specific function reflect one ideal model. However, there are more elements that bind the two areas discussed. A building corresponds to the rules of syntax and semantics. One can introduce quotations and apply spatial metaphors to it. The visual perspective corresponds to a narrative focalization. Architects use flashback and anticipation. Yet, above all, the concept of an event is being introduced more and more frequently to the art of building, and the factor of time is becoming more and more visible in it. In the era of rapid changes in space, durability ceases to be a prerequisite for a building while more emphasis is placed on its "interaction" with the user. The architectural story is heading towards a dialogue. Observed for centuries, the Vitruvian triad (*firmitas*, *utilitas*, *venustas*) is being undermined in contemporary architecture. The rules of the classic canons of beauty do not apply, the functions of structures are constantly changing and buildings are created for a specific period of time. Yet, the symbolic function of architecture is unquestionable. There are also no explicitly determined typologies, codes, meanings, and the paradigm of the 21st-century architecture is a hermeneutic approach in which the user takes over the role of the creator. The above factors trigger the desire to establish a dialogue about meanings in architecture – architecture as a language. One of its goals is also an educational social function – bringing contemporary architecture closer to society – often recognized as incomprehensible – in order to exert a positive influence on aesthetic education.

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FROM "AS FOUND" TO BUSH-HAMMERED CONCRETE – MATERIAL AND TEXTURE IN BRUTALIST ARCHITECTURE

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ABSTRACT

The problem of material and texture in brutalist architecture is fundamental and complex. There are various, often contradictory, interpretations of this issue and therefore it should be clarified. The main objective of the work is to determine the role and significance of the material and the texture in brutalism. Other objectives relate to presentation of the most important principles applied in the selection of materials and methods of shaping different textures. The scope of the article includes analyses of ideas and their implementation in buildings designed by architects connected with brutalist style. The author took into account the output of such architects as: Le Corbusier, Alison and Peter Smithson, Louis Kahn, Paul Rudolph, Basil Spence. These studies confirmed that they paid a lot of attention to the type of building material and the way it was used. The Smithsons, as protagonists of the New Brutalism, were fascinated by ordinariness and everyday life, and therefore they preferred common materials and "as found" manner. Le Corbusier propagated *béton brut* – concrete with an imprint of wooden formwork. He glorified faults of texture claiming that they add a certain richness and humanise the architecture. Kahn and Spence combined brick and concrete, creating contrasting surfaces and elements. Rudolph introduced corrugated and bush-hammered concrete that provided intriguing chiaroscuro effects. Despite the differences between these architects, the material was always in their buildings both structure and texture. Craftsman's methods became popular again and replaced aesthetic of the machine. Rough and inaccurate textures were the contradiction to smooth and precise surfaces of the International Style and symbolized sincerity and truth of brutalist architecture. The mature phase of brutalism was dominated by brick and especially by concrete, but also wood, stone and steel sheet were used. Raw, almost primitive textures that characterized the beginnings of brutalism were replaced with sophisticated, meticulously shaped surfaces.

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ARCHITECTURE AS "GESAMTKUSTWERK" – THE ROLE OF THE ROOF IN DEFINING ARCHITECTURE IN THE 19TH AND 20TH CENTURY IN TIMISOARA

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ABSTRACT

Heritage buildings and their surrounding are inseparably intertwined. Anthropological, cultural, symbolic, religious and technical factors are influencing the choice of constructive and architectural features and their interconnection. An important part of heritage buildings, influencing the general outlook, defining its aesthetics, shaping the relationship with the urban context and ultimately contributing to the skyline of the city is the roof. In recent years, numerous timber roof structure assessment methodologies have been developed, which assess the roof structure only by its structural features and state of conservation without taking the link between the roof and the building and its surrounding area into consideration. However, considering the principles of the European guilds, heritage buildings were built with no strict division between symbolic meaning, craftmanship, architectural aesthetics and urban design methods. This results in a "Gesamtkunstwerk", a total work of art, with harmonically interlinked features and fully connected to its surrounding, leading to a full aesthetic experience. All these features highly influence the aesthetics of the heritage building but also the shape and height of the roof. During the late 19th century and early 20th century, at the dawn of modern architecture and urban design, a bold and aesthetically conscious use of traditional crafts and methods took place in most European cities - the Arts and Crafts movement, Art Nouveau, National Schools. This study aims to define how the relationship between building, roof and the urban context is changing in Timisoara during the late 19th and early 20th century. Ultimately the main scope of the paper is to identify the role of the roof structure in defining heritage structures built around the beginning of the 20th century through a transdisciplinary and interdisciplinary approach.

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CULTURAL SUSTAINABILITY STUDIES ON HOUSING TYPOLOGY IN TURKEY

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ABSTRACT

In the recent period in Turkey it has been a globalization movement which brings along changing and transforming process to the old buildings. Apart from the positive returns of process has been provided, evolutions of adaptive re-use projects, applied restoration methods, insensible interventions culminate in non-foundational and wrong transformations, taking into account all of these, characterless transformations are inevitable and they increase by leaps and bounds. even though these transformations have sufficient qualifications of housing function, they do not provide the qualifications of identity of the historical building and the culture which has been carried to the present. Within this context, by noticing these adverse events, cultural sustainability idea has been questioned. Re-using the old building with new contemporary function brings the building to the present and also provide a future however it is crucial for old buildings and ruins to be used or to give right function within the correct manner, function and concept. The correct function should provide socially, economically and also most significantly culturally adaptation with the old. In accordance with this aim, in this paper Turkey has been chosen as site for the case study which is going to be focused on typical housing typologies and the way they sustain the qualities in cultural way. The typologies, as ruin housing units and adaptive re-use examples of houses will be examined in a manner of respect and the value to history and culture of Turkey, adaptive re-use ideas will be studied as case study from cultural sustainability perspective.

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ASSESING AND VISUALISATION OF PRESERVED CULTURAL-HISTORICAL VALUES FOR QUALITY ENVIRONMENT OF HISTORIC CITIES

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ABSTRACT

Many historical and cultural-heritage sites are getting lost in areas characterised by infrastructure, new buildings or industrial estates. In the time of rapid global change quality of historical sites are changing because of the spatial development, in which is evident a trivialisation of our built environment. Therefore, is research of cultural-historical potential of architectural heritage focus on not only the legally protected historical structure, but that includes not legally protected cultural heritage sites. This paper points out on the lack of contemporary approaches in the field of cultural development in towns and smart planning with emphasis on sustainability. Simultaneously it deals with contemporary tools of mapping of monument values of historical towns. Consequently, the aim of the paper is to present the new approach of mapping cultural-historical potential, in relation to current research and effective processing. The difference between the new methods and standard research is that the new one is connects urban and architectural values, with the emphasis on tangible and intangible heritage. This approach of mapping cultural heritage is formed in the framework of international project DANUrB and it leads participating countries to common strategy for mapping culture-heritage sites. The mapping is focused on clear goal: making places attractive for inhabitants and visitors and the development of tourism in towns which can lead to sustainability of towns. Case study of the towns Komárno and Štúrovo presents the use of presented mapping of cultural heritage.

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NEO IMPERIALISM IN THE ARCHITECTURE AND URBAN PLANNING OF DELHI (1991-2018)

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ABSTRACT

India has been colonised for many centuries, from the end of the XV century by Dutch and Portuguese and later on, from the XVII to the XX centuries, mainly by French and British. The city of Delhi, in particular, has been the capital of the British Empire from 1912 to 1947. It is a fascinating case study due to its heavy foreign cultural influences, not only British, which shaped and shapes its cityscape identity. In fact, it has been influenced by diverse cultures, it has been ruled by a range of rulers and dynasties, whether through conquest, subordination, or absorption, and today is subjected to the multitudinous forces of globalization. Delhi presents itself as a model case study of the intermingling and conflict of cultures and is therefore an ideal for a study of the processes of hybridization of local architecture and urbanism. During the shift from pre- and post- Independence India, it seems obvious that the “colonial” influence disappeared from the city but, in reality, it had continued in much more subtle contemporary forms of neo-colonialism. This paper aims to explore the emerging expressions of neo-colonialism and cultural imperialism in the globalised Indian capital, especially from 1991 to nowadays. 1991 is taken as a benchmark year, when the economic liberalisation started in India and globalisation actually entered the country. These analyses will focus both on the neo-imperialistic manifestations and on those very interesting forms of local resistance developed in the field of contemporary architecture and planning, which are fundamental to build a critical point of view on the present fast-growing megacity.

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CRITICAL REGIONALISM CONCEPT IN THE ARCHITECTURAL PERFORMANCE OF THE PARLIAMENT LIBRARY OF NEW-DELHI

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ABSTRACT

Due to the successive historic empires in India which ended by the British colonial, this latter left its footprints clearly and strongly in the architecture environment of India, this was a reason for the necessity to bring back the original identity of India and reinforce the lack of self-esteem. The famous Indian critical regionalist architect Raj Rewal responded to this need in the parliament library by reconciling identity with modernity, which in that time was something new and unusual. This study seeks to analyse the architectural practices and performances which Raj Rewal applied in order to answer those requirements of bringing back Indian heritage again and face the British Colonial Architecture to express the three concepts to make the new parliament library looks: anti-colonial, regional, and modern at once. The results showed that, in addition to his use of the traditional local Indian materials, and the pre-colonial decoration and sun breeze elements (the Jali), Raj Rewal expressed real Indian Identity by its own nation symbols, where the amphitheatre according to the Indian culture symbolizes the freedom and believe, the tree is a symbol of justice, and the water pool is a symbol of equality of states and opportunities, those were presented in the courtyards of the parliament library. While presenting modernity was done by using modern materials and technologies, beside the use of the complexity in combining the structure lattice systems. The parliament library of New Delhi which was designed by Raj Rewal expressed a real meaning of critical regionalism concept, a project which successfully brought back and gathers the Indian culture, identity, and heritage with modern methods

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THE MAIN VARIANTS OF REGIONAL CONSTRUCTION COMPLEX DEVELOPMENT ON THE BASIS OF INCREASING ENTERPRISE FLEXIBILITY

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ABSTRACT

In the present paper we consider the issues related to the need of increasing the mobility of construction enterprises with the aim of achieving their forecast guidelines in the implementation of overall development strategy. The aim of the study is to research the formation of the construction industry economics with an accumulated productive enterprises' capacity, which could ensure the growth of the population welfare and living standards in the long term. The object of study is flexible construction enterprises. One of the strategic development directions of the regional economy is the growth of the construction industry to provide citizens of the region with affordable and comfortable housing and utility services, fixed assets reproduction of the national economy. Territorial peculiarity of such regions suggests that the development of the construction industry can be carried out in two main zones – the zone of effect when enterprises capacity of the construction sector exceeds the demand for housing and in the zone of loss when, on the contrary, the capacity is behind housing needs. The main ways for activity of such flexible construction companies are suggested as a solution to the general problem and raising their level in terms of functioning and development of regional construction industry.

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*NARC*HITECTURE: ANALYSIS OF THE EFFECTS OF DRUG TRAFFICKING IN RURAL AND URBAN SPACE IN COLOMBIA

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ABSTRACT

NARCHITECTURE. Analysis of the effects of drug trafficking in rural and urban space in Colombia. The production, trafficking and consumption of narcotics are problems that affect Colombia with special intensity. The Community of Politics of America (AMERIPOL) noted in its 2013 report that: "Drug trafficking in Colombia has now become the main factor affecting security, becoming the largest generator of resources to finance Illegal Armed Groups, drug trafficking organizations, in addition to the increase in crime associated with drugs that leaves as a result the breaking of the social fabric ". The magnitude of the problem acquires visible physical characteristics when inventorying the assets associated with drug trafficking and when dimensioning the territory and infrastructure associated with its production. Considering the effects of drug trafficking in the urban and rural territory in Colombia, this paper presents the inventory, classification, analysis and visualization of the physical, functional, scale, location and interaction of infrastructure such as illicit crops, processing laboratories, warehouses, real estate, stash houses, among others, seized or intervened by the Colombian state in the last 30 years. The paper addresses the visible effects of drug trafficking on the physical space, the nature of the construction, transformation and destruction of the rural and urban space and the occupation characteristics of the territory. The paper extrapolates the urban analysis that traditionally accompanies our understanding of legal economies and is complemented by methodologies of forensic architecture to analyse the clandestine economy derived from drugs and that connects production, marketing, finance and consumption through of an intricate network that affects the Colombian territory and that transcends its national borders. The spatial analysis presented will refer to three scales and that range from the spatial and operational understanding of small-scale infrastructure such as caches and tunnels to the understanding of macro territorial and regional scales. Towards an intermediate scale, the research traces the logics of what could be called Narchitecture, understood as the physical, aesthetic and functional manifestation in space, of the power acquired by means hidden to society. In this intermediate scale it is intended to present inventory, classification and comparison of qualitative and quantitative information associated with ranches, haciendas, farms, houses, apartments, warehouses, etc.

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POETICAL, POLITE, POLITICAL, ARCHITECTURE IN LATIN AMERICA

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ABSTRACT

In 2016 and responding to the Pritzker Price given to socially committed Chilean architect Alejandro Aravena, Patrik Schumacher (Partner at Zaha Hadid Architects) complained that the Pritzker Prize had mutated into a humanitarian design award and announced a worrying symptom of a political politeness flowing over architecture practice. With examples in recent humanitarian architecture laureates such as Alejandro Aravena, Shigeru Ban or Balkrishna Doshi we are experiencing a shift in recognition towards a more socially committed practice by comparison with the beginning of this century and that had witnessed celebration of exclamatory poetical building expression in the works of starchitects such as Zaha Hadid or Frank Gehry, amongst others. Using this recent debate as starting point I would like to explore the conflictive oscillations of architecture when referring and relating to the poetical, the polite and the political. The use of these three notions is limited to specific understandings associated with material practices that might be summarized as follows: POETICAL having an imaginative or sensitively emotional style of expression. POLITE relating to 'refined` cultural expressions. POLITICAL having some reference to the polis and thus considering the social and political community as a primary instance. It is my intention to trace the understanding, interpretation and implementation of these three notions within some Latin-American architecture practices of the last 50 years. In order to do so I will go over some ideas published by academia and I will present some building examples that help illustrate some points; mostly low-income housing and public infrastructure which are the most pressing architectural subjects in the region.

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RÍO SECO, THE FIRST FREEZER PLANT OF CHILEAN PATAGONIA: AN UNKNOWN INDUSTRIAL SITE IN MAGALLANES

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ABSTRACT

During recent years, the valorization of architectural heritage has been an important subject of national debate in Chilean society. After decades of neglect, local heritage is achieving an important role in the country. In recent years, local legal regulations are evolving in order to guarantee a better heritage conservation. Even if listed heritage is increasing year by year in Chile, there are still several cultural sites not yet detected and studied. The present article exposes the main results of an historical research, related to Río Seco's Freezer Plant, an historical industrial site located in Patagonia, at Río Seco's district, near the city of Punta Arenas, in the South region of Chile, Magallanes. This site is not yet listed as official heritage, even if it presents highly potential to be officially recognized. Río Seco's Freezer Plant, was the first industry of its type in Magallanes Region. This site has been indicated too as the first freezer plant of whole South America. This plant was built in the beginning of the XXth century, founded by a British company operating in Chile at that time. This company was called *The South American Import Export Syndicate*, and it was conformed at London, England, in 1903. The industry of Río Seco processed sheep meat, for international export. When sheep breeding was successfully introduced in this Chilean region, exceeding internal consumption, different freezer plants were established in this territory. Río Seco was the first industry of this type. With the incipient technology of that time, frozen meet could last long periods of time, and reach far destinations in different continents by ship, as Europe and North America, starting from the plant's port at Chilean Patagonia. The installation of this Freezer Plant, started the conformation of a whole town, called Río Seco, where housing, and urban services were provided directly by the company to local workers. Due to its conformation and connections to the economic and urban history of Magallanes Region, this site can be considered as Chilean industrial heritage, with highly cultural interest. In spite of its historical value, the industrial site of Río Seco is not yet listed as national heritage. In recent decades, its decay has go on progressively. Spread the cultural relevance of this Freezer Plant and its history, could motivate its safeguard, and future conservation.

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THE REVITALIZATION PROBLEMS OF HISTORICAL SPACE IN THE REBUILD IDENTITY OF CITY: CASE STUDY OF THE OLD STEIN FACTORY AREA IN BIALYSTOK, POLAND

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ABSTRACT

The aim of this thesis is to answer question: how postindustrial spaces which are integral element of Białystok (city in the north-east Poland) are arranged to new functions and to what extent the process of devastation is progressing. The authors describe the urban transformation of Białystok from its dynamic industrial development to the present day. The part of this work is rating of degradation in the local landscape and spatial shape in the Stein Factory neighborhood over time. The work is divided into four chapters. The first introduces history of the Białystok industry and its impact on spatial development - in particular on landscape and architecture. The second chapter describes the concept of revitalization in the context of the devastated spaces. Authors describe examples of proper management of areas affected by industrial factors. The third chapter focuses on the designed area. It shows the history of the Stein factory and the legal conditions. The last chapter describes the design solutions. The project aims to improve the quality of devastated urban spaces. It assumes a complete transformation of the character of the current district and its adaptation for a new user - the visitor and the people living nearby. Designed space is supposed to encourage people to stay in the area and provide rest from urban conditions for different age groups. The idea of the project is to create a downtown as highest quality public spaces. Author designed a sensory, interactive educational garden that will improve the quality of urban space. The main object- dominant is the historic Stein food factory includes two buildings. In one of them author suggest to set up Museum "Bialystok Industrial Centre", and in second one the center of recreation and services. The essential part of project is also landscape design. The main inspiration in the plant compositions was the motif of nature as a pioneer among disadvantageous terms and rural region gardens. The Article point to problems of revitalization degraded historical space in order to appear relevant role of history in the rebuild identity of regional space.

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Session Title:

Theories of Vision and Visiuality

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DIFFERENT WAY OF SEEING

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ABSTRACT

Perception plays a huge part in human's life that is continue in a lot of different interior spaces so the term of architectural perception will be mentioned for all people. This architectural perception is actualize with using human senses. And people, with use their own thought that are taken from the result of their perceptions, identify the architectural structure as beautiful or not. People have five common senses which are used in perceiving process however they do not use their senses equally because of the dominance the sense of eyesight. That's why they decide is interior space beautiful or not without use their another senses which are necessary as much as eyesight. The aim of the study is to question the importance of common senses in perceiving the space and explaining the dimensions of space which are not related with the vision. For test these aims, a created method was regulated and selected participant's usage rates of their senses were tested in selected area with in the two phase. In the first phase of method they could use their eyesight but in the second phase their eyes were closed. As a result of the method, the sense of eyesight is more dominant than hearing, touching and smelling and eyesight block usage of these senses. Also, hearing, touching and smelling can only work when eyesight is opened but for the true perception all senses should have used together and the environment is aesthetic or not decide after the true perception.

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ART AND BLINDNESS

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ABSTRACT

The interaction between the artwork and blind people is complex in nature. It is known that when perceiving an artwork, seeing plays a major role but at the same time it is not just about its visuality. The aim of the study is to understand the connection between visuality and the perception of an artwork with multi-sensorial senses. Also, it reflects on how blind people perceiving the artworks through the sense of touch and their previous visual experiences affect their perceiving. To test these theories and aim, it was made an experiment with art and design studio students who are in early twenties. 3D models which are famous building were experienced when their eyes closed through the sense of touching. To see the use of before experience while perceiving. According to result of this method, the sense of touching has different features from sight. While perceiving the models, the shape and the size of the model considerate as main features and small details that cannot see with sight. So that, the method shows that the perceiving artworks is about the people themselves, not just the physical features, it depends on the previous experiences with surrounding world.

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FOUR FACTOR MODEL ON IMAGE AUDITING OF THE ENTRANCE DESIGN STRUCTURE EDIFICE OF HIGHER TECHNICAL INSTITUTES IN TAMILNADU (INDIA)

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ABSTRACT

This study attempts to develop a conceptual framework to reveal that the educational institutions are known to have become increasingly concerned with the expressions of their physical environments. In fact, due to today's highly competitive domain of business, the institutes imparting technical education is under tremendous pressure to market them as well as to gain an edge over competitors. In doing so, enormous amounts of resources are spent by the institute to project a desirable expected "image". The institute Institutions, today, not only want their physical settings to satisfy the functional requirements of business but also want settings to create legibility and project representative "superior images" However, in spite of the effort and expectations of the institutions in creating a set of impressions and image for their institute, there is no guarantee that the observers at large will experience the same expected image of the institutions. Thereby, the present study focuses this dimension and attempts to conduct an Image Audit of the entrance edifice of technical institutes selected in Tamilnadu, by identifying four factors i.e., Comprehension, focus, context and individualization that are responsible for inducing the variance. The findings of the correlation study indicate a moderate to high variation between the expected image by the institute and the image experienced by the observers in specific regions of Tamilnadu. Thus, it is clearly evident through this four factor model that there are certain variables that could be articulated in order to experience the equivalent image by the observers as expected by the Institute developers. Furthermore, this study facilitates the institute to assimilate the process, meanings and anticipation of the observers and integrate them while evolving their design program for enriching the existing Entrance edifice.

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Session Title:

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THE INTERACTION BETWEEN THE RESEARCH ACTIVITIES AND THE TEACHING ACTIVITIES OF THE INSTRUCTOR IN THE MASTER OF ARCHITECTURE STUDIO AT WOLLEGA UNIVERSITY, ETHIOPIA

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ABSTRACT

This article is concerned with the design research program of the master of architecture, at Wollega University, Ethiopia. Since the beginning, the program had two research activities conducted simultaneously. The first, the studio-based research had been carried out by the students. It is concerned with the type of design research described by several theorists, according to a study by Frankel and Racine (2010) as 'research for design'. The other research activity within the studio research program was the teaching-based research project. This latter research had been carried out by the studio instructor who was mainly focusing on describing the research processes, prescribing how the process should operate to develop design knowledge and predicting the way design knowledge was supposed to be used in the creation of new design. However, as research progressed the focus of interest in the studio has gradually moved away from the creation of knowledge for better design services (research for design), to the creation of knowledge for better understanding the problems of design (research through design). In this advanced stage of the research program, while the studio-based research has been engaged in diagnosing the problems of design and evaluating existing problem solving, the teaching-based research has been conducting inquiry into the processes of the students' research work. However, at this point yet another major change, which will affect the objectives and the processes of the research program, occurred. In this article, the change in the nature and objectives of the research program is discussed. The research program transcends the one-time teaching-based research and a new combined approach, which brings together teaching-based research and research-based teaching emerged. This dual research mechanism allows the research program to look into the relations between the teaching activities and the research activities of the studio instructor as never happened before. The relations between the teaching activities and the research activities of the studio instructor examined.

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CREATIVITY AND USE OF PHYSICAL MODEL IN ARCHITECTURAL DESIGN

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ABSTRACT

The paper is taking up the subject of architectural model in the context of creativity theory and design teaching methods in three parts. In first part author is reviewing creativity theories of Donald W. MacKinnon and Edward de Bono and looking for relations and parallels between work on model and creativity. Architectural model as a tool or medium will be compared with elements of theory of creativity and ideas production. In second part some experiences from world leading architectural practices are surveyed in attempt to answer the question why scale model is still crucial to creative process of practices such as OMA, Herzog & de Meuron, MVRDV, Neutelings Riedijk and Christian Kerez. Third part presents authors' own observations from didactic process in which work on model was central. Conclusions will be drawn to complement and summarize the paper.

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CHANGES IN FUNCTIONAL AND SPATIAL LAYOUTS OF POLISH SINGLE-FAMILY HOUSES

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ABSTRACT

The article presents the evolution of functional and spatial layouts of single-family houses in Poland, with particular emphasis on the functions of a contemporary house. Single-family housing constitutes a significant part of the construction market in Poland. The way of forming functions in single-family buildings in the historical cycle has characteristic features resulting from the culture of the society in a given period. The functional and spatial layout of each object is an important part of its architecture. Architecture is the art of organizing space in order to satisfy the material and spiritual needs of man. Building is an essential part of this organization. When we describe the architecture of a building, we mean its form – construction of the body, function, structure and detail, texture and color. However, a casual observer primarily perceives the appearance of the building – its body and the way it is finished. The construction of the building is usually hidden, invisible to the observer. The investor and future user most often put in the first place the functional layout. The estates of single-family houses are an important part of the modern city landscape. Such estates may consist of free-standing, semi-detached, terraced and atrium buildings. They are developed on the basis of individual projects designed for a specific user, or based on repetitive projects, selected by the investor in cooperation with the architect, from project catalogues of various architectural studios. At the same time, the developers' estates are being designed, offering ready-made houses, which the future user chooses without the participation of the designer. The most interesting in terms of the functional arrangement and spatial solutions are the projects of unique houses located in atypical situations, both within cities and on their outskirts. In each of these cases, the future user – investor in a decisive way draws attention to the functional layout of the building. The customs prevailing in society, the structure of the family and the style of family life in a given historical period had decisive influence on shaping the functional and spatial systems of single-family buildings. At present, in the era of globalization present in all areas of life, there have been significant changes in the way of life of the family that affect the functional and spatial layout of single-family houses. Global standards in creating the function of buildings are thus being adopted.

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NEW APPROACH TO ARCHITECTURE DESIGN WITH USE OF RENEWABLE ENERGY SYSTEMS

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ABSTRACT

It seems that the general transformation of the city view is our actual destination due to the massive trend of energy obtaining & saving systems influence on the buildings' architecture. Thus finding spatial solutions for the buildings' forms acceptable to the society accustomed to traditional architecture becomes a vital target for modern architects. Serious incoherence is usually observed when it comes to attach energy obtaining & saving structures, to the existing architectural objects. The paper discusses influence of obtaining & saving energy systems on the architectural view of the city. It is particularly focused on the impact of solar energy systems and vertical-axis wind turbines on the architectural form creation as well as on some ideas how to improve the buildings forms using these systems. In nowadays architecture, solar energy & passive protection energy systems begun to be in widespread use, but the point is, we are short of convincing architectural solutions that do not spoil the buildings' forms. Objects equipped with saving energy systems very often look extraneous & inorganic to urban & architectural neighbourhood as these're simply too strange for our habits & expectations. These objects seem to be more devoted to the engineering factors and their appearance becomes marginal problem to their owners. 1st part of the paper emphasizes that the solar energy could be obtained only in good lighting conditions like sufficient solar exposition as well as lighting albedo, which are not always available especially in the northern countries. For continuous energy obtaining process in the whole year scale in the zones of poor or moderate solar light operation, some other energy obtaining means should be found. 2nd part of the paper presents new approach to architectural design with the use of vertical-axis wind turbines use. In form of case study some innovative conceptual projects invented and designed by the author would be discussed. There are going to be raised in the paper the main technical pros & cons of the vertical-axis wind turbines use in the cities areas including the acoustics, aerodynamics, vibrations, wind speed acceleration as well as architectonical view of these objects. Under author's interest are conceptual projects for existing and new buildings. Ultimately, the paper aims to show main directions of solar & wind energy obtaining systems implementation to the city architecture. It proves that energy obtaining & saving systems might be integral details of the modern architecture appearance. The main methods used in the research descripted in the paper are case study & heuristic designing methods. One of the most important problems to be solved by the paper would be contextual aspects of energy obtaining systems implementation to the city view.

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AIR PURIFICATION IN HIGHLY-URBANIZED AREAS WITH USING TiO_2: NEW APPROACH TO DESIGN PUBLIC USE SPACES TO BENEFIT HUMAN CONDITION

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ABSTRACT

This paper explores the possibilities of architectural design to benefit human condition, which encompasses physical well-being, environmental quality of life in big cities during the Climate Change era. The urban pollution is rising on a global scale. The present paper is focused on a new possibility to resolve the problem of air purification in highly-urbanized areas. The first part of the paper depicts possible usage of Titanium dioxide (TiO2) technology - nanoparticles of TiO_2, as a building materials component such as cement and gypsum. These components are the latest findings in the field of nanomaterials development, and their effectiveness due to the usage of the photocatalysis, which depends on eliminating various atmospheric pollutants and especially clearing the atmosphere from nitrogen oxides. These components together with calcium carbonate to neutralize any acidic gasses that may be adsorbed. Photoactive construction materials are mainly activated under UV light irradiation. The second part presents the results of the research program Climate Change Adapted Architecture and Building Structures which has been conducted by Krystyna Januszkiewicz (the Faculty of Civil Engineering and Architecture for a few years at West Pomeranian University of Technology WPUT in Szczecin. The presented designs were developed with co-operation, Magdalena Janus and Kamila Bogacz (Institute of Chemical and Environmental Engineering) as applications samples of titanium dioxide technology (photocatalytic active building materials) in the urban space. In conclusion, the paper emphasizes the usage of titanium technology, as a construction materials component such as concrete and gypsum or a component of membrane fabrics, which opens a new way in structure designing in the urban public use space. This is indispensable to improve citizens' health and to clear the atmosphere from nitrogen oxides or the volatile organic compounds.

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PERSONAL SKY EQUIPMENT FOR INHABITANTS OF BIG CITIES: ENVISIONING AN EVACUATION SYSTEM TO REDUCE DISASTER 'S IMPACT DURING THE CLIMATE CHANGE ERA

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ABSTRACT

The 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 problem of natural disasters and hazards during the climate change era and human beings react to them. The second part presents, among others, results of the research program undertaken at West Pomeranian University of Technology in Szczecin by authors. The program is focused on adaptive built environments and envision new solutions based on advanced digital technology. Presented design contains a systemic solution the problem of disaster security in high-urbanized areas. This is a proposal of active infrastructure to reduce disaster's impact to urban environment through using personal flying evacuation equipment and safe landing site. The conclusion emphasizes the significance of integrated approach to design i.e. interdisciplinary collaboration between architects, structure, material and environmental engineers. Preventing loss of life and mitigation of damage is a challenge for coastline communities. The methods of solving the "tsunami problem" hold inherent social issues that make planning for disaster a complex problem requiring structural engineering and architectural design directing attention to the solutions. This study highlights the problem of coastal societies and serves as a useful background for further research on the possibilities of redefining sustainable and human friendly design.

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RAINWATER IN ETIOPIA AS A NEW ENERGY RESOURCES: A NEW APPROACH TO SUISTAINABLE DEVELOPMENT IN THE MOUNTAIN AREA

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ABSTRACT

Rainwater harvesting can be not just the process of collecting, moving and the storing of rainwater for future use in the domestic area, offices or in the garden. Water collection can also be a process that can be used as one of the renewable energies sources. Ethiopia is the country where the rainwater in the mountain area is between 1270 to 1280 mille meter per year. Small-scale settlements integrated with irrigation technologies, especially micro irrigation, are still relatively new in Ethiopia - especially in connection with energy generation. The first part of the paper a water problem in Ethiopia is presented. Though the country's highland has excessive rainfall, its poorest harvesting method and improper water management challenges development of the society in their activity toward poverty alleviation. In other way when there is heavy rainfall that the Ethiopian highland exhibits, there is the downstream rivers pollution and soil degradation with turbidity that challenges the aqua lives. It also hurts the existing limited number of hydro power reservoirs those generating the hydropower for major cities in the country. The second part presents result of the research program undertaken at Wollega University with co-operation with the West Pomeranian University of Technology in Szczecin by authors. The program goes on to attempt to solve the problem through application traditional and new technologies. This study highlights the use of rainwater and the formation of terrain to generate energy for human settlements in mountainous areas. In conclusions emphasizes, If the implementation of water and energy resources development projects will be really successful, significantly to ensure food security, vegetables and other cash crops will be produced to increase incomes and improve nutrition, and the burden of women in collecting water will be reduced. A virtuous cycle is then possible to increase food. That the research program will force architects, engineers and urban planners to revise and redefine contemporary design process and understanding of sustainable design.

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HOTELS' DESIGN AND THE ENVIROMENTAL CHALLENGES

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ABSTRACT

Hotels are considered as the entire world pass through their doors. Hotels are not only a commercial establishment that providing lodging, meals and guest services and classified into stars' categories, but also should have new artistic designs and services which make the working with hotels' design many insight and new vision in what the client actually needs to create ways for using the designer's latest concept and considerations to stay on the technology today and tomorrow and to make interactive places that bring the guests into creative and success designs. Hotels operations vary in function, size, cost, and structure. Most hotels have set industry standards to classify hotel types, Hotel design has an important role in sustainable development that includes all the types of commitments to mankind; every hotel faces at its level the main: current environmental issues, water consumption, building heating, household and industrial waste management, and site preservation, in addition hotels can represent many environmental practices and solve some social issues, which all should be considered in the hotels' design This paper aims to develop the hotels design to become more effective and attractive by focusing on the challenges that hotels face to reflect the people's needs, provide exploring new technology and new lifestyle with green future design. The research will focus on illustrate the different types of hotels, its categories and standards, analysis for case studies and suggest environmental challenges that create ways to use the concept hotels' design and consideration with sustainable development for more effectively and enjoyable hotels' functions, Thereafter, the study ends with important conclusions & recommendations.

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MULTI-FAMILY BUILDINGS - ARCHITECTURAL TRENDS OF THE LAST THREE DECADES IN POLAND

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ABSTRACT

During last almost three decades' architecture in Poland is developing in a very dynamic way, some Polish new projects became famous and have won international competitions (e.g. sport arenas in Warsaw, Gdansk, Art Garden in Cracow, Philharmonic Hall in Szczecin, Cultural Centre in Szczecin, Opera House in Bialystok, etc.). But in the transformation period in Poland we can find also many significant examples of housing architecture as well one family houses as multi-family (residential) buildings. In the article the author is taking the trial of synthetic analysis of the evolution of multi-family buildings architectural forms in Poland after 1989. Based on the analysis of a few hundred housing projects, the author indentifies the main - in his opinion - trends of creating the forms mentioned above, ideas of design these buildings and elements of their architecture – the architectural game. The author used the following methods during the research - case studies analysis, made in the chronological way, which was predicted by collecting materials, identification of new concepts using the analysis of architectural composition of elevations and details. As the result of research they have been identified following trends and styles as the most important: creative pluralism, traditionalism, postmodernism, new modernism, architectural game of elevation details, concepts - "idea of the form". These trends create a kind of evolution line corresponding chronological development. The research proved that the quality concepts of architecture of multi-family buildings in Poland in the mentioned period of time increased very much and now they represent high quality European level. Some of Polish housing projects realized during last 28 years became famous, for instance "Marina Estate" and "Eko Park Estate" (in Warsaw) by APA Kurylowicz Office, "Corte Verona" (in Wroclaw) by Lewick & Latak Office, Zlota 44 high rise apartment building (in Warsaw) by D. Libeskind, Wstega Warty (in Poznan) by J. Gurawski, P. Cieslak Office have been marked in the history of Polish and European architecture. Presented in the article creative attitudes and projects are not the closed list, they will be developed and completed during next research.

The work was carried out at the Faculty of Architecture Bialystok University of Technology in the frame of statutory research number S/WA/2/16.

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"GREEN" PODLASIE OPERA AND PHILHARMONIC IN THE CITY OF BIALYSTOK: CONTEXT - IDEA - ARCHITECTURE

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ABSTRACT

Podlasie Opera and Philharmonic in Bialystok was created as part of the project called European Centre for the Arts. It was located in the place of the degraded amphitheatre and became one of the most interesting public building realized in Poland in the beginning of the 21st century. The new building of the Podlasie Opera was being constructed during 2005 - 2012. The general designer of the whole complex was studio of Marek Budzynski Architect. The author of this article has taken the trial of using a kind of parametrical methodology analysing urban composition, architectural concept and sustainable aspects of the new Podlasie Opera House. A context of the location of the new building is very important - the religious hill and the small Orthodox Church of St. Maria Magdalena's, ancient cemeteries: Orthodox and Jewish, contemporary Central Park - the city centre of Bialystok. The first project contained of the building of the opera, the multi-screen cinema and an underground parking. The project was based on 3 ideas – the idea of Hope and Co-existing, the idea of the axis of the Podlasie Art. And the idea of the Tradition. In the Project of the new Opera we can see many ecological aspects: omnipresent greenery - plants on elevations, poles, roofs, introduced on a few different levels. The New Podlasie Opera and Philharmonic is the example of new tendency in the architecture of 21st century. We can call it New Romanticism or Modernist Romanticism. Other critics situate the style of the new building between the classical postmodernism and the individualistic postmodernism. But for sure we can see here the connection of culture and nature using the architectural art. Also the synthesis of opposites, synthesis of the tradition with the modernity, integration of architecture and the landscape.

The work was carried out at the Faculty of Architecture Bialystok University of Technology in the frame of statutory research number S/WA/2/16.

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ISSUES OF CONTEMPORARY SOCIAL HOUSING PROBLEMS NOWADAYS

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ABSTRACT

Social housing is nowadays more connected to economy and politics than issues related to designing and architecture. This discrepancy is a problem of the modern philosophy of designing housing estates and social housing. The concept of housing and social housing as well as its axiological elements, resulting from its program content and guidelines seem to be an inspirational basis for solving contemporary problems of shaping the housing tissue in the postmodern world. An important goal is to strike a balance between social, economic and political issues. This particular balance can be reached by designing solutions leading to eliminate or decrease the "uncertainty" of the existence of local communities, including the possibility of creating and providing jobs in the broader sense of social participation. The above reflection is connected with the philosophy of designing public estates and social housing in Poland as well as in Europe. What is more, it seems that postmodern societies require the creation of new programming conditions, housing standards and housing estates. Architectural and urban planning solutions for buildings / social settlements currently implemented in Polish conditions are preliminary in nature. The search for functional and program solutions as well as formal and aesthetic solutions is in progress. In addition, in the design of buildings and social housing estates, the eco-energetic postulate gains importance. Global warming, which in the perspective means a civilizational disaster in the world must find its reflection in the search for new solutions in the field of design, including, and perhaps even primarily in the design of buildings and social housing estates. Such solutions can ensure not only the right quality of housing and housing developments, but also generate additional jobs related to eco-energy. According to the above, it is necessary to create new design concepts.

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REVITALIZATION PROPOSALS FOR GREEN INTERIOR COURTYARDS IN THE HISTORICAL CENTRE OF TIMISOARA (ROMANIA)

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ABSTRACT

The historic district “Cetate” is the greenest district of Timisoara, with a 52% coverage of green areas, due to the presence of parks and green banks of the Bega River. The “City of roses” or “Little Vienna”, as the city of Timisoara is known locally, has gotten it`s names from the abundancy of greenery and flowers that used to embellish the urban landscape, private gardens and parks, as an important part of the urban identity. Nowadays, along with the constant development of the infrastructure and retrofitting projects proposed by the municipality, there is a constant deteriorating situation of the overall vegetation ratio as well as a lack of maintenance on individual plots. Consequently, mineral and non-permeable surfaces, which are easier to maintain, dominate pedestrian areas and interior courtyards, detrimental to the presence of urban vegetation. Beginning with the study of the main advantages of greenery in the built fabric near daily activities, the paper emphasizes urban, social and architectural aspects as well as building and human health, using selected design criteria inspired by Active Design and Biophilic Design, both concepts that aim to bring people closer to the natural environment. The selected French case studies aim to show examples of good practice and helped us furthermore develop the investigation. The second step was the on-site analysis of several interior courtyards highlighting their weaknesses and potential to develop for a better social and functional connection. Courtyards with a problematic state concerning the presence and use of greenery were the ones that inspired us to proceed to the presented proposals. The methodology was based on the analysis of Timisoara`s local masterplan for the identification of new developmental directions and the potential of our proposals to align with these and enhance connections between city life and nature. The Green Space Factor served as an actual validation for the quantity and quality of existing and projected vegetation. Four different situations were chosen for development and further study and helped draw conclusions on the greening potential of interior courtyards in central neighborhoods, as well as the most advantageous vegetative systems for the various types of spaces.

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ANALYSIS OF THE ACOUSTIC PARAMETERS OF THE MARIA ZANKOVETSKA THEATRE IN THE LVIV BEFORE AND AFTER MODERNISATION OF THE AUDIENCE

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ABSTRACT

The building of the Maria Zankovetska Theater in Lviv was founded in 1837-1842. In the years 1941-1944, as a result of damage to the building structure, the building was partially reconstructed. In place of four balconies with boxes, two balconies with amphitheater arrangements of the audience were built. Currently, the audience has 799 seats, including 531 on the ground floor and 268 on two balconies. Renovation work carried out in 2017 included the replacement of worn-out armchairs and the renovation of the floor. Previous chairs were covered with thick upholstery made of seagrass and velor. Newly mounted seats also have thick layers of upholstery made of PU foam covered with velor. The aim of the research was to analyze the acoustic parameters of the theater's historic interior before and after changing the armchairs. The article presents the results of acoustic parameters measurement of the hall without spectators before and after modernisation. The measured parameters were used to calibrate the numerical model of the hall. Next, the acoustic analysis was carried out. The reverberation time T20 and the speech transmission index STI were calculated and used to assess the hall acoustics with spectators. A comparison of the results showed that after installing new seats in the theater the reverberation time values for medium and high frequencies decreased, while for low frequencies they increased. In turn, after replacing the seats, the STI values increased. The obtained results showed that the most important impact on the acoustic parameters of the theater is provided by upholstered armchairs with high sound absorption, which is related to their construction, thickness of the upholstery as well as their quantity and arrangement in the room.

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A COMPARATIVE STUDY ON STRUCTURAL ANALYSIS OF HIGH-RISE BUILDINGS

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ABSTRACT

With the developing technology, the high-level structures provide innovative solutions that enable many functions to coexist together. In addition, high-rise buildings are an advertising tool for countries, cities and large companies to show their power and prestige. From their design to operation, these structures take place in the city skyline with their advanced technology. Formerly human's life was near to nature, which human beings have been accustomed for centuries. However today, they have been tried to rise their structures with the help of developments in technology, construction techniques and with the limitations brought by urbanization day by day. These structures, which are defined as multi storey buildings in the literature, have taken the name of skyscraper together with the desire to reach higher and higher. As technology has advanced, the desire to build higher has brought different structure system solutions and proposals. In this context, the investigation of the positive/negative effects of these structures to the function of the structure, which are the new living spaces of people, constitutes the main point of the study. It has been found that the functions are limited and the spaces cannot be used efficiently in the structure system solutions of the prestige buildings in this study. With the development of the construction materials, it will be provided that hybrid or steel construction system buildings formed by taking advantage of the steel structure with slender columns and beams. Thus, creating a more flexible and efficient use of interior spaces of extraordinary forms can be designed.

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A SWOT ANALYSIS OF PERFORMANCE BASED OPTIMUM BUILDING ENVELOPE DESIGN METHODS

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ABSTRACT

Nowadays, Turkey is a country largely depends on foreign country for their sources and also faced with a energy demand that continues to be above the average of world. In this content, the importance of energy efficiency in the agenda increase in terms of provide ensuring security of energy supply for Turkey. Nevertheless, the building sector, where very high levels of energy consumption continues to develop. Digital technologies provide opportunities to meet this requirement with its digital data format and operation method supporting all project stages. When remark to the importance of designing the process directly in the architecture instead of the final product, "Performance-based design" offers schematic and productive point of departure by providing maximum benefit from digital technologies and understanding that sustainability is whole factors and results. The use of digital technologies (BIM) optimizes all of the "better", "lighter", less energy, and more everything in performance-based design. The most effective role of building envelope design methods with regard to realization of energy targets is solar energy because it is easier to applicate structure than others, and at the same time the technologies that are produced in this field develop and spread rapidly. For this purpose, when the samples which the configuration depending on the angle of the sunlight for building envelopes for the maximum efficiency in energy save or gain are examined, it is determined that three methods are used. In this context, it is aimed to identify the Strong, Weaknesses, Opportunities and Threats aspects of the current building envelope design methods by SWOT analysis. Thus, how the strengths of the methods and opportunities are assessed, how the weaknesses are translated into strengths, and what can be done to remove constraints is researched. According to SWOT Analysis, the third design method has been concluded that the optimum solution in other design methods with is three potential factors and one problem. However, in all three methods, the common problem is ignoring the shadow creation situation of adjacent buildings in designs in built environment and the risk which an effective optimum solution of the probability of reaching in terms of energy. In this context, the third design method, which is determined as the most appropriate method is proposed to be used together with the Solar Envelope method, so that an optimum solution should be reached considering the potential of creating shadows on the building designed for the surrounding buildings.

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GREEN ARCHITECTURE AND SUSTAINABILITY IN MEANINGS OF TRANSFORMATION COMPLEXITY PROCESSES OF BUILT URBAN ENVIRONMENT IN JORDAN

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ABSTRACT

Complexity of transformation processes in urban and architectural reality in Jordanian cities is increased from spectrum and invisible elements caused from the difficult and irrational understanding of their evolution. This difficult approach, when dealing with this issue is highlighted from the difficulty to introduce physical and sensible proposals. Partially, the low level of technical requirement's definition causes this difficulty. Technical requirements at levels of building performances and at level of urban design is needed to provide innovative techniques and innovation visions able to modify the contents and practices in related projects in a deepen review. Attentions on relationship between technological elements and design choices are absent. There is a necessity to deep elements of research that contribute actively on how innovative visions could produce different approaches and create new thinking logarithms. There is a real necessity to have an integrated vision of the role of technology of architecture and its effects on [both]: urban and architectural design in the reality in exam. Highlighting development scenarios among; a "new availability concept" of materials, energetic resources and regenerating urban obsolete buildings by requalification and use changing. Incorporating adaptive behaviours, introducing elements of dynamism in the architectural and urban requalification, making them more connectable. Promoting the use computer simulations and assessments based on new urban modelling methodologies in design process as the tool which allows their reinterpretation, firstly, thin reducing their environmental impacts among the active sustainable choices. These issues are even more critical when observed within the target of the recovery of existing building and in urban requalification, as in our case, where the interaction between obsolescence processes of existing and the use of new materials presents many challenges. The technological compatibility must be considered, as well as technical solutions and as interactions between formal and expressive issues and urban-architectural transformation needs.

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ARCHITECTURE INSPIRED BY NATURE: HUMAN BODY IN SANTIAGO CALATRAVA WORKS, SOPHISTICATED APPROACH TO ARCHITECTURAL AND STRUCTURAL DESIGN

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ABSTRACT

In architecture, Nature has always been a perennial source of inspiration – both in architectural writing as in architectural design. This paper explores the architetcure of 20th century, especially the Santiago Calatrava's works that were inspired by the human body. Calatrava (born 1951) inheriting the achievements of the art of engineering, like his significant predecessors: Robert Maillart (1872-1940), Pier Luigi Nervi (1891-1979), Eduardo Torroja (1900-1961) and Felix Candela (1910-1997), goes far beyond their approach. His displaying the beauty that often comes with metaphorical captures of structures of flora and fauna or animal skeletons, as well as the static and dynamics of the human body, his movements and gestures. These references to the forms of Nature, their shape and dynamics, are easily recognizable in his works. Santiago Calatrava's artworks are the significant architectural and engineering heritage of the twentieth century. The first part of the paper presents (briefly) concepts imitation and mimesis within Western traditions of aesthetic. Selected research results on methods and techniques in architectural and structural design developed in 20 th century such as: Antonio Gaudi's (1852-1926) experiments with a centanery chain and the gravity law, Buckminster Fuller's (1895-1983) searching for the geometry of Nature, Otto Frei's (1925-2015) experiments with minimum surfaces, as well as current digital technics of imitation processes form-finding in Nature also will be presented. The second part of the paper deals with a human body as a source of inspiration in architecture and structural engineering. This part is focused on Calatrava's works among others: Telecommunications Tower in Barcelona (1989-1992), TGV railway station in Lyon (1989-1994), L' Hemisferic in Arts and Sciences Center in Valencia (1997-2001), Turning Torso in Malmö, (1999-2004), TGV railway station in Liege (1996-2009). In conclusion, the paper emphasizes the usge nature as a model, measure and mentor to solve problems in architecture which opens a new way in architectural and structural design. The transfer between natural forms and synthetic constructs is desirable. Calatrava understands that when he treats engineering as an art of possibilities and is for a new vocabulary of forms, which, although based on technical knowledge, is not a praise of the engineering alone.

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SWOT ANALYSIS OF BIOMIMICRY FOR SUSTAINABLE BUILDINGS – A LITERATURE REVIEW OF THE IMPORTANCE OF KINETIC ARCHITECTURE APPLICATIONS IN SUSTAINABLE CONSTRUCTION PROJECTS

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ABSTRACT

Biomimicry is a term to explain the use of genius in nature. It basically aims to use of resources in the most effective manner while satisfying human needs. Likewise, kinetic architecture implementations and biomimicry both tend to imitate the excellent mobility of nature and kinetic architecture implementations are somehow investigated in biomimicry studies. These two inspirational concepts of nature nested each other and were integrated over time contributing to the development of sustainable building system design. However, integration of biomimicry and kinetic architecture is essential to explain sustainable buildings and their certification systems. There is still lack of knowledge in the construction industry in terms of kinetic architecture and biomimicry practices since the concepts are dynamic and perceived to be complex by the industry practitioners. Moreover, traditional structure of the construction industry considering short term profits and project based nature makes these concepts even more challenging for the projects. Hence, it is essential to apply strength, weakness, opportunity and threat (SWOT) analysis in biomimicry and kinetic architecture implementation so that construction industry practitioners might conduct projects more effectively and satisfy project requirements in sustainable building projects. Therefore, this study adopts SWOT as the research methodology and aims to guide construction professionals to better understand these concepts. Within this perspective, this study proposes five major strengths, namely the effective use of energy, higher prestige level, climate adaptation ability, enhancing comfort and higher rental costs, where weaknesses are higher initial and maintenance costs of dynamic systems, newly developing systems accommodating unknown risks, lack of coordination among different professional groups, special production requirements and complexity in design. Moreover, five major opportunities and threats are suggested as top management support, sustainability as a firm strategy, technological improvements, the increase in demand for environmental friendly buildings, government incentives are opportunities; lack of experienced stakeholders in dynamic systems, system failures, difficulties in project financing, materials not complying with standards, and market conditions, respectively. The study is expected to reinforce the link between the design and construction processes to apply the above-mentioned concepts in sustainable buildings.

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ECOLOGICALLY SENSITIVE EVENT SPACE IN URBAN LANDSCAPE

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ABSTRACT

The paper describes the condition of public space in cities in the face of climate change. To play the role of social integration, cities must have an attractive public space that activates people. The starting point for the conducted research is Bernard Tschumi theory of „event cities". According to Tschumi, architecture is a discourse about the spaces and events that take place in it. In this theory, the essence of space is to animate the movement and actions, which strengthens the social and political dimension of architecture. Today, we often encounter the crisis of urban space, which is unattractive, unhealthy and does not favor the activity of the inhabitants. Environmental changes have a significant impact on this fact. The aim of the research is to present the possibility of using architectural events in the process of improving the space quality and the microclimate prevailing in it. According to the research results, ecologically sensitive pavilions may play an important role in this context. Problems of water shortage, air pollution and temperature rise are taken in many pavilions in a practical way. Temporary pavilions become in this sense a field of scientific experiments, indicating the possibilities of using new proecological solutions in the city. The aim of the research is to classify this type of examples. The selected examples were divided due to their role, technologies used, as well as the relationship with city space. According to the research results, these objects can perform a number of functions in the urban space. They stimulate social relations, play an educational role, improve the climate in the city and make the surrounding space more attractive. An important common element of these facilities is the use of renewable energy and a zero energy balance. The presented examples lead to the conclusion that pavilions can play a significant role in improving the quality of contemporary urban space.

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OPEN LIVING SPACE CONCEPT IN BARN-HOUSE ARCHITECTURE: SINGLE FAMILY HOUSE CASE STUDIES

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ABSTRACT

'Barn house' architecture can be presumed as a style or trend in contemporary architecture. The term 'barn-house' refers to a house that architecturally refers to barn with a simple, longitudinal form with pitched roof. Originally, barns were converted to houses for practical reasons. Later on, the design aspect was getting more important and any house or any barn were not enough and so it turned to be a style whic can be describe as 'designed barn-house'. The idea appears to be well recognised: many built houses and house designs represent that style. Also, several online blogs on that subject have been created and published dozens of examples. We may presume that many contemporary architects have either already designed or are aware of designing a barn-house. The reason for that is mostly simplicity of the architecture, and lack of details which are common in contemporary architecture. 3 case studies of barn-type house designs have been presented in the article. All of them have been designed by the authors. All the concepts were designed using synthetic models: physical and virtual. The open space concept can be recognized in all the three case studies: interior layout seems to be more important than the exterior in that kind of architecture. The authors conclude that some uniform rules can be recognized in barn-type architecture design. However, many concepts have gone far beyond the original barn-house idea. The question is whether that trend can be presumed as distinctive?

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EFFECTS OF CURRENT SUNLIGHT EXPOSURE REGULATIONS ON NEW HOUSING

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ABSTRACT

Building new living spaces is one of the most profitable and emergent industry in Romania, the European country with the greatest percent of private apartments. This is (still) a consequence of a former restrictive political regime (the communism) regarding the national housing politics with its standard prefabricated living units arranged in closed patterns. The political changes that followed after 1989 meant also specific legal regulations in the construction field, concerning all aspects needed to have more comfortable buildings, especially for living. Main aspects such as: land occupancy percentage and usage coefficient, adaptability for people with disabilities and elevators, orientation, sunlight, green and parking spaces are treated in different legal acts, sometimes contradictory between them. One of the most difficult act to follow, especially in the narrow urban spaces, is the latest Order from Ministry of Health (no. 119 from 2014), regarding public health standards for the living environment of the population. This norm defines that any new building should ensure at least 1 ½ hours direct sunlight (through exterior windows) during the winter solstice for all bedrooms and living rooms of the new building as well as for all the neighbouring ones. Above this, if the distance between the neighbouring buildings is smaller than the height of the tallest one, a sunlight study must be done to prove that the required direct sunlight is possible. This paper aims to show that these specific restrictions will have a major impact on new urban living spaces in the near future, because there are lots of situations given by site conditions or neighbouring buildings in which planners of new constructions will not be allowed to place living spaces on two or three facades (those from the North and partially from the East and West). This is a challenging limitation for urban planners and architects, especially given the new climatic environment which makes southern bedrooms quite uncomfortable during summer. By studying some examples from Romania that respect this controversial article, compared with other European cities with an emerging housing industry, the scope of this study is to find solutions both comfortable and urban possible.

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A CLASSIFICATION STUDY ON KINETIC APPROACHES IN NATURAL INSPIRED ARCHITECTS

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Today's technological developments affect and change the needs of people, their way of life. Given the developments in building production technologies, interaction between disciplines has increased with the impact of technological developments in the production of architectural form, building production and building use process. With this increasing interaction, design approaches such as biomimesis and kinetic have gained importance in the field of architecture. Biomimesis is based on the intersection of science and biology; kinetic architecture is a collaborative field of science such as electrical-electronics, mechanical, civil engineering. The common aim of using these interdisciplinary science branches in architecture is; changing needs, adaptable and sustainable solutions that enable people to meet their needs at the optimum level. In this context, it is aimed to make a general classification on the kinetic approaches in architectures using biomimesis in this work. In scope; biomimetic and kinetic design approaches are limited to 'movement in nature' and 'movement in architecture'. In the method, the concept of "biomimesis" was firstly handled on the basis of the literature and the movement types of the living creatures in the nature were investigated and grouped. Later, the concept of "kinetic architecture" was explained and the development and change in the historical process were examined with examples. In the field study, the classification of "kinetic" systems in nature and architecture has been done separately on the basis of the literature and the correspondence of movement types in nature and architecture has been put forward. In the last part, classification studies and groupings were compared over three biomimetic and kinetic design approaches. In the conclusion section, the biomimetic and kinetic properties of the samples were determined and the movement types of the structures were grouped according to the classification study. As a result, it can be seen that designing environmentally, ecologically sustainable buildings that offer more optimal solutions by increasing the interaction of biomimetic science with other branches of science, such as kinetic, with the help of the advantages of the development of technology in new designs to be built outside these buildings can be an inevitable result. It is anticipated that architects' knowledge of this design data will open up new horizons in new designs.

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APPLICATION OF THE TRIANGULATED IRREGULAR NETWORK (TIN) METHOD IN THE CREATION OF MODELS OF HISTORICAL BUILDINGS

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ABSTRACT

Renovation or modernization of a historical building involves creating its model. An accurate 3D representation of a building can be used e.g. to analyse the possibilities of renovating or recovering its damaged elements. This paper discusses examples of how helpful 3D laser scanning can be in creating models of historical buildings. This technology is of particular importance when it comes to representing decorative architectural details. To create a 3D image of a building using reverse engineering one must first gather on-site data by means of terrestrial laser scanning in the form of a point cloud. This paper describes the process of creating a model of a historical building by means of the TIN method using Leica's Cyclone programme. The on-site measurements were taken using a ScanStation C10 scanner, also by Leica. 3D data obtained by means of a laser scanner is highly accurate and, therefore, this method is becoming increasingly popular in reverse engineering. Compared to the volumetric method, TIN modelling offers high precision and is very effective in representing the structure of an object's surface. This is primarily related to the distances between particular points and their number. In addition, it provides for the possibility of superimposing on the triangular network and the point-based model a texture based on pictures taken by the scanner and giving it a natural colour. A triangular network can be applied in the case of objects of more or less complicated shapes. However, if a very precise image of a model is required, a better solution is to show it as a point-based model. Irrespective of the method applied, the generated model is generalized, as some details are invisible. Hence the importance of accuracy and quality of the data obtained in the course of a field research. It is important to select such parameters as to ensure that the resulting point cloud has the right density to be used as a basis for representing damaged elements in a virtual space. A digitized object can be exported to a CNC device software (Computerized Numerical Control), which can create a very precise, physical copy of a damaged object to replace it.

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ANTICIPATION OF CONTEMPORARY SACRED BUILDINGS - NEW DIRECTIONS IN DESIGNING OF SEMANTIC ARCHITECTURE

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ABSTRACT

The topic of this article are issues related to the realization of the recommendations of the Second Vatican Council regarding the realizations of sacred objects. Explorations of new liturgical systems can be seen in the pre-Council realizations. The documents of the Council, and a general introduction to the Roman Missal of 1969, and above all the Constitution on the Sacred Liturgy formulate new rules of the liturgy. In the introduction to the Roman Missal it is said that the Christian church is both the house of the God and of the God's people. The times now, sometimes called post-modern or post-modernist, are characterized by diversity and pluralism of views, thoughts and ideas. The rapid flow of information, which results in a multitude of forms and solutions, significantly influences the sacral architecture. For this reason, the criticism of modern architecture meets multiple difficulties. Kłosiński notes that "for the first time at such large extent extreme opposite currents exist side by side. [...] The paradigms of total freedom, liberalism, tolerance and pluralism, supported by technical capabilities, cause unprecedented ambition and power with investors." A similar phenomenon occurs in sacral architecture, which is a unique creative activity. It refers not only to material needs, but above all to the spiritual ones of a man. An interesting and new phenomenon in the field of sacral architecture is the search for new forms of objects stemming from the elements of the Christian liturgy. At the same time, objects are built with a central, longitudinal or mixed layout. The setting of the altar, pulpit and baptistery largely determines the interior. The conciliar recommendations opened the way to creativity, not giving the developers any obligatory layout. The conciliar guidelines emphasized the Christocentric character of the interior. They indicated that there must be one altar in it, which is the chief element of the sacred space. The interior of the church should be designed in such a way as to allow all the faithful to participate in the sacrament of the Eucharist. What is important is the community of the faithful, thanks to which the people have the opportunity to meet with God. The space must be open to the dynamics of the liturgy, which is variable in time and space. The liturgical movement, conciliar recommendations and changes related to advances in building technologies, opened up a new way for designers of the architecture of churches. The new liturgical space exploration resulted in a variety of architectural solutions even before the Council - especially in Germany appeared churches with a central plan. Currently, we have plenty of examples of a variety of spatial exploration. The analysis of contemporary sacral buildings for the adequacy of solutions is a difficult task, because we are currently in a time of change and time of implementing the recommendations of the Council. Too short perspective allows only for a summary and forecast for the nearest time. The newly emerging sacral buildings, in which the spatial arrangement is the essence of the idea, clearly denote looking for new solutions.

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THE RESEARCH FOR A LANGUAGE – ÁLVARO SIZA IN BERLIN

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ABSTRACT

One City, one international exhibition of architecture, one neighbourhood and one project all closely connected. The City is Berlin, the "*Internationale Bauausstellung*" means international architecture exhibition; Álvaro Siza Vieira is the project architect located in the Kreuzberg neighbourhood. Berlin is a city built in parts, but also thought by parts. With the IBA, still in the years of the Wall, Berlin has been a place of experimentation on the idea of a European city. It was in this context that Álvaro Siza was called on several occasions; the first ones out from his Portuguese experience. Siza built in Berlin-Kreuzberg a building usually considered a tribute to the Modern Movement. In spite of his organic influences, there is in that building a look for another strand of the city history of architecture: to the reflections of rationalist language. For Siza, Berlin has become an occasion to deepen a research on the relations applied to the rationalist language. The present paper tries to find the way to look the radicality and vitality of the building "*Bonjour Tristesse*" that has taken the challenge of collecting the remains of rationalism in order to create a new formulation of the rational strand - new rationality.

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METHOD FOR PARAMETRIC SHAPING OF ARCHITECTURAL FREE FORMS

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ABSTRACT

A method for parametric shaping innovative architectural free forms of buildings is proposed. Innovativeness of the method results from shaping warped shell roofs made up of plane steel sheets folded in one direction and connected to each other along their longitudinal edges to obtain a plane strip. The strip is transformed elastically into shell roof. Attractiveness of the designed architectural free forms is increased by means of oblique plane elevation walls. There are important restrictions related to geometrical and mechanical properties of the effectively transformed sheets used for shell roofing and glass plates of plane-walled elevations. 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. The method assists the designer in searching for innovative, diversified architectural forms of buildings and construction systems dedicated to these forms. The method allows for architectural integration of various elements of the designed building including shell roof, flat-walled elevations, elevation patterns and structural system into one coherent and integrated spatial free form. The proposed parametric description of the position and shapes of the above elements enables free shaping of dependent and independent variables, and relations between these variables so that the designer gets a tool for classifying, grouping, comparing and distinguishing architectural forms of the designed buildings. At the same time, the possibility of assigning intervals of values of the above independent variables and relations to the above mentioned groups and the assessment of the suitability and originality of the created forms is obtained. The method is focused on the use of computer technology that implements the aforementioned concept and parametric description. It is relatively intuitive and requires the designer to be able to use logically spatial reasoning and organize the three-dimensional space employing simplified models for engineering spatial objects and their constructions.

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SHAPE TRANSFORMATIONS OF PLANE FOLDED SHEETS FOR SHELL ROOFING

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ABSTRACT

The major purpose of the paper is to point out that big shape transformations of nominally flat, thin-walled folded sheets having open profiles are possible. Principal boundary conditions can be defined for the transformed sheets, by means of the number, position and curvature of roof directrices, including intermediate members. Next, we should exploit the opportunity to rationalize their natural boundary conditions. As a result, the sheets, in particular their individual folds, can perform a function of members, stiffening elements and bracings, or may only constitute a cover for roofing. The own research and created exact numerical, thin-walled, folded models for transformed sheet are used: 1) to qualitatively and quantitatively define functions provided by shell folds in the construction of a roof and even entire building, 2) to examine such wall areas, and especially their edges, which are difficult to be recognized with the help of the traditional methods, for example the ones using mechanical strain gauges. The paper proposes an innovative, consistent description of the essential shape and mechanical changes of T85 x 0.75 profiles up to 5.0 m long, which are caused by initial big shape transformations. Next, a description of the impact of the above changes on the folds under the characteristic load is presented.It is also presented a way to shape a simplified smooth models for transformed folded shell strips of sheets connected one to another along their longitudinal edges, which can be used in the process of engineering structure design. Based on the curvature and mutual position of roof directrices as well as the recognized geometrical and material properties, they are defined, rulings modelling longitudinal edges of shell roof folds. A sector of warped surface modelling the roof shell can be shaped on the basis of these rulings. The presented research results indicate the necessity to perform further research in a much wider scope, i.e. experimental research, theoretical analyses, numerical models configured appropriately for diversified shapes of various profiles. The research should also be aimed at optimizing shape transformations, strength, stability, support, and stiffness of the shell as well as co-operation of shell folds in a roof. These results are systematically included in the innovative method of shaping of free forms and constructions of roofs and entire buildings. However, the method is not involved in the submitted paper.

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FREE FORM BUILDINGS ROOFED WITH TRANSFORMED CORRUGATED SHELLS

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ABSTRACT

Shaping innovative free form buildings with plane oblique elevation walls and roofed with transformed corrugated steel sheeting is presented in the paper. Reinforced concrete spatial frame and steel roof construction supported by the frame form structural system of the designed buildings. Corrugated shell roofs are made up of nominally plane sheets folded in one direction, connected along their longitudinal edges into one strip and elastically transformed into shell shapes. The attractiveness and innovativeness of the considered buildings is influenced by a relatively free shape of ruled shell roof, inclined elevation walls made up of glass panels and regular patterns on elevation walls created with the help of reinforced concrete construction of original shape. An additional advantage is the attractive contraction of shell roof modelled by means of a regular ruled surfaces. The paper presents the possibilities offered by combining reinforced concrete frame with transformed steel roof in terms of shaping diversified general forms of buildings, including various forms of roof and elevation walls. Effective use of the reinforced concrete structures in defining the free general building forms is associated with innovative shaping of untypical cross-sections of members, in particular corner posts and rims stiffening the roof eaves, and difficult placement of reinforcement rods in these sections. On the other hand, steel roof construction allows: 1) to shape curved skew directrices and elements fixing the transformed roof sheeting to the directrices in a simple way, 2) to simplify the required cross-sections of beams and columns of the reinforced concrete frame shaped.

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INCREASING CREATIVITY AND COMMUNITY RESPONSIBILITY THROUGH THE INTERACTIVE LEARNING AT THE SCHOOL OF ARCHITECTURE IN JORDAN

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ABSTRACT

This paper sheds light on the application of non-traditional methods during the teaching of architecture courses at the Jordanian universities, and shows its effect in refining the students' personality and increasing their community responsibility. The creativity in architecture depends on the ability to design a unique work that balances the architectural vision and the users' requirements. This comprehensive understanding of design raises many questions about the contribution of architectural education in the refinement of interactive thinking for the students of architecture - the architects of the future - and in the development of the students' sense of community to recognize the design process as a creative process that meets the needs of society. Therefore, it was necessary to develop some teaching methods in architecture and design that focus on the social dimension of the built environment. This paper aims to create interactive learning environments that empower the youth and enrich their personalities at the schools of architecture in Jordan. Traditional teaching methods based on memorizing and using existing media such as diagrams or pictures have proven deficiency in transferring the architectural knowledge from the teacher to the students, however, the proposed interactive methods will bridge the gap between theory and practice by encouraging the students to interact with the design environment and members of the community to understand their needs prior starting the design. In this research the concept of interactive learning is not limited to the use of the new interactive technology such as multimedia software, and Virtual Reality, but it is widening to include the notion of the human interacting with the designed environment by visiting the site, communicating with the users of the space, and enhancing the public participation.

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BRIDGING THE GAP BETWEEN ACADEMIC EDUCATION AND PROFESSIONAL PRACTICE THE MULTIDISCIPLINARY TEAM APPROACH IN ARCHITECTURAL EDUCATION

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ABSTRACT

Many schools of architecture focus on developing students' competence in the spatial and aesthetic aspects of architectural design, with less effort to inform them about the multidisciplinary nature of actual design in practice. The paper will describe the main disciplines that are often involved in the design and construction of actual projects, and will highlight the importance of informing architectural students about the complexities of design in practice. It is noteworthy that several activities take place even prior to commencing the design process. These are referred to as pre-design activities and include preparation of a building's program, economic feasibility, site selection, surveying, and geophysical investigation, which all involve experts and specialized inputs. However, the paper will focus on addressing the processes involved in design and construction. The main activities and disciplines involved in design and construction

Phases	Disciplines and entities Involved
Preliminary design	Civil engineering
Design development	Landscape architecture
Preparation of Construction Documents	Structural engineering
Administration of Construction Contract	Mechanical engineering
	Electrical engineering
	Plumbing engineering
	Specification of materials and equipment
	Cost estimation
	Material, equipment, and building contractors

All the disciplines and entities listed above are commonly involved in each phase of the development and realization of a building project. In addition, certain assignments such as hospitals, libraries, auditoria, and restaurants, predicate the involvement of special consultants. It is not suggested that architectural students would be groomed to perform any particular function or professional service other than architectural design. The architect though leads and synthesizes the work of all those involved in the process of realizing a building project, and needs to be able to converse intelligently and interact professionally with all those who are involved in the process.

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THE ORIGIN OF MODERN MOVEMENT IN ARCHITECTURE: IDEAL AND UTILITY PREMISES

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ABSTRACT

The rising and development of the Modern Movement in architecture has been so far widely dealt with in the specialist literature. In most cases, the focus was primarily on the valuation of creative achievements of avant-garde architecture. Such an approach seems to be one-sided considering that architecture has been usually a reflection of economic and social changes. The considerations in this article that focus on achieving success by avant-garde artists in architecture can also shed new light on the issue of shaping purist trends in this area in the second decade of the 20th century and in the following in the Weimar Republic, France, Great Britain and the United States. Revolutionary methods used by architects focused around the idea of modernity in architecture (dimensional coordination, prefabrication, unification, etc.) had not always brought positive results. Paradoxically, the main initiator of the first Congress of Modern Architecture ran design activity in the field of architecture without any special education (Le Corbusier, 1917-1923). What should be mentioned subsequently is the issue of social acceptance concerning the avant-garde art in architecture. The wave of common ostracism that accompanied it (instead of the expected understanding and acceptance) became an inducement for traditionalists. This statement, however, seems to be incorrect - the architectural designers' environment creating in the spirit of respect for tradition was in the 1920s and 1930s incomparably more numerous than avant-garde supporters. At the same time, in architecture, as in all other areas of human activity, modernization processes were constantly occurring. The first realizations of „modernity" supporters (especially in housing) revealed the lack of appropriate techniques and technologies. In turn, such an architecture seemed to be more interesting mainly in comparison to the historical one. The ideological discourse led by the avant-garde followers in architecture gradually began to differ from the opinions formulated by the users. Moreover, these creators aspired to overcome the „conservative" tendencies in architecture even despite the social demand and professional practice. Therefore, the author of this article propound a thesis that the revolutionary changes in architecture, both those initiated formerly by avant-garde creators as well as the contemporary ones, could be hardly regarded as proper or relevant.

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ARCHITECTURAL DESIGN AS THE PROCESS OF ELIMINATION

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ABSTRACT

In 1970s H. Rittel and M. Webber significantly contributed to the theory of design proposing new interpretation for architectural problems. As they aptly pointed out, architectural problems are distinct from engineering ones, particularly in how results are assessed, qualified, and ultimately supported within systems of criteria. These two researchers introduced the concept of wicked problems which may also be called unstable – unstable in regards to permanence of applied frameworks, of social reception of delivered results, which evidently may change in time and lead to reversing whatever previous evaluation established. The wickedness of architectural dilemmas lies therefore in an inability to formulate the optimal state of the project. Consequences of this kind of approach, whose validity has been proven since, have far-reaching implications. First of all, it means that architectural solutions may be accepted as sub-optimal, as a result of compromise dictated not by objective constraints, easy-to-define and based on logic. Second, it implies that it is extremely narrow to eliminate any particular alternative solution, because fluctuations of conditions not only make these conditions unstable, but also disable simple analogies in which quick reference of acceptance and rejection could be explored. Instead of narrowing cone of available options architects remain in limbo of unique, unrepetitive schemes and configurations without providing any kind of hint how close to acceptable state of the project designer is. Third implication turns the hierarchy of course of design – in opposition of typical engineering design management in which the process is itemized, iterated, and organized in clear logical loops, architectural design must, in order to avoid severe risks of failure, extensively implement holistic view of the project. Taking the above mentioned specific attributes of architectural design one can notice that elimination of invalid alternatives at any stage of design may be very challenging. Usually elimination of potential errors can be supported by raw implementation of case studies analyses, but in the case of architecture it requires much more sophisticated multi-criteria assessment. The paper will attempt to explore some aspects of the process of elimination of contextually faulty solutions exposing how otherwise (in other disciplines) objective evaluation of architectural proposal may be incomplete or completely wrong without early implementation of qualitative component. While quality related systems of values require mature data processing within design process it creates specific feed-back loop between qualitative and quantitative elements. This sensible balance is the primary source of elimination decisions in the paper. It will exploit complex urban-architectural design case to expose stipulated and applied elements of Meta-Design methodology.

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INTERACTIVE INTERIOR DESIGN SOLUTIONS IN HOUSING WITH MICROCONTROLLER SYSTEMS

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ABSTRACT

Maker movement that presents a life vision of people whom producing their needs also started to appear in the design of users' environment. Especially it is possible to plan smart interior elements and systems for the smart home concepts with microcontrollers that have user friendly basic interfaces like Arduino and Raspberry Pi. That situation also affects design process of the morphology and function of microcontroller based interactive interior spaces. Understanding the limits of the microcontroller technology for designing the interactive living spaces in the future is essential, therefore purpose of this research is examining the ways to benefit microcontrollers during interactive interior design process in housing for architects and interior designers Study analyses the morphology and the functions of the interactive interiors and elements in housing which designed by the Makers and proposes useful design methods for the professional designers. As a qualitative research, relational screening method has been used in this particular study.

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ARCHITECTURAL DESIGN OF BIG LECTURE HALL IN RELATION TO AIR CONDITIONING SYSTEM

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ABSTRACT

The paper is focused on architectural design of big lecture hall while considering the requirements of air conditioning system. Correct architectural design and design of air conditioning system is immensely important for students in the interiors of a university. Fulfilling CO_2 values is inevitable not only from physiological point of view but also for achieving the desirable students' performance. Good architectural design must enable to apply the optimal air conditioning system, which ensures acceptable CO_2 concentration. The high CO_2 concentration is related to incorrect and insufficient ventilation in the big lecture hall and causes students to feel distracted and tired. Experimental measurements were carried out in the winter season in 2016 in the big hall to evaluate the CO_2 concentration. The device Testo 480 was used for the measurements. Obtained values of CO_2 concentration are presented in the charts. Architectural design and mechanical ventilation system of the big lecture hall were evaluated based on the parameters of CO_2 concentration. The paper concludes on how to create a harmony between architectural design and design of air conditioning system in the big lecture hall.

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INTERACTION BETWEEN ARCHITECTURAL DESIGN AND REQUIREMENTS OF THERMAL COMFORT IN UNIVERSITY LECTURE HALL

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ABSTRACT

The paper is focused on the analysis of the interaction between architectural design and requirements of thermal comfort in a university lecture hall. Correct disposition solutions of university lecture hall will enable the provision of thermal comfort in the ventilation of university lecture hall. Ensuring the optimal parameters of the thermal comfort is immensely important for the students in the interiors of a university. Fulfilling these parameters is inevitable not only from physiological point of view but also for achieving the desirable students' performance. High CO2 concentration is related to incorrect and insufficient ventilation in the lecture hall and causes students to feel distracted and tired. Experimental measurements were carried out in the winter season in 2016 in the university lecture hall to evaluate the thermal comfort. The device Testo 480 was used for the measurements. Obtained values of air temperature, air relative humidity, air velocity is presented in the charts. Architectural design and mechanical ventilation system of the university lecture hall were evaluated based on the parameters of the thermal comfort. The conclusion of this paper presents the fundamentals of architectural design of university lecture hall in relation to designing the mechanical ventilation or air conditioning system.

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CONCEPTUAL APPROACH TO GEOMETRY OF COMPLEX FORM IN ARCHITECTURAL EDUCATION

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ABSTRACT

Knowledge of geometry often becomes main driving force of innovative morphology in architectural design. The new fields of geometry and mathematical models of complex dynamic spatial systems, provide a new approach to spatial modelling that should be investigated and applied in architectural design. Different approaches are possible, regarding on the one side theoretical background and knowledge of geometry and on the other advanced computational techniques. In this paper the role of geometry in architecture and architectural education will be analysed, regarding the application of the complex dynamic geometric concepts in conceptual phase of architectural design. Geometric reasoning is a process that involves perceptual, cognitive and logical structures of the human mind. Different natural, physical and artificial human-designed systems, could be studied on the basis of similar principles of their complex dynamics and organization. Studies of the properties of complex dynamic processes and their morphogenetic manifestations and abstracted patterns could contribute to a better understanding of the possibilities of applying equivalent principles in the architectural design. The introduction to architecture students with geometry of complex systems, not based on formal determination and digital morphological expression, but mainly on conceptual actuation of theoretical approach to complex dynamic geometric modelling and representation, could support better understanding of the complex dynamic formative processes in the first phase of design. Students should be introduced to the new kind of abstraction, based on compressed information instead of generalization, revealing ordered generative structure of complex dynamic spatial form, allowing parallels between top-down and bottom-up approach. The geometric model of a complex dynamic performance space, envelops continuity of varying degrees of complexity, as hierarchical multiplication of scale size and dimensions. Development of a nonlinear, dynamic, complex spatial imaginative thinking are in line with developing trends of contemporary computational design tools. Application of the complex geometric modelling, does not mean turning to a purely technological, digitally determined design and narrowly understood geometric formalism, but also integration with sophisticated mechanisms of human perception, intelligence and creativity, as a synthesis of artificial and human potential.

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ECOLOGICAL PROPERTIES OF GLASS FIBRE REINFORCED MATERIALS BASED ON ARCHITECTURE OF ZAHA HADID

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ABSTRACT

Since 1977 – the year of inventing a glass fibre reinforced gypsum – the progressive popularity of materials strengthened with glass fibre is noticed. Light, high strength resistant, manufactured in complex geometries at high tolerances, made from post-consumer recycled material makes it a perfect component of each dream, architectural project. Zaha Hadid was an exceptional author of GFRG and glass fibre reinforced concrete (GFRC) breathtaking objects. Her astonishing Heydar Aliyev Center in Baku (The Republic of Azerbaijan) ows its fluid form to GFR materials. Glass Fibre Reinforced Concrete (GFRC) and Glass Fibre Reinforced Polyester (GFRP) were chosen as ideal cladding materials, as they allow for the powerful plasticity of the building's design while responding to very different functional demands related to a variety of situations: plaza, transitional zones and envelope. These panels generate a single curving surface that appears to emerge from the topography. It rises, undulates, and wraps inward at its base to completely envelop the building's various volumes. Another magnificent project created by Zaha Hadid studio is a King Abdullah Petroleum Studies and Research Centre - a non-profit institution for independent research into policies that contribute to the most effective use of energy to provide social wellbeing across the globe. Adding an eco-friendly advantage gives this material a full right to be announced a superb brick of the future. GFRC Glass Fiber Reinforced Concrete contains materials that, taken from the soil, have no adverse effect on the environment. Concrete's components include Fly Ash, Silica Sand, Portland cement and aggregate. Providing cheaper substitute than concrete and bricks for construction and reducing the duration of overall construction and hence saving labor cost makes it a more and more popular building material in developing countries which suffers from low increase of housing estates. Throughout a thorough scientific research the author tries to confirm this thesis, although some disadvanteges of GFRC, such as lateral stiffness has been found. The architecture of Zaha Hadid represents a beauty and complexity of material reinforced with fibre glass, whereas its popularity in impoverished and developing countries such as India makes it a new kind of low-cost building element.

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FLEXIBILITY: FROM TENT TO MODERN HOUSES IN TURKEY - *EVALUATION AND GUIDELINES*

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ABSTRACT

Old tribal life style of Turkish societies needed a house, which responds to the requirement of permanent moving and travelling. While, after the early settlements, new houses typologies appeared which also shown high level of flexibility due to the minimalism style of living.in the last century this was not a pandemic case in Turkey, even the users demanded flexibility as a factor in the design of housing projects. Architects and designers have not taken this need into consideration in planning phase. Hence, the solution to make modern houses suitable for new life style needs, or the change in family requirements were either by moving to a new house or perform some modification to suite those new needs. Due to the lack of flexibility in those houses, the end users are forced to move to another house. This paper analyses the concept of flexibility in different Turkish dwelling types, in order to define clearly its meaning in Turkish society. While it has been always studied as one indicator to achieve social sustainability in housing projects, we think it is highly important as a keystone factor in the design of housing projects in Turkey. Thus, we suggest a multi-criteria evaluation system, in comparison with international examples, to present and understand its importance, taking in consideration the peculiarity of Turkish culture and society. Moreover, this evaluation system examined on different examples, showing the main elements to be considered and developed in order to create a responsive architecture to users' needs in different phases of the life of society. Finally, we suggest some guidelines for the designers to consider, aiming to design flexible houses in their future projects, suitable for the mentality and culture in Turkey.

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DESIGN AND BUILDING OF THE NEW SOFTBALL SPORTS EQUIPMENT IN BARCELONA: THE LAST INTERVENTION IN THE OLYMPIC AREA OF THE HISTORICAL MOUNTAIN OF MONTJUÏC

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ABSTRACT

After the designation of Barcelona as an Olympic city in 1992, a process of fervent reconstruction and transformation of the city began. For the development of the games, four strategic zones of the city were chosen, destined to the achievement of sporting events. One of these places was the historic mountain of Montjuïc that hosted the largest sports complex in the city in an architectural and urban macro-project called "*Anella Olímpica*". After 25 years, Barcelona continues to rebuild the mountain, adapting it to the new requirements with regard to sports facilities and this is how the Softball Barcelona project came about. The design criteria of this equipment have been: The use of the site's characteristics, the easy communication with the current Baseball, the proper visibility of the field by the public, essentially familiar, the introduction of innovative elements that add value to the installation, and a certain visibility and quality of the installation that does not disregard the magnificent environment, in the most important concentration of sports facilities throughout the country. Other criteria have been: The use of land as a consequence of the construction of the field, the possibility of organizing future events of a certain magnitude, the economy of the media, this new softball field is located next to the current Baseball Olympic Field to the east, under the Olympic Ring, in Montjuïc. The main element is a Marquee, based on six inclined metallic "pillars" that support a structure and also allow the placement of another horizontal network, which serves as security as to configure an awning, very convenient due to the orientation to south. These porticos that form the same curvature on the ground that the track, will support the vertical protection network, and will also be able to accommodate the access lighting and will serve as support for the awning-net. This structure configures the image of the field, since it will be seen from the street Pierre de Coubertin.

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THE USE OF A COMPUTER PROGRAM ArchiCAD IN DESIGNING FENCES

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ABSTRACT

The paper shows how a computer program ArchiCAD is used to design fences and presents its tools necessary to perform a proper design. It is presented how ArchiCAD by means of libraries, materials and computer visualisation contributes to the creation of elaborate forms and shapes of fences. The work presents original projects made with the use of modern technology and materials. ArchiCAD is used for architectural planning to create and manage full technical documentation (2D and 3D) of projects, buildings, interior arrangement, gardens, 3D drafting, visualisations, showing the perspective and juxtaposing all the necessary materials as well as preparing a cost estimate. ArchiCAD is equipped with a variety of templates and libraries containing parametric values and elements such as furniture, textures, and other structural elements. It allows to create in a simple way individual libraries using the tools provided by the program and Geometric Description Language (GDL). The program enables to save project overviews as BMG or JPG document so that they could be opened in different graphics software, e. g., Adobe Photoshop or CorelDraw. ArchiCAD is a modern computer program which makes work easier for contemporary designers and planners. It is widely known that fence is an essential element of architecture. The following work shows how ArchiCAD allows a designer to create a fence which can be made of different materials, e. g., mesh, stone, panels, wood, concrete, with a variety of textures and colours suitable for the style of a given building or its surrounding. When designed well, a fence affects the aesthetics of a project and, additionally, has a representative function. Creative solutions in terms of fences made with the use of ArchiCAD software result in an attractive and user-friendly designs for people and fulfil the expectations of investors while, at the same time, enriching the surrounding landscape.

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OPEN LIVING SPACE CONCEPT IN BARN-HOUSE ARCHITECTURE: ARCHITECTURE OF SINGLE FAMILY HOUSE CASE STUDIES

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ABSTRACT

'Barn house' architecture can be presumed as a style or trend in contemporary architecture. The term 'barn-house' refers to a house that architecturally refers to barn with a simple, longitudinal form with pitched roof. Originally, barns were converted to houses for practical reasons. Later on, the design aspect was getting more important and any house or any barn were not enough and so it turned to be a style which can be describe as 'designed barn-house'. The idea appears to be well recognised: many built houses and house designs represent that style. Also, several online blogs on that subject have been created and published dozens of examples. We may presume that many contemporary architects have either already designed or are aware of designing a barn-house. The reason for that is mostly simplicity of the architecture, and lack of details which are common in contemporary architecture. 3 case studies of barn-type house designs have been presented in the article. All of them have been designed by the authors. All the concepts were designed using synthetic models: physical and virtual. The open space concept can be recognized in all the three case studies: interior layout seems to be more important than the exterior in that kind of architecture. The authors conclude that some uniform rules can be recognized in barn-type architecture design. However, many concepts have gone far beyond the original barn-house idea. The question is whether that trend can be presumed as distinctive?

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LAKESIDE RESORT BASED ONE ECO-ARCHITECTURE

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ABSTRACT

Matano Lake is one of water tourism destination which widely popular in Sorowako City. The natural condition of Matano Lake is heavily scenic includes the land, water, air, and energy and reasonably required to preserve. Exploration in resort design with eco-architecture concept is one of preservation effort to maximize the natural potency of the area based on ecology aspect, socio economy aspect, and socio-cultural aspect. Method in the design process applied an eco-architecture concept with ecological principles implementation in material, building orientation to maximize the sunlight and the wind that have benefit to maintain the building thermal in cool and warm condition, and maximize the openings as wind track movements in ventilation from west or east direction. The result explained the lakeside resort based on eco-architecture model.

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RISE & FALL OF MODERN MOVEMENT ARCHITECTURE AFTER I WORLD WAR. COMPARATIVE STUDY ON THE ROLE OF NEW TECHNOLOGY IN THE ARCHITECTURE DESIGN

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ABSTRACT

The consequences of the I[st] World War gave free way for the rise and development of new artistic trends in all kinds of arts including visual arts as graphics, painting and architecture. This was particularly visible in the Central European countries that experienced the clash of existing political systems i.e. Austro - Hungary and Germany. The paper attempts to find out the main reasons of the dynamic rise and sudden fall of the modern movement in Germany during *Weimar Republic* and Nazi periods thru the analysis of the facts and motives associated with this process. 1[st] part of the paper explains intensified impact of lower society segments coming to the fore on the modern approach to the art and architecture. Quest for the functional, material and technical solutions to meet new challenges and requirements would be emphasized in this part of the analysis. It is concluded that initial postwar plurality in Germany allowed modern movement in architecture to emerge in full range with no strings attached. The postwar pluralism brought modern trends like *New Objectivity* or *Modernism* leading to so called *International Style* announced in middle thirties. In Germany an outstanding school of *Bauhaus* was developed successfully basing on the previous *Werkbund* ideas. In its 2[nd] part, the paper subsequently describes Nazis' coming into power in 1933, and shows thru the analysis of numerous statements that *Historicism*, *Eclecticism* and so called *Vőlkish Heimatschutzstyle* became the leading trends due to their alleged national German values. Modern trends accused of tight relationship of communism were brutally censored by new reign, both publicly and administratively. Finally, *Bauhaus* school was closed, and many outstanding German architects like Mies van der Rohe or Walter Gropius were forced to leave their country. *Modernism* was unofficially banned by the new authority. In order to support these conclusions vast semantic analysis of available iconography compared with the main assumptions of the regime has been carried out. The research shows that using comparative case study between famous referent modernistic objects and the ones still designed and built during Nazi period, the modern movement never gave up. The paper concludes here that full rejection of the modern architecture was not possible under Nazi reign due to its undoubted technical and functional qualities, economics, form simplicity, and finally due to the need of appropriate living standards to be implemented. Basing on the deductive analysis the paper finds that the clash of the Third Reich in 1945 caused the fall of all *Historicism*, *Eclecticism* and *Vőlkish Heimatschutzstyle* trends for decades, for these trends became fully identified with the Nazi policy. This subsequently gave free way to unrestrained development of modern movement in architecture. Additionally, the paper proves that the absence of protagonist styles and the need of demolished cities fast reconstruction gave the way to the rebirth of the *Modernism* after the end of II[nd] World War. Eventually the lack of the styling opposition led the modern movement to truly undesirable results activating its crisis in 70-ties of the XX [th] Century. Finally, the paper concludes that the career of an architectural style is a reflection of the politics.

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PSYCHOLOGY OF PLACE ASPECTS IN ARCHITECTURE DESIGN BEFORE II WORLD WAR IMPERATIVE STUDY ON DAVID CANTER'S CONCEPT OF PLACE IN ARCHITECTURE.

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ABSTRACT

One of the most important factors of architecture is its identity. According to David Canter, the identity strictly refers to the *Place* where the architectural object or urban space were planned to be created. In his theoretical analysis on the *Place* from architectural and urban points of view, David Canter extracted three main factors to create the *Place*. These were: 1. Main ideology, concepts or assumptions that had been the basis of architectural object or urban space creation. 2. The architectural or urban physical attributes that materialize the ideology, concepts or assumptions mentioned in p.1. 3. Planned and actual social activities tightly bound with the architecture and urban space physical attributes mentioned in p.2. According to David Canter's *Theory of Place,* presence of all of three mentioned above factors are necessary and sufficient, consciously to create the identity of architectural or urban space. The research presented in 1st part of the paper goes back to the unification process of German State that emerged 1866 and 1871and was carried out in the following 40 years when this powerful state enjoyed political respect and economic prosperity. The paper reveals that the cause of German struggle for *Place* creation (in terms of David Canter's understanding), was strong opposition and hostility among German neighbors particularly after 1890. This part of the paper emphasizes that in reaction to the neighbors' tension and hostility, Germans implemented the policy of *Enkreisung* (eng. *encirclement*). In cultural movement it was realized in the development of German values – often with racist background. This process was materialized in architecture in giving preferences to national - *vőlkisch* – motives. The culmination point of this process was so called Great War between 1914 and 1918, which was finally lost by the Germany. Accordingly, the catastrophic results of the Great War, revolutionary tensions coming out from the *bolschevik* revolution as well as the clash of the Weimar Republic economy inflicted the sense of malaise in German society which finally led to the creation of Nazi State in 1933. In its 2nd part, the paper subsequently shows that IIIrd Reich consciously and effectively continued to create German identity. Although the *Theory of Place* was investigated since 60-ties of the XXth Century and successfully established in *The psychology of place* (1977), the paper shows that its assumptions were very similar to the way of struggle for the "genuinely" German identity in culture and society. Basing on imperative study of the activities triggered by the Nazi State, quoting numerous statements on political assumptions and finally comparing these to case study on the selected objects built during Nazi period, the paper concludes that David Canter's *Theory of Place* could be effective method to explain the course of national trend in German architecture before IInd World War.

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TRADITIONS OF CLASSICISM IN THE EUROPEAN ARCHITECTURE OF THE XX CENTURY

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ABSTRACT

Analyzing the architectural theory and practice of the XX century, many researchers focus on currents and directions, united by the name "modern". The beginning of this approach was put by Manifesto of Futurism (Filippo Tommaso Marinetti, 1909), which proclaimed the need for each generation to create his own living environment. This type of thinking was characteristic of most architects of the XX century, who created "new traditions". In parallel, artistic trends developed, based on regionalism, the traditions of neoclassicism or historicism. The variety of the phenomena of architecture of the XX century can be placed between two poles. The first pole defines "The spirit of time" (Zeitgeist), i.e. caused by the needs of our time social, technical, aesthetic and other problems, realized in theory and practice in the corresponding architectural forms. Toward another pole, architectural solutions gravitate due to the search for the Ideal of Architecture, Hegel's "perfect being," not related to time and the cause of its emergence. One of the options for such searches was the use of classic forms. An analysis of the use of the traditions of classicism in the architecture of the XX century is devoted to this publication.

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THE CONSTRUCTION OF SOCIAL HOUSING COMPLEXES IN PORTUGAL DURING THE ESTADO NOVO (1933-1974)

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ABSTRACT

This paper focuses on the urban growth experienced in the third quarter of the 20th century that was due to the generalized deficit of housing —by the transfer of population from rural to urban areas— and which characterized European cities mainly during the last century. This period was a time of great growth of the cities and, therefore, one of the most considerable architectural and urban production of its recent urban history. Following the precepts of the modern city of the Charter of Athens (1933), share many of the morphological and typological characteristics with the rest of Europe. However, the housing policies that were developed in Portugal during the dictatorship of Salazar (1933-1968) and Caetano (1968-1974) —within a socio-political context marked by a strong control of the State— caused Portuguese cities have introduced certain peculiarities in their development. In this sense, the work has sought to address the general context —social, economic and political— that conditioned the construction of these urban complexes during the so-called *Estado Novo* (1933-1974) in Portugal. This contextualization framework on the construction of social housing has been mainly built through an analysis of housing legislation approved in those years. The research has also required an important bibliography search for references to articulate the knowledge generated by other researchers. Likewise, the statistical data of construction and housing elaborated by the National Institute of Statistics of Portugal have been consulted. Based on this information, the research has detected two political facts of clear influence in terms of social housing. They allow us to identify three different stages. On the one hand, the end of the Second World War brought with it the industrial growth of some regions of the country, becoming important centres of population attraction at the beginning of the 50s. The pace of industrialization accelerated in the big cities and with it the migratory dynamics from the countryside to the city. In this context, the *Estado Novo* had to rethink the policy on housing, planning large-scale housing construction through development plans. On the other hand, Marcello Caetano's Government, who was appointed the new head of government in 1968, tried to solve the problems of overcrowding as a result of the previous policy. This translates into an attempt to institutionalize and rationalize housing policy through the creation, in 1969, of the *Fundo de Fomento da Habitação*. It was sought to centralize the different public initiatives related to housing in a unique structure. It can be said that this period corresponds, in the sphere of housing and urban planning, to a transition for the policies that would develop after the Carnation Revolution in 1974.

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ANALYSING OF RELIGIOUS BUILDINGS IN BYZANTINE PERIOD AT TURKEY THRACE

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ABSTRACT

Thrace region located on transit routes between Asia and Europe, has hosted various civilizations throughout history. Various civilisation such as the Persians, Odysseys, Macedonians, and Romans wanted to reign in the area that the first settlement traces extending as far as the Palaeolithic Era. When the Roman Empire was divided in 395, the Thrace region remained within the borders of the Eastern Roman (Byzantine) Empire. Thrace that had a common geography and historical background for centuries, has lost its integrity feature because of political and economic developments in European history since end of 19th and the beginning of 20th centuries. Nowadays, the region is located within the borders of Greece, Bulgaria and Turkey. In this study, Byzantine religious buildings located in the part of Turkey's Thrace region are discussed. However, the Byzantine religious buildings in the European borders of İstanbul and Çanakkale have not been included in the scope of the study. In the period when Eastern Roman Empire ruled the Turkey's Thrace, Adrianople (Edirne in Turkish), Ainos (Enez in Turkish) and Heracleia (Marmara Ereğlisi in Turkish) etc. became an ecclesiastical centre. Accordingly, many religious buildings have been built in this area. In this study, Byzantine religious buildings located in the border of Kırklareli, Tekirdağ and Edirne (the Thracian cities of Turkey) have been identified and literature search was performed; written sources and drawings related to the buildings have been examined. In order to determine the current status of the buildings, on-site inspections have been made and the present conditions have been documented with photographs. The period and plan characteristics of the identified buildings were examined. As a result of the examinations, the buildings were classified according to their periods and plan properties; at the same time it is aimed to reveal historical, architectural and artistic values of the buildings. In the direction of the obtained data, it was determined that buildings belonging to Early Byzantine, Middle Byzantine and Late Byzantine Periods in Thrace region. In addition, the existence of buildings with different plan features (three naved basilica, single naved, triconch, cross-in-square, free-cross plans) have been observed. The Byzantine religious buildings in Trakya reflect the characteristics of their periods when they are evaluated in terms of their architectural and artistic characteristics.

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ARCHITECTURE OF THE TATRA BANK AND TRADITION PHENOMENON

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ABSTRACT

The bank building features a distinctive typological kind in the history of architecture. Its particularities were still little explored in Slovakia before and after 1918, i.e. in the context of diversity of the institutional spectrum of the Austrian-Hungarian monetary sector and under conditions of Slovak finance in the newly established Czechoslovakia. A lot of them can be illustrated on the example of Tatra banka's architecture. Since its inception, it has had an exceptional position among Slovak banks. Its name became a national symbol and the bank was to serve as a showcase of Slovak banking. Since the beginning it was intended as a central nationwide Slovak bank to support Slovak industry and entrepreneurial activity and to help set up, organize and educate smaller banks all over Slovakia. Despite the fact that, in comparison with the original plan, the Tatra's operating was considerably curtailed due to counteraction of the state power in the Hungarian part of the monarchy, its connection with the national emancipatory efforts was deeply embedded in public awareness. In the long run, the bank has maintained a leading position among Slovak financial institutions, it has carried business in industry, cooperated with Czech banks, systematically built an extensive network of branches and as the first Slovak bank penetrated into eastern Slovakia, which was under strong Hungarian influence. After establishment of the new state of the Czechs and Slovaks Tatra belonged still among the strongest banks in Slovakia, but in the context of the national economy it belonged only among medium-sized institutions. The term Tatra was, at that time, an important marketing sign and the national character of the bank was a part of it. The presented work is the result of systematic research of that typological kind. It presents on selected examples how the aforementioned circumstances were reflected in the architecture of the flagship of Slovak banking under the conditions of two different state establishments. The intersection interprets the style preferences, typological particularities and the link to the traditional concept of a bank building from the historic building of the first headquarters in Martin (1912), the eclectic building of the branch office in Bytča (1920 – 1921), through the new headquarters building in Bratislava (1925) in the spirit of the official monumentality, up to the branch office in Modrý Kameň (1931) in the style of regional modernism. The lack of a central European context is documented by comparisons with selected bank buildings at the centres of architectural events in the Austro-Hungarian Empire and Czechoslovakia. At the same time, the demand is demonstrated for the connection of representative architectural forms with the pragmatism of the layout solution in the sense of building an institutional (corporate) Tatra brand.

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ARCHITECTURE OF THE NATIONAL BANK OF CZECHOSLOVAKIA IN THE TERRITORY OF PRESENT-DAY SLOVAKIA (1918-1938)

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ABSTRACT

The end of the Great war brought about many changes in the European political, social and economical climate. Monarchies were replaced with more democratic systems, countries lost their territories, and new sates based on national principle were established. In 1918, after a period of ethnic oppression and magyarization in the Hungarian part of the Habsburg Empire following the Austro-Hungarian Compromise, the Bohemian and Slovak people declared their independence and founded a new national state - the Czechoslovakia. The period short after its foundation was one full of enthusiasm and joy stemming from the new-found freedom and opportunity for cultivation of national culture, identity and politics in democratic environment on the one hand, and challenges brought by the dissolution of the Austro-Hungarian economy and political system on the other. As a result of establishing the new state, the need arose to define its nation by architecture and the issue of National Style re-emerged. After the brief period of Rondocubism preference, for some time, the official buildings retained certain expressive character and massive features. Even after giving way to Modernism, the sense of traditionalism was evident. In the Slovak part of Czechoslovakia, bank buildings, as buildings of institutions that once supported national-emancipatory aspirations of Slovak people, bank architecture often used well-established schemes and preferred more traditional designs to convey desired messages. The institution in charge of monetary separation and management of the new currency was the Banking Office of the Ministry of Finance and subsequently the National Bank of Czechoslovakia (since 1926). After the collapse of Austro-Hungarian Empire, all the buildings of branch offices of the former central bank – the Austro-Hungarian Bank - were took over by the Czechoslovak government. These were often extended, as were the cases of branch office buildings in Bratislava, Košice and Žilina. When they no longer fitted the formal or capacity criteria, three new branch office buildings were built on the territory of today's Slovakia: a neo-renaissance building in Banská Bystrica (Ladislav Skřivánek, 1930 – 1932) and two buildings in the style of regional modernism with notes of traditionalism and classical features in Ružomberok (Vladimír Fischer, 1930 – 1932) and Bratislava (Emil Belluš, 1936-1937). The article examines stylistic, ideological, formal, and layout requirements for an architectural concept of a central bank institution demonstrated on the examples of branch office buildings built during existence of the First Czechoslovak Republic in the territory of the present-day Slovakia. As a part of a systematic research focused on Slovak bank buildings, the chosen buildings will be analysed, compared with relevant examples, and interpreted in the context of political, social, and economical situation, and style and typological particularities.

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FOUNDATION AND DEVELOPMENT OF THE GENERAL BUILDING DESIGN BUREAU "MIASTOPROJEKT SZCZECIN"

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ABSTRACT

The article focuses on the foundation and development of the biggest national General Building Design Bureau "Miastoprojekt Szczecin", which had been active in the Polish Western Pomerania after World War Two. The case of GBDB Miastoprojekt Szczecin and its erection requires defining the circumstances favouring the foundation of a national enterprise- the whole transformation process after the end of World War Two and the creation of Polish People's Republic. Initially the GBDB had been a department formally reported to a superior unit established in Warsaw (design bureaus were grouped in separate sections based on their field of activity and designated to certain regions). The GBDB's creative activity had been divided into several time periods for clear deptiction purposes. First one (1946 - 1952) included recovering the city from war damage, performing an inventory of the urban fabric along with phrasing new direction of spatial development. First urban and design studios were founded. Subsequent years (1952 - 1960) bringed new implementations, the so-called "Infill construction" in particular, along with assembling the design documentation for future investments. The third period (1960s and 1970s) would consist of development of housing using the original industry technologies. During the time, large residential complexes were established in Szczecin, mainly in the outskirts. The last period (late 1980s and early 1990s) is a time of both social and political changes in the country, resulting with a major change in the way bureaus performed. "Hijacking" orders from the national design bureaus in order to offer the customers more time- and cost-effective services by private businesses gradually made GBDBs obsolete and closed down as a result. The article's summary underlines that considering the multi-aspect subject matter of the architectural objects designed by BBDS "Miastoprojekt Szczecin", it is possible to perform a relatively objective evaluation of the output of bureau's architects and recognising their importance in shaping the modern Szczecin's spatial order.

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ARCHITECTURE FOR MEDICINE: GERMAN PSYCHIATRIC REFORMS IN THE 19TH CENTURY –THEORY AND PRACTICE BY THE EXAMPLE OF THE FACILITY FOR MENTALLY ILL IN THE OWIŃSKA VILLAGE NEAR POZNAŃ (POLAND)

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ABSTRACT

The end of the 18th century witnessed revolutionary transformations in the area of psychiatry. Thanks to the so-called „moral therapy", the approach toward the patient became completely different compared to what it was before. Thanks to the popularization of the new ideas in the area of treatment of the mentally ill, back in the 19th century reared and opened were many modern treatment facilities. In many places all around the world built were new asylums that operated based on the new methods of treatment. Depending on the country-specific traditions and policies, the process of construction of new facilities for the mentally ill was different by country. The concept of the centralist supervision of healthcare present in the German-speaking countries of the time were the reason for the process of construction of asylums to also be under the control by the state. At the primary stage of creation of facilities for the mentally ill, post-monastery complexes were adapted for this purpose. However, still before the first half of the 19th century, people began to rear special medical facilities designed for that. In order to make the best environmental conditions for the mentally ill possible, such medical facilities were designed in such a way that they could facilitate the therapeutic purposes. Psychiatry needed an adequate space that properly designed architecture and its surroundings could provide. The architectural skills of the architects were combined with the medical knowledge in psychiatry, thus creating orderly complexes that aided the patients in remaining self-controlled and disciplined. As the time went by, built were model facilities that were described in the specialist literature. Based on the experience of the time, doctors and the architects specialized in hospital-related construction were having a discourse concerning the model asylum. The goal of the article is to compare the solutions found at the model hospitals for the mentally ill and the theoretical considerations to the asylums reared at the province. Did those hospitals meet the theoretical requirements and were they reared in line with the designs recommended? Was the therapeutic role of the architecture, nature, landscape and gardens incorporated into them? Did they meet the patients' needs? Did they meet the modern technical requirements of the time? A good example of a provincial asylum is the hospital in the Owińska village near Poznań, opened in 1838. Originally, the hospital comprised of the buildings that in the past made the building complex of the Cistercian Monastery. However, the said building complex was not enough to meet the demands resulting from the growing number of patients, and so, in 1874, a new facility was opened nearby. As the research showed, both complexes met the perpetually growing requirements of the modern psychiatry of the time. The new asylum was built in conformity to the humanitarian trends of the time. The authorities took care of the architecture and equipment of the building to be at a high level. For a long time, the asylum in the Owińska village, was the only mental hospital in Greater Poland. The mental hospitals to follow were built at the beginning of the 90s of the 19th century, whereas the last one them was built in the 20th century.

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ROLE AND CONTRIBUTION OF DIGITAL HISTORY TO THE HISTORY OF ARCHITECTURE AREA IN TURKEY

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ABSTRACT

In 1994, after the development of browsers such as Mosaic Netscape and Netscape Navigator, the web has quickly become a global information network. In parallel with the transformation, research libraries have begun to develop into catalogs and collections for online access, and the concept of history has gradually begun to evolve into a transformational environment. At this point, a new field of study appears to have emerged. Digital history is expressed as a combination of computer, internet network and software systems with new communication technologies. In the most general sense, it can be expressed as a visualization of the data after it has been collected and transferred via a digital platform software. In short, it is a methodological approach that frames people's past records using technology, web, or mobile software to correlate, identify, interrogate and comment on technology. This topic, which is new to the field of design, appears to be of much interest in the future, because it can serve many untouched areas of architecture history. Digital history carries great importance for its possibility of filling in the gaps of architectural history in Turkey as it allows the preservation and visualization of a deep research on issues which are left to wonder. This study, aims to provide a basis to the products of digital history in the area of design and the research which emerge from the works in history of architecture in Turkey. At the same time this study also answers and includes when the works of digitalization to support the digital history projects started, which designers in which areas could come forward and which areas could be used as a basis to do digital history research.

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REGENERATION AND PRESERVATION PRACTICE ON DONG MINORITY GAOBU VILLAGE OF HUNAN, CHINA

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ABSTRACT

The Dong minority communities are today, in a similar manner to many other Chinese rural settlements, deeply affected by the phenomenon of “Village Hollowing” and “Modernization” over the last 20 years. This unprecedented exodus of rural populations to expanding urban areas, has resulted in almost vacant villages inhabited by struggling communities of mostly elderly people and children, the social and economic system has changed dramatically among Dong communities. Using the Dong Minority village of Gaobu, located along the Pingtan River in Hunan Province, China, as a pilot project, is a fully operating agricultural community with a population of over 2500 inhabitants. It has 6 Drum-Towers, 2 Wind-Rain Bridges as well as other Han nationality’s buildings, a reflection of its rich cultural heritage and importance in the region. In July, 2017, a united summer workshop held in Gaobu village, was assembled and organized by school of architecture, Guangzhou University, Chinese University of Hong Kong, Hunan University, South China University of Technology and Polytechnic University of Milan. 56 master students, PhD students and Professors attended the workshop. The aim of the workshop is to develop an alternative and sustainable strategy to regenerate and preserve Dong Minority villages in China via architectural prototype and planning proposal, that respond to contemporary rural developments and foster minimum impact to the existing fabric of the village. Finally, a new collective and co-operative system, incorporating multiple function was offered. Meanwhile, an adaptive planning strategy that based on the needs of the community was proposed. Concentrating on the special link between dynamic heritage and villagers will provide a better rural living for the Dong community in the future.

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GUESTHOUSES AND INNS IN SPANISH SOUTHEAST: THE DECLINE OF AN ARCHITECTURAL TYPOLOGY LINKED TO THE ROADS

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ABSTRACT

Guesthouses, inns and hostels linked to travels and roads, arose as a result of the need to stop during long and difficult journeys. Throughout the centuries, the existence of the rest points that marked the roads which crossed Spain, allowed the development of such routes. Its inclusion in historical cartography and in geographical dictionaries as well as the existence of specific legislation reflects their importance for hundreds of years. They were distinguished as an architectural typology of their own, up to the point of been the subject of a project and the examination proposal for the access to the titles of architect or master of works in the different Academies of Fine Arts that arose in Spain for the regulation of the exercise of architecture. The roads constituted the elements that subordinated the formal qualities of this type of architecture, qualities that depended on its hospitality function and on the basis of which the elements that make up these establishments emerged, becoming a characteristic image that distinguishes it from the rest. It is constructions of simple forms with bearing walls that organize the space in one or two bays, always using the materials of the immediate environment in its construction. It highlights the courtyard, a large open space to which all the dependencies of the hostel ended in, and the main block of the set, where the kitchen is located, an essential element in guesthouses and inns since it was the place where, in addition to cooking, guests could warm up and gather together as well as the bedrooms, of which the wealthy travellers made use of, in spite of being very modest. However, despite the fact that they are pieces that are part of the history of communications, and in spite of their value for being part of the Cultural Heritage and public works, they are in danger of disappearing completely without being properly documented or inventoried. The lack of sensitivity and recognition as a patrimonial asset by society, together with the lack of cataloging and guardianship as well as a more direct intervention by public institutions in the preservation of this architectural typology, has led to the transformation of some, with the consequent loss of most of its architectural and patrimonial values, or the abandonment and later disappearance of many of them. We are faced with buildings of great wealth and heritage value. Hence, their intervention must be promoted, provided that we act with sensitivity, respecting their functional and compositional aspects to the maximum, finding compatible uses for them and using them appropriately, so that they do not lose their trait as a place to stop.

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INTEGRATING NEW STRUCTURES WITH HISTORICAL CONSTRUCTIONS - A TRANSPARENT ROOF STRUCTURE ABOVE THE CENTRALLY DESIGNED ATRIUM

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ABSTRACT

The architecture initiated during the time of the Austro-Hungarian period was distinctly expressed both in Sarajevo and the whole region of Bosnia-Herzegovina. A substantial number of these buildings was assessed for their historical, architectural, ambient and aesthetical values and, as such, represent the valuable historic heritage of these regions. Standing among them in its impressive dimension and being of a great national value is the palace of the former Provincial Government which was designed by Josip Vancaš in Vienna (1884). The aim of the present paper is to emphasize the importance of atrial and open spaces integrated into the volume of the building. These are the spaces that can be used to synthesize and functionally transform spaces into controlled and contextually selected forms, contemporary shapes and materials by applying functional creativity without endangering the ambience and historical values of the building. On the contrary, by closing the courtyard and atrial spaces, it would be possible to ensure a buffer zone between the interior and the exterior as well as to create a micro-climate and eliminate processes that generally occur in façades facing such spaces. These spaces could be synthesized and functionally transformed into useable, controlled and contextually selected forms by creatively applying contemporary shapes and materials without endangering the ambiance and historic values of the building. The view towards the sky through a diagonal lattice would present an association to the "lattice window" or “mušebak”, creating a comfortable microclimate. Several different structural concepts were studied. The aim of the paper was to evaluate structural concepts in terms of feasibility and energy efficiency measures pay off. There are numerous examples of transparent roof extensions introduced when rehabilitating the existing cultural-historical buildings, the extensions known for their power in terms of quality and quantity or the harmonious bond between the old and the new. The atrium roof structure will be supported on the walls of existing building. Since the roof structure would be on the interior of the building footprint it is important to consider manageable erection process.

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CATASTROPHIC LANDSLIDE THREATENING THE DESTRUCTION OF THE HISTORIC BRIDGE: THE FAILURE AND RECONSTRUCTION

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ABSTRACT

The problem of cultural heritage protection becomes especially difficult when structures are set on slopes or embankments, or in their neighbours. In such cases they should be adequately stabilized and possible deformation of underlying subsoil should be controlled. In the paper, this issue is illustrated by an example of the historical bridge in Koronowo town near Bydgoszcz (north-central Poland). This four-span truss construction supported by three truss piers was built between 1892-1895. The bridge, with the deck at 20 *m height* above the level of Brda River, is one of the tallest narrow-gauge railway bridges in Europe and according to Polish law it is under *technical monument* protection. The railway line was closed in 1992 and shortly after that the *railroad track was dismantled.* Thenceforth the embankment and the bridge had served the local community as a pathway. In 2011 wide landslide occurred in one of steep side of deep river valley and the large mass of sliding ground destroyed the part of that pathway. It caused threat to the stability of the masonry bridge abutment on western bank of the river. Furthermore, the soil slipping down the valley pressed against the foundation of one of the bridge pillars. This could cause the deformation of the structure and in effect the collapse of the bridge. Therefore, due to practical meaning and historical importance of the bridge the safety treatment of the construction had been attempted. In 2015 the stabilizing and clean-up operations on the landslide affected area were undertaken. Then the bridge was renovated and the unused railway line was paved and turned into a trail for walking, biking and hiking. At present, the monitoring system of slope deformation is established using *inclinometer technique* to *control* subsurface movements. In this paper, the narrow-gauge railway between Bydgoszcz and Koronowo as well as the structure of historical bridge in Koronowo are described. The analysis of effects of the catastrophic landslide in the embankment located by the bridgehead is presented. The process of the landslide development in time is described, its reasons, mechanism and influence on the bridge structure are analysed. There is also presented a method of stabilization and reclamation of the landslide affected area with taking into account the bridge historical significance.

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PRACTICE OF RECREATION OF THE CULTURAL HERITAGE IN UKRAINE

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ABSTRACT

The purpose of this study is to highlight the practice of recreation (reconstruction) the cultural heritage of Ukraine taking into account various local conditions and considering the legality of the implementation of various cultural heritage sites in accordance with domestic and international norms. The unique historical and cultural relics that are on the territory of modern Ukraine are an integral part of the World and European historical and cultural heritage. The process of the formation of an independent state, the ethnic self-identification of the people, causes the growing interest of society to monuments of architecture. An important role in the protection of historical and cultural monuments belongs to the recreation of objects of cultural heritage lost due to certain tragic events, to which fate in the history of Ukraine was not stingy. In this connection, for a number of cases, it seems expedient to regenerate the lost valuable historical and architectural environment with its scientifically grounded recreation on the base of historical analogues. At the same time, the provisions of the Riga Charter adopted at the ICOMOS conference "Cultural Heritage: Authenticity and Historical Heritage" should be strictly observed, especially those that relate to the need to return for the historical locality of its cultural significance with compensation for tragic losses and the need to recreate cultural heritage sites in their original place. The multifactor analysis of the practice of recreation outstanding cultural monuments, museumification and regeneration of the historical environment in various cities of Ukraine will serve as a useful example for subsequent incarnations of cultural heritage objects. Solving the problems of lost monuments should be carried out on the basis of a comprehensive analysis of various factors and local conditions, including national traditions, taking into account domestic and international legislation in the field of cultural heritage protection.

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SEALING LOG HOUSES

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ABSTRACT

In Poland, the traditional method of sealing log houses is known as *mossing* (mszenie), and the word comes from the oldest known method of chinking: inserting layers of moss between the logs. Moss was the cheapest and most widely available raw material, it had good insulating properties and the method of filling in the gaps between the logs did not require great skills and was also relatively quick. Another inexpensive and simple method was sealing the beams with clay – also a widely-available and cheap material. Other various organic fillers were also used: chaff, hay or oakum. Another traditional method of chinking wooden houses, favoured particularly in the mountainous regions, is the use of wood wool known as ***wełnionka***, i.e. wood slivers cut from spruce timber. The slivers are gathered in the form of decorative braids and inserted into the gaps between the logs. Nowadays, in addition to traditional solutions, also modern methods of chinking are used, with such materials as: a. polyester unwoven fabric (effective with narrow gaps); b. bands of synthetic felt; c. expanding tape; d. wood wool or oakum; e. mineral wool with a waterproof seal from the outside; f. hemp rope; g. specialist putties or fillers. Each of these methods has its advantages and disadvantages; however, they all fulfil their intended purpose if the gaps between the logs are for the most part uniform and quite narrow. An innovative method of chinking log houses with the use of a low-pressure sealant and adhesive for polystyrene elevations reinforced with fiberglass is described at the paper. After using many different solutions, this method was found to be the most effective and also cost-effective. A building which was sealed using this method does not show any traces of damage to the chinking two seasons later. This method of chinking was employed, which uses a low-pressure sealant and adhesive for polystyrene elevations. It is less labour intensive than traditional chinking with wood wool, while thermal insulating and sealing properties of the structure as similar. A key advantage of this technology is its relatively low cost and the ability to perform this task without professional help. To complete the chinking, the rendered joints made using the sealant were coated with exterior paint in the colour of light clay, which gave the building a look as if it was sealed with clay. This made it possible to preserve the structure's appearance, despite the employment of unusual and exceedingly contemporary materials.

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TRADITIONAL FARMS AS ELEMENT OF RURAL AREAS LANDSCAPE IDENTITY

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ABSTRACT

Cultural landscape of rural areas is one of the elements of civilization heritage. While so it should be respected and protected. Not only by creating of conservation protection areas but also by creation. Over the millennia characteristic settlements have formed of rural areas using their own system or systems. Traditional buildings (farms and huts) are a component of the landscape-architectonic heritage of them. One of the tools that save cultural and architectural tradition continuity on rural areas is correct perception while observe still existing, sublimated by ages traditional forms that are expressions of material culture. Polish country still possesses values that disappeared or destroyed in another's countries.

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CRITERION OF AUTHENTICITY OR NEW CREATION IN HISTORICAL FORTRESSES ON THE TERRITORY OF POLAND

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ABSTRACT

The article discusses adapting ruins or poorly preserved historical structures to new functions, presenting a study of the situation in Polish architecture compared to the efforts of outstanding Western European architects. UNESCO increasingly considers the "criterion of authenticity" in publications on the adaptation of historical structures to modern needs. Some architectural conservators believe castle ruins or other structures should be left in their extant state, even considering their further destruction a natural process. Others argue that ruins are haphazard and lean towards their development, partial reconstruction or redevelopment. Examples of known Western European additions and adaptations of castles to new functions (e.g. Castelgrande in Bellinzona, Switzerland, the Bensberg and Halle castles, Germany) give us hope that interesting modern solutions can also appear in Poland, instead of the increasingly prevalent reconstructions. This hope is particularly justified by the 2013 RIBA Stirling Prize for the best building designed by British architects, awarded for the design of Astley Castle in Warwickshire, West Midlands, England. Saving the ruined twelfth-century castle, a new, contrasting two-storey shell was installed inside the historical walls, turning the castle into a history-rich monument. The Stirling Prize proves the justification and acceptance of such actions. In Poland the situation regarding adapting historical fortresses to new functions is altogether different. According to the latest scholarly calculations, there are currently 421 castles registered as listed sites, around 200 of which are pre-fifteenth-century ones. After World War II a reconstruction of cities from wartime destruction began, also covering larger castles and palaces, which were being turned into museums. The common neglect of aristocratic and noble residences during this time was based on economic and ideological reasons. Many became schools, kindergartens, orphanages or retirement homes, while landed estates became State Agricultural Farms. The situation started changing after 1990, when former residence owners began returning to their homes, while conservation authorities transferred ruined structures to new, mostly private owners, who declared the will to renovate them, in order to have them saved. Local governments also started to recognise that the picturesque castle ruins can become regional tourist attractions. The author's observations and studies of preserved structures proved that there is a lack of modern additions similar to the aforementioned Western European ones. Historical reconstructions are preferred, even in cases with no historical documentation (castles in Bobolice, Korzkiew, Wytrzyszczka, Tykocin). Meanwhile, an introduction of new massings on the basis of winning an architectural competition inside the preserved medieval walls of Ciechanów Castle was sternly refused by conservation authorities. Certain delicate modern additions are being made by experienced designers (Gniew Castle), giving us hope for a change of stance among conservation decision-makers. An analysis of historical processes, as well as a tracing of the stylistic changes of the architecture of the turn of the twentieth and twenty-first centuries, in addition to the artistic stances of their authors justifies the claim that modern architecture has the mandate for intervention into historical substance in cases justified by the necessity of introducing additions or the replacement of said tissue.

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ONSITE ROBOTIC RESTORATION AND REHABILITATION OF TIMBER-FRAMED BUILDINGS

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ABSTRACT

The conservation of historical and non-historical timber-framed buildings is a growing problem in Chile. The increasing shortage of timber framers and lack of training opportunities threaten the further use of timber joints on which relies the original structural conception of a wide variety of buildings, from barns to hospitals. Replacing metal-free timber joints with metal fasteners increases stiffness and weight of the structure, and worsens fire behaviour of member joints. It not only affects World Heritage buildings such as the 17th-century Churches of Chiloé (UNESCO, 2000) or much of the Historic Quarter of the Seaport City of Valparaíso (UNESCO, 2003), but also thousands of non-historical buildings built until the 1960s in both urban and rural areas of southern Chile. Timber-framed buildings and their wood-to-wood joints have shown for centuries throughout the world a high resistance to earthquakes, fire and extreme weather conditions, but they require more frequent maintenance than steel or reinforced concrete structures. On the other hand, non-metallic timber connections and contemporary mass timber building systems may complement each other perfectly in the move towards sustainable construction. In the last 2 years, we developed and tested an extensible catalogue of associative geometry and robot tool paths for machining instances of original timber joint classes found in timber-framed buildings of Valparaíso (FONDEF ID14I10378). We concluded that unlike shop prefabrication for new construction, restoration and rehabilitation of existing timber frames require onsite machining in order to ensure mechanical fit between existing and added members. This is a fundamental advantage of small and medium-sized industrial robots over gantry and joinery machines. Our current research project focuses on onsite human-robot collaboration in timber framing by means of vision-based toolpath generation in a portable-sawmill-like (stationary or trailer-mounted) system. In our vision, the timber framer does the scribing, i.e. laying out and transferring joinery intersections from one timber to another, while the robot does the cutting (or milling) after optical recognition of these marks on the workpiece. Robot vision is also required to improve tool-to-workpiece positioning tasks in unstructured environments. The article describes research goals and methods in the light of our previous pioneering attempt in Chile to introduce industrial robots for architectural heritage conservation, but also opens the discussion about rethinking timber-framed construction as a more sustainable alternative to steel and reinforced concrete in the future.

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THE DEVELOPMENT AND ROLE OF SACRED STRUCTURES IN GLIWICE BEFORE THE END OF THE 20TH CENTURY

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ABSTRACT

In the paper, the complexes of sacred architecture in Gliwice are discussed in the context of urban development of the city. The sacred architecture objects here are connected both with the Roman Catholic and evangelical denominations. The city, since the medieval times, had been developing around its very centre. One of the most important elements in the study of the history of the urban development of the city was the analysis of the drawings of Friedrich Bernhard Werner and of the state of the city presented on the map from 1902. The research concerned also the landscape in the public space which emphasised the significance of the sacred architecture buildings. Currently, within the administrative perimeter of the city, there are many individual buildings or entire urban complexes which may serve as examples of a landscape sacrum. The origin of these buildings was closely connected with the historic past of the city or was the outcome of its industrialisation occurring from the 18th century onwards. Nowadays, many of these objects can be regarded as the examples of the buildings with high historic, artistic and cultural value. Historic temples, shrines, crosses and cemeteries illustrate the combination of the changes in the artistic styles and tendencies in sacred architecture and art with the local tradition. They are important elements of the urban composition of the city, being at the same time, as places of worship, carriers of its intangible heritage.

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CONTEMPORARY PROCESSES AND THE SELECTION OF MATERIALS IN HISTORICAL URBAN GREENERY AREAS ON EXAMPLE FROM CRACOW AND WARSAW

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ABSTRACT

The paper will discuss urgent and topical problems that affect historical areas of urban open space. Its main goal will be the identification of phenomena which take place within it, and which mainly affect its natural tissue. The article will also contain such aspects like: an analysis of modern trends in revalorisation and the effects of its impact, an analysis of possible preventive measures that can be taken, as well as an evaluation of the influence of environmental factors on the condition of individual types of greenery. The problem of contemporary processes that take place in green areas located in the layouts of historical cities, towns and villages undertaken in the article constitutes a further development of research work that has been performed for many years at the Garden Design and Green Areas Division of the Institute of Landscape Architecture of the Faculty of Architecture of the Cracow University of Technology. The protection, revitalisation, regeneration and shaping of cultural and natural historical landscapes is a broad subject, in which the diagnosis of currently ongoing negative processes constitutes the basis of appropriately prepared guidelines and, afterwards, design work. The main objective of this article is analysing the changes that occur in material selections in areas of historical urban open spaces, against the background of the transformations of design tendencies, conservation ideas, environmental factors and civilizational needs. The article uses the research material of authors from the areas of Cracow and Warsaw.

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STUDIES ON RECONSTRUCTION OF THE HISTORICAL VALUES OF THE MARKET SQUARE IN WODZISŁAW ŚLĄSKI

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ABSTRACT

Wodzisław Śląski, due to its location and turbulent history, had been a multinational town throughout the past centuries, a place linking the lives of Poles, Germans and Jews. The diversity of influences within the local community was also reflected in the varied enclaves of development set on mediaeval settlement system. The tragic events, such as the fire in 1822 which destroyed almost the entire town and the world war two damages covering 80 per cent of the development structure, erased the traces of numerous timber and masonry buildings representing an important part of its cultural heritage. Very few urban architecture resources, whether reconstructed or newly built, referred to the nature of the structures lost in the turmoil of fire and war. The growing strength of local identity sense and local patriotism of Wodzisław population being reborn, contributed to the research endeavour to reconstruct the original Market Square. The research included studies and analyses of archive cartographic materials and photographs, iconographic materials, parish registers, results of archaeological excavations and other materials concerning the history of the town as well as comparative analyses to the structures of the same founders, located in Wodzisław and other towns. To obtain a clear image of the original town fragments, it has been decided that the reconstruction result should include a set of architectural models and dioramas presenting its original development. The finished models of backlit Romantic Flank Tower, synagogue, timber church of Holy Cross, the Dietrichsteins Palace (present location of the Museum) and the Market Square frontage as of the turn of the 19th and 20th century, enriched with multi-media functions, with reconstruction of the history of the 3D imaged structures in the form of narration read by a speaker, have been included in the museum's exhibits enabling the local population and visitors to become familiar with the views of the history of lost or reconstructed parts of the town. The local authorities find them as a significant reference of modern Market Square reclamation proposals to the historical values that form the centre of Wodzisław throughout the centuries.

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CHALLENGES IN PRESERVATION OF INDUSTRIAL HERITAGE IN FORMER COMMUNIST COUNTRIES: THE CASE OF BULGARIA

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ABSTRACT

In regards to immovable cultural heritage monuments, Bulgaria comes third in Europe in numbers and variety, right after Greece and Italy. With more than 40 000 registered sites [NIICH, Bulgaria, 2017], most of which dating back millennia, the struggles to preserve them are huge and quite challenging. Thus, it is not a surprise that more recent heritage sites (dating up to a 150 years ago) are being neglected or not even acknowledged as such at all. And, as industrial heritage is a relatively new addition to the list of categories, it is natural that there would still be a vast gap in research on the topic. The current reality is that most of the potential sites and monuments are yet to be identified, properly studied and eventually enlisted for protection. A severe problem proves to be that ownership of these properties is private, and oftentimes unclear, mainly because of the property restitution in the early 1990s, thus reflecting poorly on the ability of the authorities (municipality, government, etc.) to take any precise actions towards preserving them. In addition, it is of no help, that these sites are located in close proximity to cities' centres, as they are attractive to the investors, who in many cases, unfortunately, seem to prefer demolition to preservation, and as there is not much transparency and publicity regarding majority of such investments, it has been hard to prevent some losses from happening. At the same time, as these brownfields have been there for a long time, people tend to mentally block them out and just accept the status quo, not even considering the possibility and the need of change, therefore making it challenging to get the society involved. Nonetheless, a transformation in perception is emerging. Several major scandals, involving industrial heritage sites in Sofia and Plovdiv (Capital of Culture in 2019), have managed to grasp the attention of both locals and authorities. What until recently was only visible to specialists and young artists, now starts to hold the attention of the general public. Investors are being held under close inspection when regarding their intentions towards the aforementioned buildings, and the focus is slowly expanding beyond what is already recognised as heritage to what has the potential to be valued as such.

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HERITAGE OF EARLY MODERNISM IN RESIDENTIAL ARCHITECTURE IN SARAJEVO

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ABSTRACT

Appearance of modern architecture in the early 20th century brought revolutionary changes in the meaning and sense of architectural design. New design implies a new way of life of modern man and entirely new approach to residential architecture. The new ideal of residential architecture becoming sunlit living units oriented toward the green, free of bulky furniture, with flexible, open plan, equipped and materialized in accordance to the time. Pure and simple design without decorations started to replace eclectic artistic expressions of the past times. In many European countries, a modernism was reaching its peak during the 1920s and 1930s by promoting and strengthening the ideas of the Bauhaus School and Athens charter and by increasing a number of young architects that have finished schools of architecture in Central European universities and continue to work with significant names of modernism. Such the case was in Sarajevo with a numerous of architects that worked from the second half of the 1920s and later. They have developed remarkable pieces of modernist architecture that are not appropriately treated by institutions and understood by wider public. The purpose of paper is to contribute indicating of value of such architecture that should result with raising of awareness about its importance and future proper interventions based on experience of similar projects related to protection and promotion of modern architectural heritage, that were realized in Europe and wider. Early modernism in residential architecture has brought tectonic changes in development of architecture and cities, quality and way of human living. It was just beginning in creation of extraordinary avant-garde modernism that existed during period of Socialist Yugoslavia in second half of 20th century. A comprehensive understanding of modernism from mentioned period in study case of Sarajevo and promotion its values will help to built positive and honest relation to heritage which was part of common international European identity.

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ANALYSIS OF METHODOLOGIES FOR AN INNOVATIVE WEB ENVIRONMENTS SUITABLE FOR 4D MODELS SHARING

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ABSTRACT

The article presents the results of the final stage of the Cultural Heritage Through Time (CHT2) project implementation. The main goal of the project is to build a 3D / 4D database for overpasses of defensive architecture and to prepare appropriate tools for publishing a multi-temporary database in the Internet. Objects being the subject of the study are located in 4 countries, which research teams are members of a consortium working on the project, namely: Italy, Poland, Great Britain, Spain. This project is a co-funding from the Italian, Polish, British and Spanish Research Authorities in the framework of the "Joint Programming Initiative in Cultural Heritage" JPI-CH (http://www.jpi-culturalheritage.eu). As part of the final stage, an analysis of existing and available tools, applications for online publishing of three-dimensional data was carried out. The review showed that there are many approaches to the 3D web publishing, for example: *WebGL*, *Geoweb3D*, *Cesiumjs*, *Free GIS software*, *GeoBrowser3D*, *3D ArcGIS API for JavaScript*. Available software was tested. Initial tests allowed comparison of two commercial solutions: ESRI and Hexagon and one Open-Source. Open Source software testing included for 3D model web presentation and point clouds sharing. For 3D model presentation model technology based on HTML5 was applied: *Cobweb X3D browser*. Whereas, for point clouds, *Internet presentation Portree* was applied. *Potree* is a free open-source *WebGL* based on cloud computing point, developed at the Institute of Computer Graphics and Algorithms, TU Wien. Commercial 3D publishing software ESRI application is user friendly, many tools for web sharing are available. The second commercial application Hexagon provides solutions for automatic geometry simplification, but some problems with texturing were observed. Open-source methods seem very promising, but there are also problems with texturing. On the project website, the examples of publishing 3D / 4D models obtained with various techniques (CAD modeling, photogrammetry, laser scanning) can be viewed.

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HUNAN UNIVERSITY CAMPUS "TEACHING AND RESEARCH BUILDING TWO" PRESERVATION AND REUSE DESIGN

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ABSTRACT

Hunan University Campus is an architecturally and historically relevant academic facility complex set in the city of Changsha, in People's Republic of China Hunan Province. Its modern era masterplan construction started in the 1920s, Teaching and Research Building Two" was the first building finished in 1926. In 2015 has been enlisted in "China Sites of Cultural Relics Protected at National Level" lists. As an international and multidisciplinary team the authors were, with different roles, called to study the building history, define its problems and decay episodes, and design solutions for its preservation and social and functional reactivation. In this scenario the present work will outline the results of the researches done on the building giving a brief overall view but mainly focusing on those aspects that had major impact on many choices in the subsequent phases. Then the general field diagnostic on the building will be presented, focusing again briefly on the general methodologies and results, then getting more specific into those aspects that had major influence in the project part. The design phase will be constituted by two aspects: The Preservation and the Reuse Design. As it might be evident, the first will concentrate on removing the most prominent decay episodes and their causes from the structure, the second will focus on the insertion of new functions and the subsequent user needs to ensure a contemporary life to the building. Apart from these basics it will be though evident that the reuse design strategies that are intended to enhance the user experience are directly connected to the conservation guidelines, trying to trace a common "minimum intervention driven" and "immediate awareness of the contemporary additions in the palimpsest" design strategy that will not hinder the problem solving aims nor the contemporary standards and expectations. In fact these two design aspects, even if presented as separate chapters for better comprehension, will appear as solidly interwoven: the common conservation aim and the firm interdependence of the strategies between the preservation and the reuse project as well as how these strategies are intermixed in the historical palimpsest layers of the building will possibly result as one of the most interesting aspect of this paper, and potentially an interesting case-study in modern building preservation design methodologies panorama.

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DISAPPEARANCE OF THE LIMESTONE ARCHITECTURAL HERITAGE IN CENTRAL POLAND - TRENDS AND CHALLENGES

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ABSTRACT

Koło Basin is a geographical region located in central Poland, where in the period from the mid-XIX century until the late of 1960s the traditional rural construction had been developing architectural features of an unique character. The structures in that area were not being constructed using wood, which was the most common construction material used throughout the Polish lowlands, but limestone, mined at small local quarries. Their emergence is a result of a specific terrain of the discussed area, where in the vicinity of villages Rożniatów and Czepów, as well as the little town of Poddębice, a layer of Cretaceous sedimentary rocks reaches to the surface. An estimated number of 4000 structures in the region was erected using this material. These include houses, homesteads, barns, churches, manors, mills and other rural buildings. Research conducted by the authors between 2011-2017 revealed that a little over 2300 of these structures still exist. In the recent times, the speed of removal of these buildings, which are such a characteristic feature of the region's cultural landscape, rapidly increased. There are at least a few causes of this phenomenon. The depopulation of the rural areas results in abandoning of the farms, which thereafter soon become derelict and devastated. Most of the residential structures made of limestone in the past centuries does not meet the current utility standards. Therefore, they are frequently taken apart, and being replaced by new structures made out of modern construction materials and integrating universal design projects. More frequently as well, the owners of such structures are upgrading and expanding the existing construction, having the existing limestone elements covered with layers of thermo-isolation and plaster. These changes involve also farm utility structures for agricultural production. Since Poland's accession to the European Union, the rural areas of the country begun a definite expansion, but also a change in its profile and scale. As one of the side-effects of modernization of farmsteads, which were to increase their profitability and competitiveness, old structures are being abandoned and demolished. The civilization growth in Koło Basin and its surroundings results in the improving of its populations' living and working conditions is definitely a positive development. It'd be beneficial however that it proceeds in a more harmonious and balanced manner, preserving the unique cultural heritage of the region. In authors' opinion the actions which had been taken by the local authorities so far towards the protection and the preservation of these assets of cultural heritage for generations to come do not guarantee success of the undertaking. There is a necessity for forming and a subsequent firm execution a complex plan for protection of the limestone structures in the region. Authors point to the fact that the rural limestone architecture existing in Koło Basin is unique in the scale of the whole Europe.

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CONSTRUCTION OF CORRIDOR OF ARCHITECTURAL HERITAGE ALONG THE LINE OF ZISHUI RIVER IN HUNAN PROVINCE IN THE BACKGROUND OF THE TEA ROAD CEREMONY

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ABSTRACT

Heritage corridor originated from the United States, which is a new method for regional protection of linear cultural heritage, the accurate construction of heritage corridor is of great significance to the integrity and authenticity protection of the architectural heritage of the Tea Road. The article intends to build a reasonable corridor of Anhua Section Heritage Building by in-depth analysis of the distribution, heritage relevance and spatial structure of Anhua Tea Ceremony in Hunan Anhua Section, to provide a kind of thinking for the protection of the whole building heritage of The Tea Road, advance the work of application for a world heritage site.

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DISCUSSION ON THE PROTECTIVE RECYCLING STRATEGY OF HISTORIC BUILDING IN LINJIANG

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ABSTRACT

Village architecture is an important part of architectural heritage, is to explore the development of civilization indispensable valuable resources, contains a wealth of historical information and cultural connotations. The village architectural heritage has its own uniqueness, with the nature of the village and village have produced a different heritage protection form. We try to discuss the innovation and uniqueness of architectural heritage protection in atypical villages and towns in the non - typical villages and towns in Linjiang town.

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THE EVOLUTION OF THE SACRED ARCHITECTURE DEVELOPMENT IN WESTERN PODILLYA

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ABSTRACT

The purpose of the study is to determine the peculiarities of the sacred buildings and structures construction at each historical stage of the development of Western Podillya and the influence of socio-political factors on its sacred architecture. For the first time the article analyzes and reveals the regularity between the architectural planning of sacred objects and the socio-political factors that influenced them. Western Podillya is of great tourist value due to the historical-architectural and artistic heritage, and a great concentration of architectural sites and the urban planning at each historical stage. Being the part of the Kievan Rus and the Kingdom of Galicia-Volhynia, state was situated on the boundary of their western borders, which caused the construction of fortification buildings and structures, palaces and churches. After the Kyivan Rus collapse, Podillya region had become a constituent part of different countries such as: Poland, Hungary, Austria, the Austro-Hungarian Empire, the Russian Empire, the Soviet Union. Frequent wars, raids down caused the architectural transformation: transformation of castles on the fortress, fortification of churches, synagogues, monasteries. The contemporary history of the region wasn't less dramatic: being divided between different states. However, historical circumstances did not lead to assimilation, but caused rising of the spiritual potential of the region, the preservation of language and cultural traditions, religiosity, and national identity. After Ukraine has proclaimed its independence, the revival of national culture, the restoration of existing and the construction of new religious buildings began. The article presents the history of construction, names the patrons and this characterize the most prominent sacral buildings of the land, belonging to different historical periods of development of Western Podillya. Archaeologist's studies give us a reason to believe that the development of the most settlements began with the heyday of the Kingdom of Galician-Volyn. The Polish annexation of the Galician Rus part has provoked the process of establishing the Western European construction tradition in sacred architecture. It has been determined that some magnate families, firstly Russian and later Polish and Lithuanian, played crucial role in the sacred objects construction. It is proved that at the beginning of the XVIII century the elite stone construction was carried out by the architects with European architectural education. At that time, churches, monasteries, and temples, which currently have the highest artistic value, were built in all the areas of Western Podillya. As the research shows, the recent history of Western Podillya, two world wars, the atheistic power of the totalitarian period caused significant destruction of sacred shrines. During the Ukrainian independence a rapid process of temples building and restoring has begun. Western Podillya sacred monuments analysis is not complete, it needs a further research, but it gives us grounds to claim that the land is rich in sacred shrines with the highest architectural and spiritual value, which creates a unique architectural-landscape image. Considering the above, we can state that West Podillya sacred monuments inherited and continued the Kyiv Rus cultural traditions, but they are also closely connected to the Western European culture. Therein lays the uniqueness and value of sacred architecture of Western Podillya.

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URBAN LANDSCAPE - CUBIC STONE STREETS IN HISTORICAL AREAS, ADVANTAGES AND DISADVANTAGES: CASE STUDY TIMIŞOARA VERSUS ROME

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ABSTRACT

Cubic stone streets are part of the identity of historic cities. Over the last decade's most of the streets have been replaced by new but more perishable finishes, which have seriously damaged their historical appearance. Timisoara, the city on the Bega River, also called Little Vienna, still owns fourteen historic streets covered with cubic stone in the interwar period. From an urban point of view, there are two coherent assemblies of cobbled streets in Elisabetin interwar neighbourhood and four other isolated streets from other areas of the city. Architects, landscapers and culture people, inhabitants of Timisoara, want to stop the approach of local councillors who adopted in 2016 a feasibility study on the modernization of the last fourteen cubic stone streets by asphalting them. The immediate result of this article is the awareness of those involved in the city's problems by accessing a detailed and clear explanation of their importance to the city and the consequences of removing the cubic stone streets from the city. The multiple advantages of these streets are studied in direct connection with the area they belong to, depending on their local need and the benefits they give. A simple comparison with cities from Italy, such as Rome, can make us not only more aware of the importance of keeping them, but also teaches us that without a clear set of rules on their maintenance over time, the city could not still benefit from their existence, after hundreds of years of use. Historic areas are massively losing their appearance once the old pavement is replaced by asphalt cover. The areas of the cobbled streets mentioned in the modernization program are part of the historical protective areas or even integral part of the Elisabetin neighbourhood monument areas. To uncover the streets in question and to lack them by their already established image of cubic stone pavement streets simply represents the destruction of the historical identity of the area and therefore the image of the city.

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THE IMPORTANCE AND PROTECTION OF ARCHITECTURAL DETAIL: CRACOW CASE STUDY

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ABSTRACT

Nowadays, cities experiencing fast-paced growth need to tackle a plethora of issues. It has become necessary to marry multiculturalism and individuality, booming tourism and the day-to-day lives of the residents. Not unlike other cities, Kraków is experiencing rapid development – many townhouses are being modernised, and their appearance is evolving; it is especially the details. One pertinent task is to adapt historic townhouses to their new functions, while respecting the needs of their owners. This is why the protection of precious architectural details has become a particularly pertinent issue. State laws and local legislation adopted by local authorities protect buildings as a whole – in terms of their form and mass – but provide insufficient protection to precious architectural details of historic townhouses. Only few buildings have become officially recognised as monuments and entered in a relevant register. One of the objectives pursued in this paper is to popularize the need to preserve and protect the architectural heritage in the form of historic details pf Kraków's townhouses. The analysis of townhouses from the turn of 19th and 20th century produced the necessary basis for drawing several key conclusions. The manner of rendering details provides a link between the townhouses and the cultural heritage of the region, as well as to its flora and natural resources. What is more, architectural details enable us to identify connections between the form and its background – objects created in different periods of time – in terms of composition and space. Their continuity testifies to respect for the place, its culture and tradition. What is more, the paper also emphasizes the role of details in creating friendly urban space. They constitute an immanent part of the buildings, closely related to the human scale. They catch our eye and inspire curiosity, motivating us to ponder on the meaning of metaphors and symbols that they represent. The diversity of detail renderings ensures variable stimulation of spatial perception, while their artistic value and capacity to influence our emotions leave a permanent mark in our memory, facilitating the identification and memorisation of forms. The ambiguity that the details contribute to architecture catch our eye and create the specific atmosphere of a place. Although such details can seem of secondary importance, they constitute an essential part of the urban structure, and determine its quality. As a result, urban space becomes friendly and attractive. Diversity in terms of forms and materials, the vast array of textures and colours, not to mention the artistic value, strengthen one's identification with one's living quarters and offer props that facilitate the memorisation of forms. The dynamism of the 21th century necessitates, once again, the unification of physical urban structures – buildings, spaces, streets – with the cultural and economic aspects of life. Architectural details found, among other things, on townhouse facades, can be instrumental to this process. Good quality details, referring to the history of the city and found across public spaces, contribute to the formation of new civilizational patterns and can provide inspiration for the development of new architectural forms.

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RECONQUERING THE ALCAZABA OF BAZA

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ABSTRACT

The Andalusian medieval citadels are walled enclosures that, strategically placed on hills, still continue showing their defensive function inside the city and the surrounding territory. There are still good examples in the south of Spain, especially concentrated in the last territories of Al-Andalus. To the north of the old Nasrid kingdom of Granada, the city of Baza, with a brilliant Iberian and Roman past, also preserves some remains of its medieval past in its urban fabric. However, the Alcazaba of Baza, which was its main medieval architectural landmark, has suffered during the last century a lamentable process of abandonment and destruction that has almost made it disappear. Today its limits are unrecognizable and there are hardly visible parts of its walls or its towers. Anyone that visits it for the first time only recognizes a central empty space in the urban fabric. It has been mistreated by sporadic inappropriate uses, most of the time in disuse and converted into residual space of the city, a focus of marginality where it is not convenient to go. Despite its poor state of preservation, the fact of being an old military structure makes it a Historical Place of Interest *(Bien de Interés Cultural–BIC-)*, the highest level of protection granted by the Law of Spanish Historical Heritage (1985). Since then, with greater or lesser fortune, the urban planning of Baza has recognized its values, although it has allowed lamentable interventions inside. With some more success, the current General Plan for Urban Development (2009) established, as a public free space, a scope of the Special Plan for the Interior Reform of the Alcazaba *(PERICH-02)* through which the protection, conservation and revaluation of the delimited space, as well as establishing determinations of use, qualification of the land and intervention criteria in its historical and archaeological heritage. The Special Plan of the Alcazaba of Baza is the result of an international contest carried out in 2007 and develops the winning proposal that dealt briefly with the values of the Alcazaba. Consequently, the regional administration competent in the protection of the historical heritage demanded that, for a correct drafting, an exhaustive study of the emergent and hidden remains of the medieval military structure should be carried out previously. From here it comes the commission that a research group of the University of Granada developed at the end of 2016 and which is the subject of this article: Combining digital technology through drones and field work, it has achieved surprising results that has been shown in several maps: an updated topographic of great precision and, what is even more interesting, a typological map at different levels that allows to establish accurate hypotheses for the future archaeological intervention and that conditions all the initial approach of the Special Plan that resulted from the contest of 2007.

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URBAN REHABILITATION: A GLIMPSE FROM THE SPATIAL PLANNING LAW

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ABSTRACT

The urbanized policy of the last years in Portugal has been based on the construction of urban expansion areas, as much for industrial ends as for residential ends. It is estimated that the areas available for construction when added to the consolidated urban areas can house a population of 30 million inhabitants, while the Portuguese population is around 10 million. Many of these new urban areas are much bigger than it is necessary with problems in terms of waste of infrastructures, creating urban voids or discontinuity. Recently, there have arisen new legal diplomas designed to encourage an urbanized praxis that goes against the current trend and incentives the urban rehabilitation actions. These diplomas define one policy of urban rehabilitation in articulation with the municipal plans, namely with the contents of the detailed local plans (the most detailed of the Portuguese planning system). In this context, this article aims to present a reflection about the new challenges to the urban rehabilitation as an agent of urban design, the figure of detailed local plan as the first instrument of urbanized praxis in urban spaces which should be hackneyed in its utilization and, the process of construction of the city based on urban rehabilitation instead of urban expansion.

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ISSUE OF PROTECTING HISTORIC URBAN LAYOUTS OF SMALL TOWNS IN SOUTH-EASTERN POLAND – ON SELECTED EXAMPLES

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ABSTRACT

The article addresses the issue of protecting historic urban layouts of small towns in south-eastern Poland. The problem will be presented on the example of such towns as Dukla, Kołaczyce, Brzostek, and Sieniawa. Those towns were established during the medieval period, and their spatial layouts represent the urban models used at the time, which were based on full regularity. Among those most frequently applied within the discussed area were: 9-square model, turbine or pseudo-oval model also known as Silesian. Both during the last 50 years and nowadays, in the course of the intensified multi-faceted town development, those layouts and historic buildings surrounding them have been in grave danger of degradation, or even annihilation. It is worth emphasising, that only some of those layouts are under statutory legal protection thanks to an entry in the voivodeship register of immovable monuments. The others are not protected in any way, unless they have been included in Local Spatial Development Plans. As a result, their historic spatial layouts have been uncontrollably transformed or even obliterated. Such tendencies have a definitely negative impact on the cultural landscape, the identity of the place, but also on the spatial order of the centres of those towns. Therefore, more emphasis should be put on the issue of protecting those layouts and buildings surrounding them. Maybe cultural parks, which would help in ordering and revalorising those spaces, should be created in the centres of small historic towns on a larger scale. One should also demand ordering the traffic layouts in those towns, since frequently main supralocal roads run through historic town centres thus negatively influencing their cultural landscape, as well as their reception as a homogeneous urban interior. Another important question is educating the society about the protection of cultural heritage values, in this case historic urban layouts, which also entail such non-material aspects as traditions and the origins of a given town.

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ARCHITECTURAL HERITAGE AT ESTACIÓN CENTRAL COMMUNE (CHILE): TOWARDS A SUSTAINABLE CONSERVATION.

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ABSTRACT

Under a neoliberal policy established since the seventies, Santiago de Chile has faced the huge consequences of an accelerated urban sprawl, related to population increase and unlimited horizontal and vertical growth. In recent decades, architectural heritage has not been considered as a central factor in Santiago's urban development. The lack of attention towards heritage can be observed in this capital city. Estación Central commune is located at Santiago's central area, attached to the city's historical center. This commune reflects the recent effects of Santiago's urban transformations, with no consideration regarding constructed memory. The origin of this neighborhood, is related to the location of the first capital city train station, in the middle of the 19th century. Local heritage is composed, in consequence, by residential and industrial buildings of that time. Nowadays, this heritage can be seen in a complex conservation state, abandoned and neglected. In recent years, several non-listed historical sites of this commune, have been demolished. Non-strong legal preservation framework was established, and construction regulations were permissive. In recent months the explosive construction of high density buildings in this commune has reached local authorities opinion and national press. Non-quality apartments of reduced surfaces are progressively replacing and erasing the historical tissue of this area. The lack of an adequate heritage policy is related to this process: in fact, Estación Central commune has only 12 listed buildings in its whole territory of 1550 hectares. Chilean preservation policy works around a monumental heritage concept. Lower scale architecture remains, often, outside the preservation framework. Also, monumental, but not yet identified historical buildings remain out of legal protection. The absence of a sustainable urban policy in Chile related to architectural heritage conservation, has led to historical buildings' deterioration and demolition. Linking cultural heritage with urban planning, is nowadays a pending challenge. Conservation public policies should start from the knowledge of local cities urban memory. Understanding the past, could lead us to project its future. New ways of dealing with constructed memory should be proposed, in order to reach a new equilibrium related to our collective memory. This article analyses the amnesic phenomenon in progress at Estación Central, and identifies non-listed heritage existing in this commune, as a first step for its valorization.

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MONASTIC BUILDINGS: A REVIEW ABOUT NEW USES ON FORMER MONASTERIES - THE PORTUGUESE CISTERCIAN CASE

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ABSTRACT

This paper aims to present a review contribution to the history of the reform and renewal in the Portuguese Cistercian monasteries, throughout nine centuries of cultural and architectural history, but focusing on the new uses on former monasteries. The monastic Orders had a vital importance, both temporal and spatial, in the development of the urban fabric of cities. It must be considered that the transformation and development of the territory has been responsible for isolated buildings and settlements which have gradually been absorbed by the expansion of the urban fabric. 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 first Cistercian monasteries appear in Portugal, in the 12th century, far from the urban context. Portuguese Cistercian monasteries became worthy examples of the European Cistercian architecture, although over time having been adapted, enlarged and transformed according to the styles of each epoch. The extinction of the religious Orders, in 1834, and the successive owners adapted the monastic buildings to new uses. The monasteries have provided the contemporary city, especially from the 19th and 20th centuries, expectant spaces or new fields of experimentation as diverse as: rehabilitation, reuse, renovation, conversion. These are new spaces which adapt to new situations and new uses, they update themselves, including and integrating, in its history, the values of the present. Therefore, this paper aims to discuss, in which way the ideals and the realities of these monastic buildings and related urban spaces are divergent, but a factor of city growth and cultural development.

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DETERMINATION OF THE PHYSICAL AND MECHANICAL PROPERTIES OF THE MATERIALS USED IN THE NORTHERN CITY WALLS OF HISTORICAL SINOP CASTLE

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ABSTRACT

Turkey is a country that has hosted many civilizations due to its geographical location. The artifacts of these civilizations constitute important historical heritages of the country. The preservation, restoration and strengthening of historical artifacts and their transfer to future generations are the responsibilities of every country. Historical Sinop Castle that investigated in this study locates in the Sinop city where takes place northernmost of Turkey. Sinop province is a half island due to its geographical position and it is known that the castle walls were built due to the protection of this city. It is not known exactly when the historic Sinop Castle was built. It is estimated the time period of built could be 8th century B.C based on excavations. It is known that to hosted the Milets, the Cimmerians, the Persians, the Romans, the Byzantines, the Seljuks and the Ottoman Empire. Sinop Castle, which could survive untill today, has a length of 880 m in the North, 500 m in the east, 400 m in the south and 273 m in the west, and it defines the old borders of the city. It is observed that nothern city walls of castle (Kumkapı Site) have been subjected to natural influences due to the its location and it is in danger of collapse. The purpose of scientific research on materials used in historical buildings; to obtain more informations about visual, physical, mechanical and mineralogical properties of materials used in these structures. Using this information, suggestions on material selection to be used in the restoration of structures will be presented. In this study, stone and mortar samples were taken from the northern city walls of castle (Kumkapı Site) under the necessary laws and regulations. It was paid attention for the stone and mortar samples taken from the area at the sea level of the castle were intact. Samples of stone and mortar are masonry samples on the front surface, filler part and back surface of the castle. As physical analyzes on the samples; water absorption rates (bulk/ weight), real density, apparent density, porosity, and pressure resistance tests as mechanical analysis were appiled. In accordance with the results obtained, the suitability of the material with the material values used in the literature was emphasized. In addition, it was aimed to suggest restoration propasals that compare the mortar samples taken from the castle walls with the mortar samples of some researchers in the literature.

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FILTERING SURFACES IN SURVEYS WITH MULTIPLE OVERLAPPING: SAGRADA FAMILIA

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ABSTRACT

The heritage survey with the Terrestrial Laser Scanner (TLS) allows you to document the geometry of the building and to constitute a 3D point cloud as a register of its conservation state. When complex buildings with architectural and sculptural elements are scanned, there are a lot of captured data that is not valid because of the instrumental error and foreign elements of the buildings. For that reason, the point cloud must be cleaned with the objective to obtain a final model from which different products could be created, such as plans, technical documents and 3D models to print. For this cleaning process, in this article with the case of study is Antoni Gaudi's *Sagrada Familia* (*Fachada del Nacimiento*), we propose a methodology based on applying some filers, considering the fact that more than 3000 positions were realized, 750 of them belong to the same façade with positions that have a lot of overlapping data. Therefore, in a same zone of the building there is data scanned from multiple positions in different ways, so we can find there any kind of error, such as the noise from boundary effects, glass flections and mobile objects, and scans realized from a scissor lift, that have been previously validated. Different point cloud filtering processes have been studied, through the point cloud itself (position by position and with a unitary cloud), and by meshing it. Every process requires the knowledge of how the scan was realized, so it can be analysed what kind of error dominates in each zone. Therefore, each filtering option accomplish the requirements established after the analysis.

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LARGE SCALE PROJECT ARCHITECTURAL SURVEYS

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ABSTRACT

In this article, it is developed a methodology for complex surveys, using the Terrestrial Laser Scanner (TLS) technology, both for the characteristics of the building, the documentation particularities of the different spaces and the size of it. The developed study case is the monumental complex of the *Palacio Real Mayor*, part of the *Museo de História de la Ciudad de Barcelona* (MUHBA). The monumental complex is divided into: The Salón del Tinell, the Chapel of Santa Ágata, and the Romanesque Arcs under the Tinell. This study case requires a high number of positions due to the compartmentalization of the spaces and the degree of interconnection between levels, in both the interior ones and to the four attached exterior spaces. At the end, a total of 230 TLS positions were realized. As it is a project of great complexity of spaces and lighting, it has been chosen to work with differentiated methodologies between areas, highlighting the use in the same project of different equipment such as the Scanner Faro Focus3D 120 and the Faro Focus3D X 330 HDR. As the project has a purpose of disclosure, the colour registration must be photorealistic. Therefore, HDR techniques and photographic projection were used, in relation to the characteristics of the buildings. As a dissemination tool, classification processes of the point cloud were performed emphasizing the characteristics of a set of interconnected buildings. These can be decomposed stratigraphically taking into account the different periods of their construction, which are related to other investigations and allow a greater understanding of the historical evolution of the building. A Romanesque architecture building that is building on ancient Roman buildings, and rehabilitated based on Catalan Gothic architecture.

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THE 18TH AND 19TH CENTURY INDUSTRIALIZATION PROCESS AS THE MAIN ASPECT OF CITY CREATION AND ITS IMPACT ON CONTEMPORARY CITY STRUCTURES: THE CASE OF LODZ

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ABSTRACT

The article analyses the 18th and 19th century industrial towns transformation and the development in their structures. Due to science and technological advancement occurring in the industrial era, medieval and renaissance methods of city planning became inefficient. Industrialization forced great changes in urban planning and usage of natural resources in the most of the European towns. The case of Lodz – little agricultural town which changed into one of the biggest textile production centers in continental Europe over less than a century – indicates the importance of industry-related developments on its unique appearance and local identity at present. Lodz was transforming from craftsman town into the metropolitan area with the use of semi-rural layout from the early stage of industrialization. As a result, the city developed into a mixture of public spaces with strict planning law of iron-grid pattern surrounded with independent production centers as well as suburban residential structures without unified urban plan. As a result, a large European city emerged. It urban structure was subject of further extensions and transformations, especially in the second half of the 20th century. The most important were the changes in usage of public spaces and the emergence of new means of transport. Due to these transformations streets had to be widened, causing demolition of buildings, which resulted in destroying the compact urban structure. Another reason of the city deterioration was economic problems connected with political issues. In 1962 Lodz was one of the biggest manufacturing center where 58,8% of employment was recorded in the textile industry which show how that part of economy was connected with city. Some thirty years later at the early stage of post-communist transformation the textile production decline and a lack of new investments led to regression. The city created by industry underwent a metamorphosis. The factory closures badly affected not only the local economy but also traditional urban structure, and as a result caused the loss of identity and destroyed emotional links of local society with the city. The main aspect of article is to discuss how spatial organization of the industrial city, its urban structure and its way of functioning affected urban planning after the deindustrialization process, and how these factors shape the existing as well future city structures.

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AUTHENTICITY PROTECTION IN THE PROCESS OF ADAPTING ANTIQUE SACRAL OBJECTS. CONTEMPORARY ARRANGEMENTS IN CONSERVATORY DESIGN

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ABSTRACT

The article presents the ways of adapting antique sacral objects from various regions of Europe and also one from Asia. The introduction cites the post-war and contemporary conservatory doctrine, which extensively impacted the range of conservatory interference on specific objects. The examples of adaptations are historicist shapes and interiors of buildings or integration of the historical sacral building with contemporary architecture that uses modern material solutions and technologies which clearly contrast with the authentic pieces of the object. Contemporary arrangements in conservatory design are described based on the realization of two engineer's theses involving issues of conservation, revalorization, and adaptation of churches in Wrocław. The first work made by Eng. Arch. Ewelina Szczepańska titled "Attic and inter-tower spaces adaptation of Wrocław Archicathedral." included revalorization of cathedral's attic and spaces located above the northern nave and its adaptation into expositional functions. In the second work created by Eng. Arch. Karolina Bazan considered the topic of "The Attic adaption of Collegiate Church of the Holy Cross in Wroclaw.". In conservatory practice, the definition of authenticity and its interpretation has still got essential importance. Considering the primacy of authenticity's value as leading in the way of revalorization of the specific object and to keep the identity of the place. It is possible to analyze local traditions in the adaptation of antique objects. The value of authenticity in sacral objects cannot be just limited to material heritage, for which it consists of such obvious values as: form, function, construction of architectural object, material and detail, but also the value of the nonmaterial sphere, such as sacrum, symbol, memory and historical and social issued should be considered.

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MOISTENING OF WALLS CAUSED BY DAMAGE TO TERRACES - RESEARCH STUDIES AND NUMERICAL SIMULATIONS

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ABSTRACT

The aim of the article is to determine the impact of terrace damage on the moisture of adjacent external walls. Changes in moisture of wall structures can be diagnosed based on different measurement methods. In the building being the subject of the research, the damage to the terrace was caused by the moisture of adjacent external walls, made of solid ceramic bricks. On the basis of macroscopic studies, the causes of irregularities were determined. Conducted measurements of water content of individual parts of the external wall made of solid ceramic bricks were made by non-invasive method and destructive method. Measurements of water content by non-destructive method were carried out using a measuring instrument with a probe to measure material moisture. The research showed differentiation of the water content of walls depending on the location in relation to the source of moisture. During the non-destructive tests carried out inside the building, the surface moisture of the solid ceramic brick, constituting the construction of external walls and lime plaster, was measured. Measurements of water content of plaster and brickwork, qualifying them as wet walls. In places outside the area of moisture, the water content of plaster and solid bricks were several times lower. The destructive tests were carried out using the drying-weight method. In order to obtain the results of water content in the area of moisture and outside the moisture area, 3 samples of solid bricks were collected. The average water content of the ceramic brick wall in the places of occurring moisture, they were three times higher than the water content of the brick outside the moisture area. The obtained test results indicate significant differences between the moisture of the brick examined in the near-surface area and water content inside the wall. On the basis of obtained results of laboratory tests, numerical calculations were carried out using WUFI 2D software. Numerical simulations made it possible to present changes in water content of a solid brick over a period of three years. Based on the carried out tests and numerical calculations, it can be concluded that despite relatively large differences in the initial water content of wall parts in moist and non-moist areas, after a period of 3 years, the moisture status for both analyzed cases is similar and occurring water content differences are practically negligible.

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DAMAGES TO HISTORIC BALCONIES IN THE ASPECT OF BUILDING PHYSICS

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ABSTRACT

The article presents the problem of damage to historic balconies of other construction and material solutions than currently used. The issue of their durability and maintenance is a wide spectrum of issues, including repair and renovation methods, selection of new materials for existing structures and their interaction. The applied solutions must take into account the specificity of the element's work in conditions of external environment impact, variable temperatures, positive and negative (including, in particular, zero crossings), atmospheric precipitation or solar radiation. Special attention has been paid to balconies with a steel-ceramic structure, which diagnostics should also include, apart from structural analysis, a detailed observation of phenomena in the field of heat and mass flow. The results of numerical analysis for two-dimensional models, similar to the actual construction of the historical barrier (for the original state and after thermal modernization works) were presented as well as the results of infrared measurements of one of the apartment buildings with balconies, with steel beams. In the adopted boundary conditions, the local climate was taken into account, based on data from the nearest meteorological station. The assumption was to obtain qualitative results. As results, distributions of temperature fields in cross-sections, distribution of heat flux density changes, and temperature values in selected cross-section locations were obtained. The research confirmed the expected tendencies in the temperature distributions in the partition, places of local thermal bridges and showed the zones of their impact. Further analysis is required for obtained changes in heat flux density, both in the steel beam support node, as well as in the joints and bricks, in the adjacent layers. These places coincide with the actual occurrence in buildings loosening and weakening of mortars in walls and ceramic tiles. In further analyzes, it will be necessary to use simulation programs that allow to determine the amount and changes of moisture in time.

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THE DISTINCTION BETWEEN MUSHROOM AND UMBRELLA STRUCTURES IN SLOVENE ARCHITECTURE

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ABSTRACT

The essential feature of the tree-inspired structure is a roof supported by a single central column and its foundation. Often called dendriforms or lily-pads in the past, different tree-inspired structures are nowadays described mostly as mushroom or umbrella structures. Even though there are certain differences between these kinds of structures, most authors, predominantly art historians, do not define the terms mushroom and umbrella structure precisely and often do not bother to make the distinction clear. This paper aims at clarifying this distinction using the existing tree-inspired structures in Ljubljana, the capital of Slovenia, as test cases. A brief historical overview of the development of tree-inspired structures is given first. It starts with the world's first three mushroom slab constructions built from 1906 to 1908 and continues with several tree-inspired roof structures of the first half of the twentieth century. The main part of the paper describes eight selected buildings in Ljubljana, all of them examples of mushroom or umbrella structures made of reinforced concrete. The oldest described building is an experimental structure from 1933, then come two pavilions built at Ljubljana's Exhibition Centre, three different examples of gas stations, canopies for cars, and canopies at the Ljubljana's main railway station. Except for the first, all were built in the late 1960's and early 1970's. The eight buildings are first compared quantitatively regarding their overall size, shape of the roof, and the number of the repetitive structures these buildings are made of. Then, the type of each described structure is examined and compared to others. It is shown that Slovene architects and art historians of that time used both terms, namely mushroom and umbrella structure, imprecisely, indifference being the most probable reason. The analysis of different tree-inspired structures in Ljubljana as well as in literature leads to the clarification of the definitions of the mushroom and umbrella structures: the latter have ribs or cantilevers while the former do not. Hence, for civil engineers and architects the difference is in how the load force is transferred to the central column. In the mushroom structure, the load force in every single point of the roof is transferred directly to the central column while in the umbrella structure, which consists of a tension loaded roof that works together with ribs, the load force is transferred indirectly via the ribs. For art historians and common public, however, the main difference is that unlike the mushroom structure, the umbrella structure has visible ribs - but this might be misleading as ribs might be covered by a secondary structure.

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CULTURAL TRANSFORMATION OF THE OTTOMAN PERIOD PALACE LANDSCAPE IN ISTANBUL

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ABSTRACT

Physical environments that are set up within natural environment bear the traces of the periods in which they existed and the traces of societies which lived in these periods by shaping historical structures and positions of structures to one another, the use of gardens and interior/exterior places, the utilized materials, construction techniques, etc., and they put forward the identities of societies. Cities develop and change in accord with the society's living needs. Today, historical gardens are damaged due to problems including rapid urbanization, population increase and unplanned structuring, etc. Making roads or enlarging the existing roads especially damages the borders and texture of historical palace gardens both visually and physically. Palace gardens in Istanbul have been subject to these problems and their unique borders have been changed or special quality structural components of palace gardens have been demolished because of the new road works carried out or as a result of structuring. The Ottoman period historical palace gardens turned out to be the structures which functioned as the living areas of state administration and the Sultans and reflected the art and architectural cognizance of the period with their unique structures. These palaces, consisting of structural groups, have been the areas where the western influence has been observed since the 19th century conspicuously and as a result, they have been the areas where special designs and compositions were created. The aim of this study was to set forth the Ottoman Period palace garden cognizance as well as to investigate Çırağan Palace Gardens, which have the quality of cultural landscape yet have lost their cultural value and reached today with a different texture, function, and feature, and to put forward their special quality, garden design, and spatial organization.

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REVITALISATION OF HISTORIC CENTRES IN SMALL TOWNS OF WARMIA – IN SEARCH OF CREATIVE SPACES

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ABSTRACT

Warmia is a historic land in north-eastern Poland, where twelve towns founded in the Middle Ages have survived until our time. All of them (except Olsztyn) can be classified as small urban centres. Their location was dictated by a combination of military and topographic considerations. In the past, these towns were protected by castles and fortified walls, while their layout was developed according to the medieval principles of urbanistic composition. Revitalisation of small Warmian towns is a problem that mostly concerns their historic centres, which are a manifestation of the towns' identity. The part of a town called the Old Town comprises both public and private spaces over its relatively small area. The complexity of elements which create these structures (spatial factors, such as the urbanistic and architectural components, preservation of historic buildings, economic and social issues) forces us to seek for such transformations that will expose and revive the functionality of a town's historic centre against the backdrop of its other areas. This is where the need to shape creative spaces within the town's historic area can find its justification. The above issues are the main objective of this article. The research has enabled us to draw conclusions in regard to including numerous aspects and connections between spatial factors and functions of old towns. Revitalization efforts should focus on the elimination of sources of threat, improvement of the technical condition and aesthetic values of the space (urbanistic patterns and layouts, architecture of urban complexes) and the betterment of living standards and conditions for local residents. Having achieved this, we will re-focus on the status of historic town centres, on their essential role in the contemporary life of towns, and on the need to preserve the heritage of whole Warmia.

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ORIGIN AND THE IMAGE OF CONSERVATION ZONES OF SLOVAKIA

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ABSTRACT

Conservation zones, as one of the legislative status of historical sites, are an integral part of the monument fund of the Slovak Republic. At present, they are divided into four basic types - urban, rural, landscape and special. The contribution will be devoted to the urban conservation zones in Slovakia which are the most represented in the Central List of the Monument Fund. Even at the time of preparation of the proposals and the subsequent declaration of the conservation zones (90s of the 20th century), their historical urban structure was disrupted by modern buildings, mainly from the second half of the 20th century. These interventions remain as negative phenomena that interfere with the integrity of the cultural and historical values and the genius of the site. This approach is typical for every town in post-socialist countries, due to their industrial development which increased the population growth and catalyzed the construction of new residential zones (new mass-housing period) with new amenities in the historical core. The radical change from private to social ownership was a significant milestone in the modern history of Czechoslovakia and all the countries under the influence of socialism. The main problem of the new structures is that they were built according to modern urbanism, creating solitaire buildings and neglecting the traditional public spaces. The first step should be evaluation of the existing situation and determining if a positive redesign of their surrounding areas would eliminate most of the negative view. Current views on the protection, care and further direction of cultural heritage in historic sites is summarized in the Principles of Protection, Rehabilitation and Presentation of the conservation zones. The Principles of Protection sees the constructions from the second half of the 20th century as "objects that do not respect the values of the area". Furthermore, they propose to correct the disturbing character by change of materials and colours or replace them with new objects. Here we come to the question of how to replace these parts of the area where the original structure disappeared in the 20th century and were replaced by a "new" modern development? Nowadays it is common practice to enforce the former historic plotting, when dealing with new design in conservation zone. *"This is the case where a much deeper analysis of the original and current situation is needed."* (Vodrážka, 2002)

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INDUSTRIAL HERITAGE OF TRNAVA IN THE CONTEXT OF ACTIVITY OF TRNAVA'S BRANCH OFFICE OF PITTEL & BRAUSEWETTER – THEIR ARCHITECTURE, URBANISM AND IMPACT TO THE CITY DEVELOPMENT IN PAST AND TODAY

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ABSTRACT

The research of industrial heritage on the territory of the city Trnava concerns a relatively wide range of issues – from the context of city development through the influence of the industrial development and gradual expansion of city, through the urbanism of the industrial areas themselves, the architecture of individual industrial objects, their present situation and the future of their preservation. Trnava is best known as a historical medieval town, which was closed in the historical core surrounded by the medieval fortification to the half of 19th century. The development of industry in the city has also started to develop the city and its gradual expansion. Despite the fact that Trnava was not a big and such important industrial city in comparison with others (Bratislava and others), there were several industrial concerns that significantly influenced town development in several aspects. There were other issues that develop the city and have made city life even better, except the above-mentioned rise of the city, which was related to jobs opportunities and thus the rise of the number of citizens. One of them was the impact of factories on the technical infrastructure of town – specifically electrification. The second was there impact on some social and cultural aspects – when they became part of the identity of the town. There is another value related to the industrial heritage of Trnava, which exceeds local values of heritage. It is an activity of famous construction company Pittel & Brausewetter which is significant in the history of construction and architecture in the whole Austro-Hungarian monarchy, later in Czechoslovak republic until the company was seized. Pittel & Brausewetter and established of their branch here in Trnava. This article is focused on two significant factories in Trnava – Coburg's metallurgical plants and Fisher's chocolate factory, both projected and built by Pittel & Brausewetter. Both were built at the same time at the beginning of the 20th century. The paper aims to evaluate and compare the architectural features of this industrial heritage of the city, to evaluate the urbanism of the industrial heritage and their impact on the city not only in physical form. It answers the research questions: what are the characteristic features of the architecture of selected industrial buildings, what forms their location in the city and their urbanism and what was their impact on the life in Trnava? What are the values of this heritage and how to protect them?

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URBAN CONSERVATION POLICIES AND PLANS FOR A WORLD HERITAGE SITE CASE: ANTIQUE PERGE CITY AND ITS MULTI-LAYERED CULTURAL LANDSCAPE

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ABSTRACT

Pergamon, Ephesus, Pamukkale, Goreme, Cappadocia, Istanbul, Bogazkoy, Nemrut Mountain, Xanthos-Letoon, Patara and the Great Mosque and Hospital of Divrigi in the "World Cultural Heritage List" which are very famous assets of Turkey. Turkey is one of the 10 original member states to establish UNESCO. 16 Assets in Turkey are included in the UNESCO List of World Heritage Sites. Further, 69 sites have been nominated and are included in the tentative list. Antalya's Perge (Pergeai) Antique City and Its Multi-Layered Cultural Landscape entered the UNESCO World Heritage List 06. 02. 2009. Perge became the 999th WORLD HERITAGE. Bergama, which has been in operation since 2010, has entered the list as a "Multilayered Cultural Landscape Area". Perge, the long-established city of Pamphylia region, is located 18 km east of Antalya and 2 km north of Aksu Village. The Archaeological site of Perge has been excavated systemically by Istanbul University since 1946. The site and the surrounding protected by the Turkish Legislation for Preservation of Cultural and Natural Property, Law No.: 2863 amended as 1., 2. and 3. degree archaeological site since 1981. Archaeological finds in Perge date back to different periods beginning from the Late Chalcolitic Ages. It's revealed through the even rarely found remains that Perge had been settled permanently in Early Bronze Ages, meaning that it is a significant settlement witnessing permanent land use from the beginning of that time. One of the remains belonging to early periods of settlement has been excavated in Bogazköy. "Parha" name written on a bronze plate by cuneiform script and documenting an agreement in 13th BC is associated with the name of Perge. Any remains contemporary with the bronze plate has not been found yet. In the Classical period, Perge had a grid-iron plan with a defense system. It is discovered through the excavations that the quality of this grid-iron city plan and defense system was advanced and new monumental buildings for cult and other purposes were built in Hellenistic Period. In Archaic and Classical periods, however, Perge has the urban characteristics containing native and Hellenic motives and having relations with different centers and states in East Mediterranean. For this features city stands as an important sample of classical city planning. The main purpose of this paper is to explain and summarize of urban and archaeological conservation efforts for Antique Perge City since 1993 to 2009. In the paper also aimed to give the conservation policies of public administrations which mainly central (Ministry of Culture and Tourism) and local (Antalya Municipality). As being a conservation planner working on Perge since 1993, I' will concentrate the following aspects and conclusions; a. 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, b. In the Case of Perge; this problems mentioned above are already defeated by the central governmental bodies. Unfortunatelly this success costs time and money, as well as more losess in the urban and archaeological areas, c. The Paper will be aim to handle the governmental policies about the conservation, the inefficiencis in planning and approval of conservation aimed plans.

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ENHANCING THE ATTRACTIVENESS OF ARCHITECTURAL MONUMENTS AS TOURIST ATTRACTIONS: CASE STUDY OF MEDIEVAL CASTLE RUINS IN THE AREA OF JURA KRAKOWSKO-CZĘSTOCHOWSKA IN POLAND

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ABSTRACT

The author explores a recent phenomenon that is gaining popularity in Poland and causes alarm amongst conservation professionals, namely a series of initiatives undertaken to enhance the attractiveness of architectural monuments during their adaptation to meet the needs of cultural tourism. Such adaptations are undertaken to attract larger audiences, requiring the provision of suitable infrastructure. The ensuing challenges relate to the erosion of cultural significance caused by alterations to the fabric and the impact on the setting of the heritage assets, as well as less tangible changes in attitudes and behavior of local communities. It is obvious that there is a pressing need for finding satisfactory and creative solutions as part of new heritage management policies for historic assets operated as tourist attractions. So far the effects of these policies are debatable to say the least. The issue is discussed using three case studies – ruined castles forming part of the medieval fortification defense system of the area of Jura Krakowsko-Częstochowska in southern Poland. The sites have similar character but they are representing entirely different approaches of their managers to the adaptation of a monument in order to create a tourist attraction. The analysis of these case studies leads the author to present her own, innovative model of changes that would inform the process of adaptation of monuments as tourist attractions without causing any loss to their heritage value and significance. The researches and conclusions presented in this paper have been constructed based on site visits and field research as well as on the existing tourist guidebooks, information included on the official internet page, opinions expressed by visitors on various travel portals and comments given in social media. The survey of these sites has informed the author's objective to create a model which could be used by managers of similar heritage sites to transform their property into a tourist attraction without jeopardising its heritage significance.

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THE INFLUENCE OF ARCHITECTURAL PRACTICE IN POLAND ON CULTURAL HERITAGE – SELECTED PROBLEMS

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ABSTRACT

The condition of architect's profession in Poland has changed significantly in last thirty years. It doesn't mean that an important progress can be observed in every part of this specific job nowadays. Of course, there are many advantages of a political transformation, which had place in this country starting from the year of 1989. The today economic situation of architects differs very much from the past. Meanwhile, alarming things have occurred in many examples of re-use of old building and gentrification of historical area. The purpose of research was to recognize reasons of controversial actions in the field of architectural design related to conservation issues. The main aim of the article is to outline a few problems of contemporary practice, which have impact not only on modern, but also on historical architecture. Among others, principle results are mentioned in next couple of sentences. Very significant are contracts. In many times, there is lack of proper balance between an investor and an architectural studio. It concerns primarily the part of designing process. The essential chapters of contracts have some information about remuneration for services, usually quite low, and punishments for delays and withdrawals from the contract. In practise, the position of architect in Poland is very weak. The other problem is law regulations that seems to be rather inadequate to reality in the area of historical buildings' preservation. Another issue is the fact that a designer has often no relevant knowledge, experience and interest in the field of tangible cultural heritage. Also the architectural organisations, operating in Poland, seems to act not strong enough in discussed topics. There are many things to do in the matter of public orders, workshops, interventions and others. Conclusions include proposal of ways of changing the situation. Some of them has been already begun, others can be improved. The content of the paper may help to understand why economic growth can be negative factor of preventing ancient buildings from damage. Values of heritage are part of basis of architectural design. Combining them with modern needs to find the best solution is difficult, even for professionals, but can be conducted properly, due to continuous development of theoretical findings.

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MUST PROTECTION STOP REVITALIZATION?

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ABSTRACT

"The rate of building renovation needs to be increased, as the existing building stock represents the single biggest potential sector for energy savings. Moreover, buildings are crucial to achieving the Union objective of reducing greenhouse gas emissions by 80-95 % by 2050 compared to 1990." (Directive 2012/27/EU of the European Parliament and of the Council of the European Union, 2012). Today we have international goals, but not international regulations in Europe. Among other the minimum energy requirements are defined on national level, and often the regulations are not clear in the case of existing buildings. *The building stock in Norway constitutes about 4.1 million buildings and represents one of our largest values. 70-80% of the buildings that will be used in 2050 are built. Use and reuse of the elderly building materials instead of demolition and construction of new ones are important environmental protection* (Tekniske krav ved tiltak i eksisterende bygg I Eksempler på unntak etter plan- og bygningsloven). In Norway the current regulations are formulated for new buildings, not for existing. Exceptions must be sought by investors. For investors, demolition is often preferred due to lack of clear retrofitting regulations and requirements as well as uncertainty of cost-efficiency (Byplankontoret, Trondheim; Dive-analyse, Kulturhistorisk stedsanalyse for Kulturmiljøet Kjøpsmannsgata – høst 2017). Buildings of high historical value are often protected by other law in addition to regulations defined in Norwegian building code. As a result, upgrading existing buildings to the current, among other, minimum energy requirements or higher energy standards is challenging. What can we do for to protect the buildings without to stop their revitalization? Method; a. Analyzing current status of regulations related to existing buildings of high historical value protected by Cultural Heritage Management Office in Trondheim, Norway, b. Mapping of conflicts in the current regulations that stop revitalization projects. As conclusions; a. Today, upgrading of existing buildings of high historical value in Norway is challenging, b. New regulations that take into account the specific situation of the protected buildings are needed for to save the buildings and the culture landscape that we can enjoy today for the next generations.

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STUDY AND ANALYSIS OF EXISTING HISTORICAL BURIALS: THE POSITION OF THE DEADS INSIDE THE CO-CATHEDRAL CHURCH OF SANTA MARÍA IN CÁCERES

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ABSTRACT

Cáceres has been a World Heritage Site since 1986 and one of its most emblematic monuments is the Co-Cathedral Church of Santa María which is located within the walled city of Cáceres in the heart of its historic center. The building was erected between the 15th and 16th centuries over an earlier Mudejar building. Although there are several studies about the church from a historical and architectural point of view, none of them have been dedicated to its pavement which contains one of the most important tombstone mosaics in Spain. It is a checkerboard of tombs executed progressively from XV century that occupies the totality of the three church naves from the start to the chevet. The present study initiates a precise dimensional analysis of tombstones paving the floor of the Co-Cathedral Church of Santa María in Cáceres to catalogue them, establish the orientation of the dead buried under its granitic pavement and concretizing certain aspects of the architectural evolution of the temple. To carry out this study, advanced methods of photogrammetry and digitalization have been used in order to be precised and been able to rebuild the lost and crucial information. When we mention the position, we do not refer only to the topographical one, interesting in itself by the relation that always existed between closeness to the altar and fortune, but also to the position of the person in the society that gave him burial. This social positon can be deduced by the artistic dimension of the shield carved on its tomb placed in one of the most complete heraldic groups of the Spanish Renaissance.

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THE RURAL HOUSES OF AKÇAKESE – İSTANBUL

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ABSTRACT

Rural settlements represent the ideal synthesis of people's ability to modify the environment to their own advantage with minimum impact. Every building can be an important part of rural architecture creating the identity of a landscape or a region. Akçakese village is one of the most valuable and conserved villages of Şile, which is a district on north of European side of İstanbul. Although it is located close to İstanbul, it is not affected by the negativity of the metropolis. The unique vernacular architecture of Akçakese reflects and supports the region's own identity. Statutory protection of traditional Akçakese houses dates from 2009, lists of buildings of special architectural or historic interest were compiled, totally 60 of them were recorded. The historical, architectural, environmental features of the traditional houses and how they developed through time with special characteristics and their relations with the setllement is evaluated. The assesment is based on literature review, field observations, interviews, visual materials that focus on the architectural characteristics of houses. The predominant building materials are wood, stone and adobe. While load-bearing masonry and timber skeleton systems are used common, the wattle technique is used in the outer walls of the houses. Traditional Akçekese houses were built of natural materials and are of great cultural importance. Small quarters connect two-storey wooden houses which sit comfortably to the landscape. It is important to retain awareness about the importance of preservation of this traditional houses and its environment.

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MEDIEVAL BUILDING TECHNIQUES AND TECHNOLOGIES OF THE MEDITERRANEAN MARITIME AND RIVER ARSENALS

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ABSTRACT

Historical shipyards are to be considered, first of all, as infrastructures in which naval experimentations have been started but, at the same time, also as an open-air workshop where innovative construction techniques, for the construction of impressive industrial buildings, were developed. Dockyards are peculiar constructions, places of transition where terrestrial activities serve and give way to the aquatic ones. They are architectures that rest on the mainland but at the same time create an indissoluble connection with the water, their raison d'etre. Although today they are obsolete due to their original function, they are holders of grandiose and timeless architectural structures. They are embedded in the dense and intricate plots of the historic centres of the Mediterranean port-cities and are increasingly included in plans for their recovery and redevelopment of adjoining areas. A research, dedicated to the comparative analysis of the Mediterranean major arsenals of the medieval era, has been put in place for creating an analytical document concerning the evolution and definition of the architectural type "naval arsenal", aimed at enriching knowledge useful for the conservation and recovery of these buildings. The analysis of these structures is essential both to understand the spatial conformation and to shed light on the technical innovations and technological experiments carried out in the construction field during the Middle Ages. For this reason, the data taken from the iconographic and bibliographic sources are compared with those derived from the direct analysis of the arsenals of the emblematic port centres of the Mediterranean Sea. During the cognitive research process, we have examined the arsenals of the Italian peninsula belonging to the famous group of maritime republics, Venice, Genoa, Pisa and Amalfi, creating a graphic collection of the different shipbuilding structures according to their original concept. Through the comparative study, expanded with other specimens of the Iberian Peninsula (Seville, Barcelona and Valencia) together with those of the Balkan, Greek and Turkish territories, the analogies and the differences between these structural systems have been highlighted, to increase the study of these architectures that unite various and different peoples linked to marine or fluvial activities within the Mediterranean basin.

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INTERPRETATION OF GRAPHIC SOURCES AND CERAMIC ELEMENTS "IN SITU" FOR THE RECONSTRUCTION OF THE PINNACLES OF *CENADOR DEL LEÓN* IN THE REAL ALCÁZAR OF SEVILLE

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ABSTRACT

The medieval gardens of the *Real Alcázar* of Seville hides, among the dense vegetation, the beautiful *Cenador del León*, attributed to the architect *Sánchez Falconete*, decorated with paintings made by the painter Juan de Medina and tiles created by the *Valladares* brothers. Example of the late mannerism of Sevillian architecture, the pavilion, next to its pond with limestone fountain which fountain is a statue in the shape of a lion, constitutes a harmonious and symbiotic set with nature. In 2014, due to the advanced state of degradation in which the pavilion was located, especially due to problems of leaking water from the pond and humidity due to the increase in capillarity, it was decided to undertake a rigorous and careful restoration work. Among the objectives of the project, which have mainly interested the elimination of moisture in the walls, chopping and recomposition of coatings with lime mortar and stone cleaning as well as locksmithing, the restoration of all the ceramic elements present on the roof, in the pavements and in the perimeter banks of the pond has been very important. The rich set of tiles, commissioned to *Benito Valladares* between 1645 and 1646, included both the tiles to cover the exterior of the dome, composed of white and blue tiles, arranged in checkerboard, the pavement of the pavilion where it develops an ornate figurative composition adjusted to its starry plant and finally the toned pinnacles. The latter, as demonstrated by a meticulous investigation of iconographic material (fundamentally old paintings and photographs) have been replaced and changed over time, probably because of their rupture or fall, leaving only three of the original pieces, all of them decorated with segments and blue circles on white background. These are constituted by two circular bases, placed on the highest pedestals of the side walls of the pavilion, and the ball with two circular plates that culminate, next to the wrought iron cross candle, the cover. Through this elements, from the written and iconographic sources together with the comparison with other models of coeval pinnacles, it has been possible to create four "*ad hoc*" pinnacles, which have replaced the previous ones, both due to their poor condition and incongruous chromatic combination, to return a harmonious image, with adequate proportions and just composition, of the facade of the *Cenador del León*.

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BRICK WALLS OF BUILDINGS OF THE HISTORICAL HERITAGE. COMPARATIVE ANALYSIS OF THE THERMAL CONDUCTIVITY IN DRY AND SATURATED STATE

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ABSTRACT

In the energy efficiency restoration, one of the most important aspects to consider is the loss of heat through the enclosing walls, for which constructive solutions are sought to improve their thermal performance, being usual to place a sheet of insulating material on the inner side of the facade, avoiding intervening on the outside, so as not to alter the appearance of the buildings. This fact is aggravated in the buildings built with brick factory, especially in those belonging to the Historical Heritage whose walls are raised with handmade bricks joined by mortar joints. This type of wall has a high porosity, whose immediate consequence is the absorption of a large amount of water, which is a good conductor of heat, which means that a wall saturated with water has a higher thermal conductance than being dry, increasing the consumption of energy needed to thermally condition the interior. Applying the current regulations, in order to determine the thermal conductivity of the mentioned walls, laboratory tests have been carried out on dry and saturated specimens and also on similar materials. The analytical study of the values obtained from the thermal conductance of the brick factory wall in wet state and in dry state offers data with important variations. The most immediate conclusions are two, firstly that it is necessary to know the state of humidity of the facades to determine the insulating behaviour of the same and that to save energy and achieve an effective intervention, it is necessary to act on the outside of the walls, keeping it dry by applying treatments on the facades.

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FORMER AUSTRO-HUNGARIAN FORTRESSES IN THE SOUTHERN POLAND AS PROBLEMS OF PRESERVATION, RESTAURATION AND ADJUSTMENT FOR PUBLIC PURPOSES

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ABSTRACT

As a result of partition of Poland in the year 1772 all the southern and eastern part of the Kingdom of Poland was captured by the Austrian Empire. In the 1846 the last independent survivor of Poland - small Republic of Krakow was joint to the Austria. A crisis between Austrian and Russian empires during the Crimean War (1854) forced a decision about erecting two new fortresses, defending the maneuver area of the Galicia, north of the Carpathian Mountains. Fortress Przemyśl defends a strategic way thru the Łupków and Uzsok passes to the Hungarian Lowland. Fortress Krakow defends a main strategic way to Moravia and Vienna. Each one fortress was enlarged, reinforced and modernized in many times according to development of artillery, firearms and modern tactics. In the 1880-thies a concrete constructions were used at the first times. In the 1890-thies the Austrians used armored constructions - turrets, shields, casemates, protecting artillery emplacements against the projectiles of new types. Each the fortress fulfilled its functions during the World War I. Przemyśl was besieged in three times; the 2nd siege was a longest fortress battle in the Great War. Before a capitulation in the March 22. 1915 all the forts of Przemyśl were blown up and demolished. Krakow stopped the Russian offensive in the November and December 1914. After the war, the army of independent Poland still used the Fortress Krakow and continued a demolition of the Fortress Przemyśl. A lot of forts fulfilled military and not military functions during the WW II (in this number - a places of the Nazi terror) and during the Cold War. In the beginning of the 1960-thies scientific recognition of the former fortresses was started (Bogdanowski, 1966; 1979). In the 1969 first former forts were enlisted to the Polish Monuments Register. Moreover, a circular system of the fortress' camouflaging greenery of Krakow was treated in the first time as an outline of the city system of greenery. Today huge circles of forts, batteries, earthworks around each city and massive complexes of barracks, magazines, factories, hospitals and other post-military structures signify big problems but, on an other hand, an opportunity for these adaptation - for cities' self-governments. Union of communes inside the former Fortress Przemyśl started an ambitious program of the adaptation of the forts ruins as attraction for a cultural tourism. It succeeded to finish a first stage of the project with a financial support of the EU Founds. A part of more than 140 fortress' objects of the former Fortress Krakow are under adaptation, but a majority of them still are without a new function. Each the fortress is a great urban, engineering and moral problem and challenge. There are great battlefields, blooded by the sons of a many Nations of the Central and Eastern Europe. This paper is a report of the state of proceeding of these projects.

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PREVIOUS STUDIES FOR THE IMPLEMENTATION OF A BIKE LINE ON THE ROMAN BRIDGE OF ANDÚJAR, SPAIN

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The Roman Bridge of Andújar is a structure of ashlars and fourteen spans that allows to save the course of the Guadalquivir River in its middle section. Linked to the Via Augusta first and the so-called Carretera de Andalucía from the 18th century, it has been part of the main road network of the Iberian Peninsula. Once its traffic was reduced half a century ago to the local level, its level of protection is as great as possible within the Spanish legislation and it is the objective of the administration to allow the transit of bicycles and connect the two margins of the population. In this article we will develop a specific methodology for the study of the different pavements that throughout history have been arranged for different types of vehicles and traffic: cars, animals, livestock and motor vehicles. Taking as reference the pedestrian adaptation of the Roman Bridge of Córdoba, on the same river, it will be particularized for the concrete factory of the Puente de Andújar. The historical plans and the reports of the Highway Service will be analysed. The objective is to propose an adequate solution to the structure and current needs in terms of sustainability.

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NEW SUSTAINABLE LANDSCAPE-CHANGE SCALAR STRATEGY TO DEFEND THE FARNSWORTH HOUSE´S ENVIRONMENT FROM THE FOX RIVER FLOODS

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ABSTRACT

The Farnsworth house has contributed to create a real and meaningful landscape for its community and region along the past sixty years. Latest emergency news about its vulnerability to floods, studies and reports requested by its current owner - The National Trust for Historic Preservation in the United States – and options on them pondered to mitigate water destructive effects, demand a new sustainable scalar strategy in the light of current cutting-edge landscape research. The present essay would first offer a brief analytical approach to the solution options to identify and attend the flood mitigation problem included on the engineering report of 2014 and also to the resolutions that show interrelation with the mentioned issue implemented by the successive owners of the house from 1945 to 2017. A contribution to a new integrative conceptual framework would then be offered by means of a double theoretical approach: one derived from a critical opinion on the so far published considered solution options that claims for preservation of the current existing landscape features, and the other provided by a compatible new proposal developed at two scales: a regional scan that would offer future-anticipation defenses for the causes, and a close-range look that would provide creative-invention defenses for the effects. The essay concludes with some thoughts that intend to excite new synthetic reflections and more specific guidelines to face the landscape flooding problem of the house and so develop general interest concepts for the scientific community, experts and stakeholders, in a further discussion.

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THE OVERLOOKED RURAL ARCHITECTURAL HERITAGE OF THE SECOND POLISH REPUBLIC

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ABSTRACT

In the Interbellum, in farms emerging on government lands for subdivision, there were erected within 1-2 construction seasons, according to typical projects, new farmhouses. It was one of the elements of the agricultural policy of the then Minister of Agriculture, Juliusz Poniatowski, hence the farm buildings, which were raised in the 30s of the twentieth century, primarily in Pomerania and Greater Poland, were commonly called "Poniatówki". The construction and farmhouse lending system were scheduled for the parcelants, flood victims from southern Poland, highlanders from the overpopulated areas and other smallholders and landless farmers. Wooden objects erected with prefabricated elements can be considered as the first prefabricated buildings on Polish lands. "Poniatówki" are an overlooked and wasted certificate of a successfully prognosticating settlement action for impecunious people, based on a system of construction, lending and enfranchisement never used before. The endorsed by Juliusz Poniatowski process of transformation of Polish agriculture from peasant and landlord model to the farm model, inter alia, by subdivisioning landlord's estates, introducing merging of lands and enlarging the peasant farms, was a task for at least one generation period. “Poniatówki” are still present in the landscape of the Polish countryside, but if real emergency actions are not taken, in a few years, they may remain only in photographs, names, places and... marketing activities of design and construction companies offering new "Poniatówka" cottages.

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THE ARCH CONSTRUCTION IN ANCIENT PALMYRA

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ABSTRACT

Palmyra is an important ancient site famous of its architectural monuments. In general opinion Palmyra architecture is described as a perfect example of Greco-Roman building style with some oriental changes in decoration. Recent research brought to the light a new evidence showing a great development of a local building construction and techniques. Due to a better recognition of local limestone properties it was possible to invent in the IIIrd century AD a new building technique called opus *palmyrenum*, where walls were constructed of a long and thin slabs (1 x 3 x 0,35 m). Analysis of numerous monuments exposed an intriguing situation, until the III rd century arches and arched vaults were constructed in a specific manner based on a corbelled system. Such system was adopted even in construction of a famous Monumental Arch of Palmyra. Situation completely changed in the IIIrd century AD, when a numerous arches of a large span were constructed at that time. Intriguing is a lack of an arch construction build of a regular voussoires in the Ist and the IInd century, however numerous examples of individual solutions were adopted. Author discusses the problem analysing development of the building construction and technique in Palmyra comparing it with other sites of ancient Syria

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ARCHITECTURAL HERITAGE AT ESTACIÓN CENTRAL COMMUNE (CHILE): TOWARDS A SUSTAINABLE CONSERVATION

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ABSTRACT

Under a neoliberal policy established since the seventies, Santiago de Chile has faced the huge consequences of an accelerated urban sprawl, related to population increase and unlimited horizontal and vertical growth. In recent decades, architectural heritage has not been considered as a central factor in Santiago's urban development. The lack of attention towards heritage can be observed in this capital city. Estación Central commune is located at Santiago's central area, attached to the city's historical center. This commune reflects the recent effects of Santiago's urban transformation, with no consideration regarding constructed memory. The origin of this neighborhood, is related to the location of the first capital city train station, in the middle of the XIXth century. Local heritage is composed, in consequence, by residential and industrial buildings of that time. Nowadays, this heritage can be seen in a complex conservation state, abandoned and neglected. In recent years, several non-listed historical sites of this commune, have been demolished. Non strong legal preservation framework was established, and construction regulations were permissive. In recent months the explosive construction of high density buildings in this commune has reached local authorities opinion and national press. Non quality apartments of reduced surfaces, are progressively replacing and erasing the historical tissue of this area. The lack of an adequate heritage policy is related to this process: in fact, Estación Central commune has only 12 listed buildings in its whole territory of 1550 hectares. Chilean preservation policy works around a monumental heritage concept. Lower scale architecture remains, often, outside the preservation framework. Also monumental, but not yet identified historical buildings remain out of legal protection. The absence of a sustainable urban policy in Chile, has led to historical buildings' deterioration and demolition. Linking cultural heritage with urban planning, is nowadays a pending challenge. Conservation public policies should start from the knowledge of urban memory, and architectural heritage of local cities. Understanding the past, could lead us to project its future. New ways of dealing with constructed memory should be proposed, in order to reach a new equilibrium related to our collective memory. This article analyses the amnesic phenomenon in progress at Estación Central, and identifies non listed heritage existing in this commune, related to residential and industrial architecture, as a first step for its valorization.

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DISSONANT HERITAGE - UNWANTED HERITAGE - MISUNDERSTOOD HERITAGE ON THE EXAMPLE OF UPPER SILESIA

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ABSTRACT

The architecture, art and cultural heritage of the 20th century is perceived by the prism of cultural value only by some specialists. The interwar period had tensions at international relations and created totalitarian systems: Nazism or fascism (especially in Italy and Germany) and communism (the Soviet Union). After the Second World War in Central Europe, there was a change of borders with the expansion of Soviet impact zone, resulting of change in the political system, and an unprecedented action of population resettlement. After 1989, there was (and probably still is) a period of criticizing the art of communism. “Dissonant heritage”, misunderstood and unwanted cultural heritage, has different meanings and faces in Upper Silesia. Like in a lens, it focuses all of these problems that are present in all of the regions in Central and Eastern Europe during the process of economic and social transformations (related to the end of the industrial era).Currently, the main problems of the protection of cultural heritage of Upper Silesia in the beginning of the 21th century are: a. protection of the heritage of the industrial era; b. protection of the heritage of other nations in the region; c. protection and the value defining of modernism after 1945; d. protection of the heritage of the communist period 1945-89. It is especially important in contemporary Poland, which do not concern of such examples of architecture, culture and art, not perceiving them as over-temporal, over-national and over-political values.

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LISTING MODERN HISTORICAL BUILDINGS IN CHANGSHA (CHINA)

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ABSTRACT

Modern buildings are a very crucial category of heritage to preserve in Changsha, a historical city of which the majority of built heritage has been destroyed. Listing historical buildings has been adopted as the main way for their conservation. For that purpose, 4 lists in the scope of modern buildings have been announced by municipal offices so far to replenish the coverage of the national-wide system for protection. By analysing the background, the employed criteria, the responsible authorities, the preservation methods and the following projects of these lists, the advantages and the obstacles to overcome for the listing system in practice could become clearer. In a recent survey of historical buildings in Changsha to be listed, 266 buildings have been screened to enter the candidate database, according to certain criteria that allows expansion of the choices. A research has been conducted to understand the layout, the features and the current conditions of these buildings. One of the major discoveries is that a large number of collective housing built in the 1950s and 1960s possess good qualities in architectural design, crafts and construction, and better still, mostly stand adjacently in walled neighbourhoods. Such results shall be helpful to define the goals for the upcoming lists of historical buildings in Changsha, and in combination with the study to previous lists of historical buildings, they could be meaningful to understand the prospect of built heritage conservation in Changsha.

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REVITALIZATION OF SMALL TOWNS AND ADAPTIVE REUSE OF ITS CULTURAL HERITAGE

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ABSTRACT

Cultural heritage presently holds an enormous potential for the development of not only large cities, but above all, small towns and town-lets. The value of cultural heritage is used as a development factor, which, owing to conservation activities, is to serve both the city and the society. Revitalisation and adaptation, along with protection and conservation of heritage objects, have recently become the most popular conservation activities throughout Europe and Poland. Revitalisation works are performed on a large scale with a view to improving the quality of life of the inhabitants of the revitalized area, raising both the city's standards and its aesthetic appearance, and consequently encouraging people to live in it as well as attracting tourists. In recent years, numerous revitalisation projects have been carried out in Poland. The analysis focuses on the issue of real possibilities of determining the scope and scale of such projects. In big urban centres, there is an enormous substantive potential and financial resources for conducting the indispensable analyses for revitalisation programs. However, small towns lack both the substantive support and the necessary resources to prepare appropriate analyses for revitalisation works. Therefore, in small towns, the most urgent and essential revitalisation works are carried out, related to infrastructure, such as bicycle paths, and public spaces, like the market square, a local museum, the greenery as well as sport and recreation areas. At the next stage, more complex revitalisation projects, such as works within a historical complex, including ruins, requiring more detailed analyses, reflections and design solutions, are developed and introduced. In order to solve these problems and develop specific projects, specialized teams and designers should be consulted. Unfortunately, the regulations of public procurement, where the lowest price is a priority, are not a helpful instrument for an appropriate determining of the concept and the scope of the future revitalisation solutions. An alternative solution is to develop revitalisation concepts as part of student projects, where the city councils can be presented with a variety of ideas that can be used in the future revitalisation project after the analysis. Such was the case of a small town of Bodzentyn, in the Świętokrzyskie Province, which, in cooperation with the Faculty of Civil Engineering and Architecture of the Kielce University of Technology, held a student competition project for the revitalisation of the ruins of the 16th-century bishop's palace and the former garden complex, now destroyed entirely. The presentation showed various activities, all in accordance with the art of conservation and protection of heritage objects as well as contemporary design standards. The subject matter of the article will be presented using the example of Polish towns whose local authorities are trying to restore their former splendour through revitalisation activities. For this purpose, the preserved cultural heritage is used, along with the ruins of old historical buildings.

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RESTORING MINARETS AS A DOMINANT PART OF URBAN LANDSCAPE RESTORATION OF STONE AND WOODEN MINARETS IN BOSNIA AND HERZEGOVINA - MATERIALS, STRUCTURE AND URBAN FORM

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ABSTRACT

In a post conflict zone, restoration of monuments is not only a scientific or technical matter but also a highly symbolic and emotional act of reclaiming culture, identity and urban form. In Bosnia and Herzegovina minarets are shaped by local building traditions and materials, influenced by the ottoman classical minaret format. Most of the prominent mosques have stone minarets, especially in regions abundant with suitable stone and craftsmanship. Wooden minarets were usually built alongside local neighbourhood mosques and they defined city image due to their frequent occurrence in most parts of the urban core. Restoration of these two types of minarets is significantly different mainly due to the nature of the material itself. Interventions on stone minarets were carried out through reconstruction and re-composition of elements, based on documentation about the structure. Stone remains were actually the prime source of information for geometry and breadth of the minaret body and for the complex structural considerations – mainly how to counteract the tension forces. Restoration of wooden minarets had its own challenges, due to the fact that after a major destruction its parts could not be reused and there was less available documentation about the original state. The paper will consider different parameters and make a comparative analysis on both typologies, from materials, structure, aspects of intervention and their subsequent role in restoring the historic urban landscape.

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Session Title:

Sustainability in the Built Environment

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SOME OF CHALLENGES FACED BY ECO-NEIGHBORHOODS IN POLAND IN COMPARISON WITH ÉCOQUARTIER PROGRAM IN FRANCE

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ABSTRACT

The first attempts to create eco-neighborhoods date back to 1960's. First they were developed in northern Europe – Denmark and Sweden, but the concept was gradually spreading to other countries including Holland, England, Germany, France, etc... The French National program of eco-neighborhood certification ÉcoQuartier was initiated in 2012. So far over fifty projects were awarded the certificate and many more are already engaged in the program. Although, there is some criticism, the program is regarded as a real-life laboratory which tests new sustainable solutions and offers additional educational value. The concept of eco-neighborhoods is relatively new in Poland. New neighborhoods are being constructed without officially using the term of eco-neighborhoods. It is an interesting question to compare the new neighborhoods build in Poland with eco-neighborhoods in France, certified as ÉcoQuartier's, and determine the challenges and obstacles for Polish neighborhoods to become eco-neighborhoods. The Assessment list and guidelines developed by French Government and used to evaluate and certify the projects in ÉcoQuartier program will be used as a reference. The challenges identified include: universal accessibility, access to public green space, mixed-use development, sustainable management of water and soil, energy saving, urban design and cultural environment, architectural quality, economic environment, social capital (e.g. different age groups), risk management, climate change adaptation and protection of biodiversity. Some of the challenges can be overcome with help from the local government. This study, in author's opinion, may be used to start a discussion about implementation of standardized national certification program for eco-neighborhoods in Poland and maybe in other Eastern European Countries.

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THE MICROCLIMATE IN THE FACILITIES AND THE QUALITY OF LIFE IN THE CONTEXT OF ARCHITECTURAL DESIGN

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ABSTRACT

Consumer lifestyle, caused by the dynamic development of the economy, affects the development of the built environment. Is carried out more and more buildings with different functions which absorb significant amounts of energy both during the implementation or operation. They have an increasing impact on the environment. Despite the fact that the paradigm of sustainable development determines the attitude on the demand side, not rare public utilities are implemented as separate from the broader context, as the "icons" of architecture. Often this has a negative impact on the quality of the natural environment and also on the quality of life and health of the users. Such objects could be realistically sustainable, it is necessary to implementation the concept of built environment that flows from the principles of sustainable development, in which all the components − architectural substance, technical infrastructure, biologically active areas − acting multi-layered structure, are characterized by high environmental performance and provide users the right conditions for life and work. They should also assist human development across the complexity of his existence, giving the possibility of the implementation of the needs of individual users while at the same time over-runs the development of the entire community now and in the future. It becomes necessary, therefore, to ensure a healthy, eco-friendly built environment for users. Field of research described in the article are the methods of shaping the microclimate in an efficient manner in the architectural objects, as important for the avoidance of "sick buildings" syndrome and implementation a high-quality environment for the users, who spend more and more time in them. The objective, in the context of architectural design, is to present the relationships between technological systems and architecture while making attempts to optimize solutions.

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TECHNICAL INSPECTION AND INTERVENTION PROPOSALS FOR THE REHABILITATION OF A MULTIFAMILY HOUSING BUILDING OF THE DECADE OF 60 OF LAST CENTURY IN PORTUGAL

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ABSTRACT

The Portuguese housing park, especially in what concerns to older buildings, is very degraded due to the lack of maintenance over the years, resulting in the depopulation of many historical centres of the country. The specialists usually characterize the housing park in different construction times, being based on the entry into force of regulation and the implementation of different trends and technological evolutions in construction. In Portugal, the 60's decade of the twentieth century stands out by the construction of a significant number of multifamily residential buildings with a resistant reticulated structure and without concerns from the point of view of thermal behaviour. In this work, the case study of a multifamily building of the construction period mentioned previously, located in the city of Covilhã, in central Portugal, is presented. The analysis of the case study is divided into two main stages: technical inspection of the building and identification of intervention proposals based on the analysis of detected constructive fragilities. In the first phase of the study a technical inspection sheet adapted to multifamily buildings was created and applied, accompanied by a survey of the residents, in order to know the occupancy conditions, the sensitivity and the expectations about intervention. In addition, a thermal analysis was carried out with the support of thermography, data analysis of temperature and relative humidity measurements performed at certain time periods and thermal quality evaluation based on the calculation methodologies for the energy certification of fractions. After analysing all the elements registered in the first phase of the case study, it was possible to propose duly substantiated intervention measures with the main concern of creating better access, use and comfort conditions.

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THE INFLUENCE OF METABOLIC SULFURIC ACID SOLUTION ON CEMENT MORTARS (CEM II) MODIFIED WITH NANO-TiO_2

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ABSTRACT

Cement with the addition of TiO_2 nanoparticles is a modern material. It allows ecological use of concrete by making concrete surfaces that demonstrate the ability to reduce airborne contaminants and self-cleaning. This is the result of introducing into its composition nanoparticles titanium dioxide TiO_2, which has photocatalytic properties. Corrosion of concrete in wastewater treatment plants and sewage networks is a serious problem and poses a great threat. The phenomenon of corrosion caused by sulphur bacteria *Thiobacillus* is associated with the formation of biogenic sulphuric acid (VI). Therefore, the tested materials have been subjected to the environment stimulating sulphur bacteria. Used 1.5 mmol/L sulphuric acid solution. Despite the very good properties of mortars / concretes with nano-addition of titanium dioxide and the possibility of their use in various objects, it seems impossible to use sewage treatment plants in tanks. This is related to the deactivation of titanium dioxide after some time.

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IDENTIFYING SANTIAGO'S NATURAL ELEMENTS FOR IMPLEMENTING AN ECOLOGICAL PLANNING PERSPECTIVE: HAVE THEY BEEN CONSIDERED SO FAR?

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ABSTRACT

Santiago, the capital and biggest city of Chile, has experienced a rapid urban growth during the last decades. This has included a large increase in population, proliferation of suburbs, and the loss and degradation of thousands of hectares of natural and semi-natural areas, whose natural elements may play a key role for the city's sustainability. Taking in consideration the relevance of these natural elements for Santiago's future planning efforts, in this work we take an ecological planning approach, -where ecological and environmental considerations are set in the front, to identify Santiago's natural elements and assess how they are, and have been incorporated, in local and regional planning regulations. To achieve this goal, we first analysed the city's geographical components using an ecological planning framework to identify the most relevant natural elements that could be considered worth to be included in planning regulations at the local and regional scales. The framework promotes the conservation and connectivity of natural, agricultural, periurban, and urban landscapes at the regional and local scale. Then, we analysed past and present planning instruments to evaluate how they have incorporated the identified natural elements, and how these regulations (or the lack of them) may have driven the regional and local landscapes at its current state. Our results show that the identified natural elements have been rarely formally recognized in planning instruments, and therefore not taken in consideration for urban planning. Consequently, most of natural elements that are identified as relevant for ecological planning in Santiago are currently degraded. Nevertheless, these natural elements still provide valuable opportunities for increasing Santiago's sustainability if restored and conserved, and if they are better incorporated in planning regulations. The few regulations recognizing the natural elements do not indicate how to protect or conserve them, nor how they should be managed to provide benefits to the city. We conclude that in Santiago is imperative to modify current planning regulations, to effectively safeguard the conservation of these key natural elements, and to promote a better interconnection among natural, agricultural, periurban and urban landscapes at multiple scales.

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BUILDINGS EVALUATION IN SUSTAINABLE DESIGN USING THE EXAMPLE OF MULTI-CRITERIA METHODS

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ABSTRACT

The article defines the concept of sustainable development. It shows the characteristics of sustainable buildings and sustainable development goals achieved in the design of new buildings. The aspect of energy saving is presented as a key factor in the assessment of buildings in the multi-criteria methods of LEED, BREEAM and Green Building. The paper also emphasizes the need for applying multi-criteria evaluation of design solutions using specialized computer programs in the process of sustainable design. A group of industry experts, including professionals in the field of building energy assessment, should be involved in the process of assessment and verification of the applied solutions. The architect in the interdisciplinary design process (satisfying the standards of sustainable architecture) has a leading role of a coordinator and creator for whom humanistic values of considerable significance. Examples of buildings designed and erected in Poland, characterized by high quality design solutions in the field of energy efficiency have been provided. These developments have been awarded the Passivhaus, Green Building, LEED, BREEAM certificates.

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CONCEPTUAL LANDMARKS OF SUSTAINABLE DEVELOPMENT IN CITIES

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ABSTRACT

The Roman Club meeting 50 years ago initiated the discussion on the limitations on the manking development model by introducing a new actor - nature. The world population's explosive urbanization defined cities - especially in developing countries - as *locus* of the contradictions of this model; it also incorporated proposals and plans of urbanistic action, promoting advancements in the discussions of city management models. The revision of concepts - from the systemic approach to the recognition of socio-environmental structures - brough advancements in the proposals for sustainable development of the Global Urban Forums. However, the distance between the discourse and practice in the reduction of socio-environmental inequality in cities was still persistent. Nature is recognized by the CAPITAL as an object to be captured as private property - which, by not incorporating labor, does not need to be paid for. Treated as an externality of the economical process, nature's social role was neglected for a long time, which makes the revision of this concept necessary. Parallel to that, urban legislations advanced in the control of the use of urban land, to finance infrastructures and basic services in cities, incorporating the principle of its social function. In Brazil, the concept of social value of land ownership underpins the Statute of Cities (10.257/2001), federal legislation that urban policies and guides city master plans with innovative solutions in urban land management - allowing mechanisms to capture the value sharing generated in real estate operations to be adopted and to not only redistribute benefits and amenities in deprived areas of the city, but also restrict distortions in the occupation of urban territories, avoiding populations' segregation and exclusion to urban goods and services. In São Paulo, Brazil, the irregular distribution of the urban infrastructure supply - water, sewage, energy, transportation and accessibility to public services - is a symptom of socio-territorial imbalances, affecting the appreciation of the soil in accordance to its distribution. Paradoxically, public investments in areas with little infrastructure value the soil in favor of private owners, generating inequality and gentrification. Thus, in 2014, the City of São Paulo approved a Strategic Master Plan (PDE) that incorporated the Onorosa Grant as a mechanism for capturing real estate surplus value, whose resources feed a public investment fund - Urban Development Fund (Fundurb) - that makes plans, programs and urbanistic and environmental projects. The objective of this research is to verify the application of Fundurd resources in the promotion of environmental programs and projects and in the recovery/mitigation of impacts to the natural environment by the urbanization process of the city of São Paulo. It considers, however, that because it is a mechanism to capture surplus value over land use, it does not take ownership of the concept of environmental services that could extend its scope from repair and remediation of environmental offenses, to the maintenance and conservation of assets such as afforestation urban areas and tree stands guaranteeing benefits for urban populations.

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

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ABSTRACT

Residential issues bother every living human. These challenges have remained one of the greatest threats to virtually every worker in Ethiopia particularly the academic staff of higher education. The challenges have taken such forms as accommodation, and inconvenient housing proximity to workplaces. This thesis project attempts to provide comfortable, suitable and academically friendly housing accommodation for an academic staff of Wollega University Ethiopia. In order to achieve this an environmentally integrated design approach is identified as a design approach to help quality knowledge transfer that enhances the institutional academic performance and productivity, as the higher institutions are meant to be citadels of higher learning per excellence. An environmentally integrated residential design works to improve the comfortability of academic staffs to the scale of their job nature within their home spaces making the buildings in integration or harmony with their natural environment. Through an environmentally integrated design approaches both buildings and the natural environment will exist together. This way possible adjustment of the interior functional spaces of the residential buildings with respect to the climate conditions and topographic features were analysed as the core of this thesis. Case study is used as main research project. The outcome intended to provide a framework for enhancing an 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 Federal Democratic Republic of Ethiopia (FDRE) 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 of Wollega University, Nekemte town and other natural environment with similar context.

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LAND USE CONFLICTS IN THE SUDETES, POLAND

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ABSTRACT

The Sudetes (Polish and Czech: Sudety; German: Sudeten) are mountain range located in the Czech-Polish-German border region with relatively high population density. They are historical industrial district based mainly on the mining of mineral (raw) materials, which had an impact on degradation of the environment due to, among others, land use transformation and industrial waste areas location. It resulted in increasing human pressure to use the unspoilt areas, which often have important nature values. In the 20th century, the land use conflicts and problems in the Sudetes were connected mainly with mineral resources exploitation, especially in black coal deep mines and brown coal strip mines. In 21th century, the growing number of land use conflicts is caused by plans of ski infrastructure development and second homes quarters localisation in valuable nature areas, plans of constructing new quarries and wind energy farms. The municipal local spatial management plans and investment plans are sometimes at variance with nature protection needs and focus on the immediate municipal budget income. There are difficulties with the promotion and implementation of alternative projects, which, taking into consideration nature protection, would also satisfy social needs. We argue there are several different sources of conflicts: the effect of low level of ecological consciousness, strong embeddedness of productivism idea in post-communist society, the investors strong economical interest and sometimes NIMBY (not in my backyard) syndrome. In the paper we analyse the main type of conflicts and the most important stakeholders engaged in it. To promote compromises in spatial planning and to weaken or eliminate ecological conflicts we need to create more strong communication and negotiating networks of local inhabitants, local authorities, and naturalist (both scientists and NGOs) and promote the role of alternative nature friendly conceptions at the early stage of spatial planning.

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WASTE WATER TREATMENT PLANT RETECHNOLOGISATION FOR 160 000 EQUIVALENTS INHABITANTS

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ABSTRACT

Domestic and industrial wastewater exerts significant pressure on the aquatic environment due to organic matter, nutrients and dangerous substances. Given the large percentage of the population living in urban agglomerations, a significant part of the wastewater is collected through sewage systems and transported to waste treatment plants. The level of treatment, before discharge, and the state of the receiving waters determines the intensity of impact on aquatic ecosystems. The effect of pollution wastewater untreated or insufficiently treat to the surface waters, is mainly manifested by the content of suspended matter, organic matter, in salts nutritional, ammonium and pathogenic microorganisms. The fact is known that nutritional nitrogen and phosphorus salts cause eutrophication of water surface effect, consuming dissolved oxygen required to support aquatic life. Ammonium is particularly toxic for aquatic life. The wastewater untreated or insufficient treat, pollute the groundwater, among others with nitrates, ammonium and bacteriologically. It follows from above that the wastewater treatment urban (and not only) is an essential requirement of development of human civilization. Being a necessity with social implications, the overall provision of infrastructure necessary for waste water treatment is a priority. At the country level, 31% of the wastewater (urban and industrial) are evacuated without treat, 41% are insufficient and only 25% are properly treat. In this paper it is emphasized the importance of retehnologisation of a waste water treatment plant (160000 inhabitants). It is presents a comparative analysis of the water quality parameters between before and after such investment. From the water quality analyses carried out before the refurbishment of the wastewater treatment plant, a series of measurements ranging from October 2009 to November 2010 were selected, highlighting the minimum, maximum and average values for each month included in this range, and after rehabilitation a series between January 2012 and January 2014.Through this analysis is trying to show that even if these investments are expensive the results will improve the quality of water which is discharges.

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ENERGY-EFFICIENT CONSTRUCTION IN POLAND AS A CHANCE FOR SUSTAINABLE DEVELOPMENT

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ABSTRACT

One of the basic challenges of the contemporary world is to limit energy consumption. This results from the economic and ecological reasons. Minimization of energy consumption is one of the elements of implementation of the concept of sustainable development in the construction sector, which consists in the economical use of energy resources and environmental protection in order to maintain these resources for the generations to come. The paper presents the idea of energy-efficient construction and key objectives and areas of activities in this field. The energy consumption in the construction sector in Poland was discussed with the emphasis on various types of buildings, their character, purpose and time of use. The increasing requirements of the European Union and the obligations adopted by Poland set new objectives for activities aimed at the improvement of energy efficiency of buildings.

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FORM, COST AND ENERGY EFFICIENCY FOR A SINGLE-FAMILY HOUSE

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ABSTRACT

One of the main national targets stipulated by the EPBD directive in the case of Romania is the reduction with 44% of the total energy consumption. Moreover, the residential sector has expanded significantly in the last decade as a result of an increase in the need for housing next to the prolific urban areas. In this context, the embracement of energy efficient building concepts becomes necessary in order to reduce the energy demands of the new urban sprawls. The main purpose of the present research is to determine the comparative return of investment value for an energy efficient single-family house with a total built area of 200 m^2, occupying an average plot of 600-650 m^2, as a common type of home suitable for a family of two adults and up to two children, in Timisoara, Romania, based on different energy consumption standards (reference level described by the national building codes, low energy and passive standard). In addition to this, from an architectural standpoint, three different volumetric approaches and compacticity levels were considered that comprise a constant air volume of 600 m^3, with the aim of exploring the influence of the building form over the overall costs of the building envelope components (roof/terrace, walls and ground-floor slab). The scenarios consist of: a ground-floor flat roof volume, a two-storey pitched roof volume and a two-storey flat roof one. The paper intends to analyse the relationship between the building form, energy performance level and cost of construction, and to search the optimum configuration of the building envelope, both in terms of form and layer composition, that allows a maximum energy efficiency level with minimum investment.

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WITHIN A HISTORICAL PERSPECTIVE TURKEY'S ENERGY POLICY DEVELOPMENTS AND NATIOANAL GREEN CERTIFICATION SYSTEM: ÇEDBİK-RESIDENTIAL

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ABSTRACT

For all countries, energy is a key fact to achieve sustainable, economic and social development. In today's living conditions, the quality of life depends on the well-managed energy. Therefore, countries produce different energy policies to manage energy resources. Basically, the common points of all of these policies are saving energy and using energy effectively. Countries that fail at energy management also limit their own development. Every energy crisis, whether global or local, has become a driving force for the development of energy efficient policies in countries. In this framework, developing energy efficient systems, using renewable energy resources and establishing green certification systems and using it are important to control and to arrange energy consumption. Furthermore, it is seen that buildings are one of the significant energy consumers when the sectoral distribution of energy consumption is examined. For this reason, determined energy policies should be appropriate, applicable and controllable towards the building sector. Green building certification systems are one of the most common applications of energy efficiency in this sector. In this study, the energy policies of Turkey and the world, which are enhanced with the impact of energy crisis, are examined comparatively from 19th century to nowadays within a historical perspective. The importance of the green building certification systems, as being a tool to obtain energy efficiency, is emphasized in the study. Accordingly, Turkey's first green building certification system – ÇEDBİK-Residential – is analysed by comparing it with other international certification systems. The study is based on literature review, and related legislation, laws and regulations and related guidelines of green building certification systems are used in the study. As the result of the study, it was determined that sustainable solutions used for energy efficiency are not new technologies and applications, however they are delayed in creating suitable usage area for the building sector. Also, the development of national green building certification system provides advantages on less cost, less time and more promotion while contributing positively to increase the number of energy efficient buildings in the country.

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PRACTICE OF URBAN TRANSFORMATION IN TERMS OF FINANCIAL AND ECONOMIC CYCLES: A CASE STUDY OF ISPARTA (TURKEY)

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ABSTRACT

One of the important dimensions of urban transformation practices is comprised of their impacts on the economic structure (on urban - national economy and finance markets). The process of financialization of the structure in general, and of the housing in particular, on the global plane as the object of transformation commenced with the post-Keynesian neoliberal globalization process in the 1980s. The financialization of the housing brought about the processes of articulation of the housing production processes with this financial system. The increased importance of housing production in terms of the finance markets also accelerated the urban transformation practices and legal regulations were carried out to this end. Within the scope of this paper, the components and stages of the financial cycle in the urban transformation practices are examined in the case study of Isparta, Turkey. These components and stages are as follows: The actors of the financial cycle include the state, ministries, the municipalities, contractors, finance establishments, consumers, the actors taking part in the production of urban transformation decisions, the components of the construction and demolition processes in urban transformation, and professional chambers. The stages of project designing, preparation of the risk report, an application to the Provincial Directorate/Ministry of Environment and Urban Planning authorized as the public institution as well as approval, the real estate valuation process, the obtaining of subsidies, realization of the license, the contract, and the construction, and settlement are addressed as the stages of the financial cycle. In terms of these components, the winners and the losers of the process of housing production through urban transformation as a financial instrument and the component of economic growth are examined in the case study of Isparta. The research data are based on the talks and interviews made at the provincial centre of Isparta and the compiled information, documents, and findings, along with the literature review. The size and areal dissemination, the value in the economic growth of the country, the financial subsidies granted by the state (rent benefit, interest and loan subsidies, tax wage subsidies, and other subsidies) and the impacts of these subsidies on owners, tenants, contractors, and urban transformation firms are examined within the scope of this paper, which aims to analyse the economy and finance sectors affected by the urban transformation process.

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THE POTENTIAL OF CIRCULAR ECONOMY STRATEGIES IN SUSTAINABLE BUILDINGS

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ABSTRACT

The building industry contributes to resource scarcity by consuming vast amounts of natural resources and produces in addition large amounts of waste, both contributing to a considerable portion of the environmental impacts induced by the demands of a growing world population. Manufacturing of most building materials require large amounts of material and energy resources. These materials are nevertheless either down-cycled or ends up as waste after demolition. Consequently, the building industry only manages to exploit an insignificant percentage of the building materials' inherent economic value and durability. Hence, the need for improved resource efficiency will increase parallel to the growing human demands to ensure that future needs, well-being and progress can be accommodated. Circular economy principles can potentially facilitate minimising the aforementioned pending issues emanating from the building industry through recirculation of building materials. E.g. existing mechanical joint solutions can enable design for disassembly, thereby potentially prolonging the service life of building materials and components through reuse in subsequent building projects. The research presented in the paper at hand aims at identifying the main challenges of implementing circular economy principles as well as potentials here-off within the building industry through a literature review. Furthermore, a conventional Danish office building is used as case study to support the literature review by quantifying potential environmental and economic benefits of designing the buildings concrete structure for disassembly, with the purpose of reuse, as well as to exemplify how circular economy can be applied in future building projects. Moreover, the paper aims at suggesting a more industry focused approach towards circular economy in order to seize the inherent potentials. As a result, it was found that recycling and energy recovery are the most common circular economy practices in the building industry, even though the economic and environmental benefits of reuse are believed to be much higher. This is supported by the findings of the case study, which revealed that reuse of the concrete structure can potentially avoid a noteworthy portion of the building's embodied CO_2-emissions and provide a reasonable economic gain. Moreover, increased impact savings were exhibited when substituting concrete with alternative materials e.g. wood, steel and glass, thereby enabling easier disassembly for both reuse and recycling. However, main challenges preventing the industry from seizing these potentials are identified as: focus on short term goals, complex supply chains, lack of collaboration between stakeholders and absence of a commonly agreed definition of circular economy within the industry. In conclusion, the study demonstrates an improved environmental performance of the office building when designed for disassembly. Furthermore, the choice of building materials has a noteworthy influence on the building's embodied environmental impacts. From the results obtained in this study it is estimated that the potential environmental impact saving as well as economic benefits can be further increased through a higher degree of design for disassembly.

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PASSIVE COOLING IN THE SYSTEM OF A HEAT PUMP WITH A VERTICAL GROUND COLLECTOR

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ABSTRACT

Heat pumps from more than ten years are known as an alternative source of thermal energy. They are primarily used for central heating and domestic hot water preparation. Next to the solar collectors they are the cheapest and the easiest way to save energy. But heat pump can also be used for cooling. Heat can spontaneously flow from a colder to a hotter body. Flows from a body with a higher temperature to body with lower temperature is common known as the second law of thermodynamics. The heat pump pulled out of cooler ambient heat which may be used for central heating or for domestic hot water. There are many types of cooling pumps. This depends mainly on the type of pump, and actually kind of heat source that can be used in two ways: as a heat receiving surfaces - or as a source of cooling for utilization. Knowing the general principle of operation of the pump, we can introduce innovative technologies that allow more devices to reduce operating costs. In this solution, the heat pump installation, initially designed only for heating or, ultimately, also for cooling purposes, enables the use of a system that will be based on the part of the installation associated with the lower heat source, but not as a source of heat but as a source of coolness. This system is often referred to as "natural cooling" or as a passive cooling system. In such a system during the production of chilled water a significant reduction in production costs is obtained due to the lack of energy consumption for the drive of refrigeration compressors, and only the use of circulation pumps for the lower and upper circulation of the heat source. The disadvantage of this solution is the limitation resulting from the situation of close connections between ground temperature and chilled water temperature in the supply, which causes the limitation of its use for the period beyond the maximum peak demand for cold in the cooling season, i.e. most often at the highest outside temperatures. Thanks to the economical use of electricity, we can contribute to protecting the environment.

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LEACHATE TREATMENT PLANTS USED INSIDE COMPLIANT LANDFILLS, SOLUTIONS TO COMPLY WITH TECHNICAL ENVIRONMENTAL PROTECTION STANDARDS

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ABSTRACT

The purpose of this paper is to present solutions chosen for the treatment of leachate resulting from the storage of non-hazardous solid wastes, from a landfill site. The technical characteristics of the installations dealing with the leachate of the compliant landfills must be designed so that the characteristics of the effluent correspond to the limits of pollutant loading of industrial and urban waste water into the discharge into the treatment plants or natural receptacles. From a technical point of view, water management solutions at the complaint landfill site provide a distinct separation of the rainwater from the site and the compliant landfill leachate resulting from wastes moisture content and rainwater that percolates the waste cell in operation. The sewage treatment plants aim to treat the leachate from the body of the landfill and do not interfere in the water balance in the related service area inside the landfill location.

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THE USE OF FOREST WASTE IN THE ENERGY SECTOR

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ABSTRACT

Forest areas cover almost 30% of the territory of Poland, of which about 70% are coniferous forests, the rest are deciduous and mixed forests. Annually, about 9,000 trees are cut from these areas. Which gives about 36 km^2 of wood. Analysing we can assume that we will obtain 10m^3 of bark, 15m^3 of brushwood, 20m^3 of branch and carpinus, 19 m^3 of sawdust and 36m^3 of sawn timber from 100m^3 of wood obtained in the forest. Wood obtained from forest areas is used not only as one of the main construction and industrial materials, but also as an energy raw material. For energetic wood we include all forms of biomass obtained directly from the forest felling: needles, leaves, carpels, bark, branches, sawdust, shavings, cones and from recovery, crates, pallets, sleepers. The calorific value of the collected samples was examined. As a fuel, it can use wood biomass that has not been processed in the form of firewood or fuel, or processed in the form of sawdust, wood chips, briquettes, pellets or wood dust. This publication shows the combustion process of fuel obtained from wood biomass. Factors that influence the calorific value obtained and the value of the heat of combustion are described. The paper presents the results obtained from the incineration of waste obtained from forest areas. The study uses cones and sawdust obtained from the following tree species: fir, poplar, birch and beech. The influence of moisture content in wood as the main factor influencing the calorific value of fuel was also discussed.

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HYDRAULIC STABILIZATION OF HEAT NETWORK

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ABSTRACT

The article analyzes changes in pressure in the heating network taking into account the variable daily heat consumption. The simulation assumes diversification of heat demand during the day due to significant differences in the distribution of hot water.Taking the decreases in hot water consumption by up to 70%, pressure losses were calculated on the sections of the district heating network. Changes in the flow rate are taken into account. The simulation assumed changes in water flow from 10% to 70% respectively. Completed calculations and results are presented in diagrams drawn up for different amounts of hot water consumption. They allowed to determine the size of the changing pressure of the available heat network. Graphs of dependencies between changing flows and the corresponding pressure values, illustrate the magnitude of these changes. In the case of central heating, the heat demand is determined in the so-called external air temperature calculation conditions. The heating plant works in accordance with an ordered diagram of heat loads. The amount of heat delivered to the recipient for central heating depends on the outside temperature. It is calculated on the basis of the heat load factor and the average heat demand of individual customers. In relation to the production of hot water, the unevenness of the hot water demand should be taken into account. This variable size, as a result of the day, is described by the hourly diversity factor. For such calculations, daily schedules of hot water consumption are developed. On their basis, the operation of the heat network was analyzed. The heating network section and the hydraulic system of the network were analyzed for existing pressure changes, which are caused by the variability of the heat demand for heating domestic hot water. The calculations and simulations carried out show that the calculated flows, and thus also the pressure losses in the considered network, are variable and depend on the distribution of hot water to consumers. These differences are significant and affect the choice of pumps, which can bring significant financial benefits throughout the year.

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INTEGRATED GIS MONITORING SYSTEMS FOR SUSTAINABLE SPATIAL MANAGEMENT: CASE STUDY CITY OF POPRAD

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ABSTRACT

The article is focused on the definition of crucial elements and their interactions for the definition of a concept of effective integrated GIS monitoring system as supporting tool for sustainable spatial management. The article is dealing with monitoring system requirements and describes steps of the monitoring process in concrete details that include proposals for an efficient and effective monitoring system. It describes why monitoring is needed, what is possible to monitor, who is active in the monitoring process and briefly described possibilities for monitoring. Applicability of the concept is confirmed by practical implementation of GIS monitoring system focused on energy efficiency spatial aspects in the city of Poprad. The article particularly summarizes preliminary outputs of international project Bhenefit supported by Interreg Central Europe programme. The project is focused on improving sistainable management approaches of historic built areas and looking for novel solutions improving decision-making and managing processes efficiency, through monitoring and assessing, risk prevention, environmental sustainability, conservation and re-use.

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CATEGORIZING BUILDING CERTIFICATION SYSTEMS ACCORDING TO THE DEFINITION OF SUSTAINABLE BUILDINGS

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ABSTRACT

The availability of sustainable (or green) building certifications schemes is constantly increasing and it is not always easy to understand how the schemes on the market differentiate from each other. The purpose of this study is to create a better dialog between client and consultant in relation to building certification systems. Here it is relevant to give an overview and understanding of selected certification systems, and how they fulfil the definition of sustainable buildings. There is a great variation of how certification systems are structured and evaluated. Furthermore, “sustainability” is a word with many meanings and definitions, which is why sustainable certifications will also vary. In this study, certification schemes are categorized using a definition of sustainable buildings. This definition consists of a social, environmental and economic dimension of sustainability and in total 13 subcategories. The subcategories are based on recent years’ publications concerning sustainable buildings from the Danish Building Research Institute and the Danish Transport and Construction Agency, which leans on the European CEN TC/350 standards for sustainable buildings. The certification schemes analysed are both of international, regional and local scale (Active House, BREEAM, DGNB, Green Star, HQE, LEED, Living Building Challenge, Miljöbyggnad, Nordic Ecolabel and WELL). The results show a large variation of the weight on the dimensions of social, environmental and economic sustainability within the 10 certification schemes included in the analysis. To be defined as a sustainable building certification, the three dimensions should be given equal weight according to the definition of sustainability. However, this is only the case for the DGNB certification scheme. A majority of the building certifications have the largest focus on criteria within the environmental dimension. Across the selected certifications this dimension account for an average of 51%. This indicates that certifications have “green” buildings as their main focus point. However, a certification such as WELL almost completely focuses on social sustainability (93%) due to its attention to the wellbeing of the user inside the building. The social dimension on average account for 43% with a large focus on the indoor environment. Overall, economy is only represented in the certifications to a very low degree (average of 5.6%), except within DGNB. There are aspects, which this categorisation method does not consider such as the ambition within the criteria. In addition, the values in the environmental and social dimensions potentially have an impact on the economic value of the building and thus the economic dimension indirectly becomes a focus, which is not visible through this method. However, the categorisation makes it easy to get an overview of the thematic content within the certification and thereby highlight the value of the certification. Furthermore, it could be of especially good use for non-technical clients.

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WITHIN A HISTORICAL PERSPECTIVE TURKEY'S ENERGY POLICY DEVELOPMENTS AND NATIOANAL GREEN CERTIFICATION SYSTEM: ÇEDBİK-RESIDENTIAL

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ABSTRACT

For all countries, energy is a key fact to achieve sustainable, economic and social development. In today's living conditions, the quality of life depends on the well-managed energy. Therefore, countries produce different energy policies to manage energy resources. Basically, the common points of all of these policies are saving energy and using energy effectively. Countries that fail at energy management also limit their own development. Every energy crisis, whether global or local, has become a driving force for the development of energy efficient policies in countries. In this framework, developing energy efficient systems, using renewable energy resources and establishing green certification systems and using it are important to control and to arrange energy consumption. Furthermore, it is seen that buildings are one of the significant energy consumers when the sectoral distribution of energy consumption is examined. For this reason, determined energy policies should be appropriate, applicable and controllable towards the building sector. Green building certification systems are one of the most common applications of energy efficiency in this sector. In this study, the energy policies of Turkey and the world, which are enhanced with the impact of energy crisis, are examined comparatively from 19th century to nowadays within a historical perspective. The importance of the green building certification systems, as being a tool to obtain energy efficiency, is emphasized in the study. Accordingly, Turkey's first green building certification system – ÇEDBİK-Residential – is analysed by comparing it with other international certification systems. The study is based on literature review, and related legislation, laws and regulations and related guidelines of green building certification systems are used in the study. As the result of the study, it was determined that sustainable solutions used for energy efficiency are not new technologies and applications, however they are delayed in creating suitable usage area for the building sector. Also, the development of national green building certification system provides advantages on less cost, less time and more promotion while contributing positively to increase the number of energy efficient buildings in the country.

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ANTHROPOLOGICAL ASPECTS AND SPATIAL DYNAMICS IN NEW FORMS OF LIVING. RECOVERY AND CONVERSION OF A SQUATTED INDUSTRIAL BUILDING: THE CASE STUDY OF SPIN TIME LABS IN ROME

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ABSTRACT

The right to housing is the economic, social and cultural right to adequate housing and shelter. In the Italian Constitution there is no specific protection for the right to housing, but in some articles there is a clear reference to values related to the right to housing. The right to housing is seen as an instrument of propagation of all the other fundamental rights of the individual, allowing them to be valid and effective. Today the housing emergency is a reality; as a response to the problem, homeless people begin to occupy buildings that have been left unused, which previously had a different destination than the residential one. In Rome there are over 100 occupied buildings. The occupation of abandoned public or private buildings, strategically positioned in the urban fabric, becomes a way of access to the house but even more to the city. The satisfaction of the home problem is not resolved with a safe shelter, but it is all the more effective the more it is able to insert its inhabitants in urban services: health, education, work, transport, etc. The forms of appropriation of disused buildings go to satisfy the disregarded demand for low-cost houses, addressed to public administrations, which can only be filled by appropriate public policies, which are still incapable of adapting to the socio-economic changes taking place. The work examined the housing situation in Italy, in particular focusing on the Roman reality. The study then focused on the movements arising from the issue of housing emergencies, in particular on Action, one of the three major house-fighting movements on the Roman scene. Preliminary research regarding the occupation of *Spin Time Labs* (former public agency INPDAP headquarters, located at 55-57 in Via di Santa Croce in Gerusalemme abandoned in 2011) did not focus on the architectural aspect of the building, but on the anthropological one concerning the occupants, evaluating the internal dynamics, the cultural background of the inhabitants and the consequent uses and customs, to define a well-articulated picture of the Spin Time Labs community. In a second moment, the merits of the distributive-functional aspects of the building were analyzed, an architectural analysis of how the building was used before the occupation by Action, and how it was changed, how the spaces previously used as offices them became "homes". In some cases, these "homes" are real houses, with all the services necessary for a dignified lifestyle, in others they are simply rooms with the necessary to live that rely on common services made by the occupants themselves, such as kitchens, drying racks, bathrooms, etc. It is also important to highlight how this study is based on non-stable situations and therefore subject to constant changes. In conclusion, this research focused on a new way of living and on the delicate passage of occupants from outside the law, to stable inhabitants of dwellings based on new forms of living. The model also aims to be replicable for other disused buildings and public property in the Roman and national territory.

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GREEN ROOF TECHNOLOGY AS A SUSTAINABLE STRATEGY TO IMPROVE WATER URBAN AVAILABILITY

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ABSTRACT

The scale of the potential impacts of climate change is uncertain but, concurrently with other demographic, land-use, socioeconomic changes, it is affecting water availability and demand and increasing competition for water. As temperature increases, evaporation increases, resulting in droughts and devastating effects on fresh water supplies. Water will be one of the key resources for a sustainable urban development. Making clean water available in the next forty or so years will require the extending of the service to 3.7 billion more residents in urban areas. Therefore, it is necessary to promote an engineered redistribution of fresh water in space and time. This problem must be solved in a sustainable way using an innovative Green Infrastructure (GI) able to increase the water provision in urban systems realizing the recover of rainwater and domestic water and reusing the same for irrigation and non-potable uses. Therefore, the aim of this research is to develop a project idea of GI in terms of ecosystem services focused on the reuse of water resource in a condominium of 40 housing units located in Lecce, south Italy. In particular, the project will exploit the free areas on the roof of the building, accounting a total surface of about 900 mq. The project involves the construction of a green roof to develop the ecological functions linked to the purification of wastewater like in a Costructed Treatment Wetland (CTW) that represents a low-cost alternative to conventional secondary or tertiary wastewater treatment. This green roof allows the reuse of wastewater on site for sanitary, garden activities and other uses in the building, reducing the exploitation of the already scarce regional freshwater resources. The project idea also includes the possibility of using aromatic and medicinal plant species for phytoremediation, with potential applications in phytotherapy and cosmetics. CTWs produce ecosystem services like ones provided by wetlands and, therefore, act as sinks of CO_2. Moreover, it is widely recognized that the green roof reduces the heating of the buildings caused by the solar irradiation, thus reducing the consumption of energy necessary to cool the apartments. So, the green roof turns from an unused cemented roof into a source of ecosystem services related to both the reuse of water resources and the development of potential economic activities. The cost of the work can be reduced by government incentives for the development of gardens in condominiums or for energy efficiency of the building. At the municipal level, the replication of this project on many buildings could reduce the water demand for residential areas as well as can mitigate the island heat effect that afflicts urban area during the summer and improve the quality of life in the city. This approach offers many opportunities for integration of water resource conservation, economic development and public health promotion.

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THE INDOOR AIR QUALITY IN KINDERGARTENS IN POLAND

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ABSTRACT

The universal ventilation system in Polish kindergartens is the natural ventilation system. This is due to the fact that these buildings are several or even several dozen years old. National regulation for natural ventilation define only general guidelines. There are in the legislation acts only the permissible tightness of the building joinery and the minimum value of the air infiltrate to the rooms. The amount of air is constant regardless of the room's purpose or the number of people staying in them. Over the last decade, in such buildings incomplete thermomodralization treatments were carried out, as a result of which the inflow of air to the rooms was most often limited, and thus the indoor air quality decreased. While, the low indoor air quality may lead not only to the poor well-being of users, but also to low efficiency of work and insufficient learning of new messages. This problem is extremely important in the case of a group of people who are not be able to determine the requirements in relation to IAQ. As has been shown in the Scandinavian countries, in the rooms where children are staying there the proper ventilation system several times reduces the chance of allergic symptoms. At the same time, research carried out in Denmark showed that the low indoor air quality in school premises negatively affects the learning efficiency of children. That is why it is extremely important to ensure proper microclimate conditions in the rooms where the youngest children are staying. The article presents the results of research on the indoor air quality (IAQ) in 7 kindergartens in Poland, located in the city with 200,000 inhabitants. The buildings in which research was carried out were built in the years 1970-1993 and were equipped with a gravity ventilation system. The analysis covered the variability of the basic parameters describing the indoor air quality, i.e. temperature, relative humidity and concentration of carbon dioxide.

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ADOPTING THE EU SUSTAINABLE PERFORMANCE SCHEME LEVEL(S) TO THE DANISH BUILDING SECTOR

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ABSTRACT

This paper investigates, to what degree EU Level(s) can be adopted in Denmark and what possible measures need to be developed. In 2017, the European Commission's Joint Research Centre has launched Level(s) as a voluntary programme of sustainable building indicators based on existing EU standards and initiatives. Level(s)' original value, beyond the mere aggregation of existing standards, is the selection of the most relevant indicators according to EU policy, the graduation of indicators into three levels of expertise and comprehensiveness as well as providing further, original definitions for their practical application. In the absence of mandatory EU regulation for sustainable buildings, Level(s) represents a virtual EU sustainable performance standard and thus, an authoritative reference. The study scope is limited to Level(s) indicators related to the life cycle assessment (LCA) of building materials including environmental impacts, resource use and waste. The possibility of adopting these indicators are measured by five main criteria: The capability of the official LCA calculation tool, available and consistent building product environmental performance data, available and consistent service life data, a weighting standard for environmental impacts and the specification of environmental performance benchmarks. The analysis also considers the building industry's present LCA competency and the feasibility of demanding such services for clients. The experience with the established DGNB certification scheme is included in the Danish building industry's level of development in the field of LCA. It shows that major parts of the Danish building sector are capable of complying with Level(s) LCA criteria, at least on the lowest level of expertise and comprehensiveness in the Level(s) system. However, a series of factors, which would contribute to a greater acceptance and feasibility, cannot be provided by the present Level(s) programme. Among them are three crucial areas for further development. Firstly, standard weighting factors for the numerous environmental impact categories would reduce the complexity and thus lead to greater feasibility. Secondly, service life data with an increased level of detail would secure fair competition among construction solutions. Thirdly, the industry should be encouraged to gain experience with scenarios for service life, adaptability and disassembly in order to improve LCA results and harness economic benefits of the life cycle approach.

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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 search for those solutions is the main subject of research. 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.

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STUDENT FEEDBACK ON PREPARATION FOR SUSTAINABILITY IN HIGHER EDUCATION IN THE BUILT ENVIRONMENT

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ABSTRACT

Given the global energy challenges and the pressing concerns for the environment, it has become imperative for future built environment professionals to be prepared to meet the demands of sustainable development. This in turn has implications for higher education and several modifications to architectural and engineering curricula have been initiated, around the world, to meet these requirements. Since a fundamental objective of these efforts is to sensitize and prepare students as future professionals, the students' feedback is a crucial factor which merits consideration when developing curricula. Currently, there is a paucity of academic studies which aim at gathering and analysing students' opinion on their preparation for sustainability and their feedback on the efficacy of teaching and learning methods. Against this background, and as a part of a larger research, this paper discusses results from a pilot study conducted among senior level students and alumni from the architecture and civil engineering programs at a University in Abu Dhabi, UAE. The study comprised of a survey with 25 items, structured in three blocks addressing 1) the demographics of respondents, 2) respondents' value and confidence in their ability to employ sustainable solutions and 3) feedback on the role of their higher education in architecture and engineering in their preparation for sustainability in the built environment. Preliminary analysis of the data collected indicates that students placed a high value for the importance of sustainability and sensitivity to the impact of their work. While generally, the students were confident of their preparation, they indicated lower confidence levels with regard to their ability to convince clients and to justify additional cost of employing sustainable products and solutions. Working on design projects and attending field trips, featured as the most effective learning methods. Based on suggestions provided by students through open-ended questions, the paper also outlines various measures that could be included to enhance the contribution of higher education in the preparation for sustainability. Findings are expected to be of interest to higher education professionals.

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COOPERATION OF A HORIZONTAL GROUND HEAT EXCHANGER WITH A VENTILATION UNIT DURING WINTER: A CASE STUDY ON IMPROVING BUILDING ENERGY EFFICIENCY

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ABSTRACT

Renewable energy sources have a significant impact on improving a building's energy balance. These sources are increasingly used in modern construction. One such source is a ground air heat exchanger (earth-air heat exchanger – EAHX), which is used in a building's mechanical ventilation system. This solution allows for the initial preparation of inlet air in a ventilation unit prior to the exhaust air energy recovery process (recuperation). As a result, the solution reduces the energy demand for the heating or cooling of rooms. This article expands upon a previous study on the possibilities of improving energy efficiency of a horizontal earth-air heat exchanger (EAHX) working in cooperation with a ventilation unit. This study adds to the knowledge gained in the previous study (Romańska-Zapała et al., 2017) performed during the summer of 2016. This previous study found that, in the summer, the continuous operation of these exchangers is not optimal; therefore, there is a need for dynamic control of the ventilation unit's fresh air source. This is due to changes in the exchanger's operating status between heating and cooling, as a result of external temperature fluctuations. The thesis statement of this previous paper emphasized that this relationship is not only appropriate on an annual basis for the transitional seasons (spring and autumn), but also on individual days during the potentially most favorable seasons of exchanger work (summer and winter). This article presents the results of in situ measurements of the horizontal, tubular ground air heat exchanger which supports building heating by preheating the inlet air of the cooperating ventilation unit in the winter season, in southern Polish climatic conditions. In particular, this article provides details on the experimental verification of the previous paper's thesis regarding the possibility of sub-optimal performance of an EAHX exchanger subject to continuous operation during the winter season. The experiment in this paper was performed using a ventilation unit (intake – exhaust) connected to three independent fresh air sources: a direct external air intake located on the wall, and two air intakes located outside of the building that directs air into the pipes of two earth-air heat exchangers. This article illustrates how the exchanger's work changes the ventilation unit's inlet air temperature. For a majority of the experiment, the exchanger – ventilation unit system was working optimally. Therefore, the system did not require intervention of the control system. However, due to several temporary increases in outdoor temperature, the occasional cooling state operation of the EAHX exchanger was also recorded. Even before the occurrence of these undesirable states, an exchanger should be switched off and a bypass should be used to directly collect external air and reduce the unnecessary load of electric fan drives. Considering the results of this study, it can be concluded that in the winter, it is favourable to automatically control the selection of a ventilation unit's fresh air source depending on external conditions. However, in the winter, the energy effect of the control is comparatively lower than in the summer.

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THE NEED FOR AUTOMATIC BYPASS CONTROL TO IMPROVE THE ENERGY EFFICIENCY OF A BUILDING THROUGH THE COOPERATION OF A HORIZONTAL GROUND HEAT EXCHANGER WITH A VENTILATION UNIT DURING TRANSITIONAL SEASONS: A CASE STUDY

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ABSTRACT

Renewable energy sources are increasingly used in modern energy-efficient buildings to improve their energy balance. One such source is a ground air heat exchanger (earth-air heat exchanger – EAHX). This solution helps to reduce the energy demand for the heating or cooling of rooms by pre-conditioning the inlet air of a ventilation unit. This article continues the study on improving energy efficiency of a horizontal earth-air heat exchanger (EAHX) working in cooperation with a ventilation unit. In the previously reported study (Romańska-Zapała et al., 2017), performed during the summer of 2016, it was found that in the summer, the continuous operation of these exchangers is not optimal. Furthermore, there is a need for dynamic control of the ventilation unit's fresh air source. This is due to changes in the exchanger's operating status between heating and cooling, as a result of external temperature fluctuations. The previous paper's thesis stated that this relationship is not only appropriate on an annual basis for the transitional seasons (spring and autumn), but also on individual days during the potentially most favorable seasons of the exchanger's work (summer and winter). This article presents the results of in situ measurements of the horizontal, tubular ground air heat exchanger which supports maintaining the desired temperature in a building by preheating or precooling the inlet air of the cooperating ventilation unit during transitional seasons (spring and autumn) of the climatic conditions of southern Poland. In particular, this article provides details on the experimental verification of the 2017 thesis regarding the ineffective work of the EAHX exchanger during transitional seasons. The experimental set up consists of a ventilation unit (intake – exhaust) connected to three independent fresh air sources: a direct external air wall intake, and two air intakes that directs air into the pipes of two EAHX exchangers. The influence of the exchanger on changes in the ventilation unit's inlet air temperature is presented. Numerous, unfavourable changes were registered in the state of the exchanger's work, either heating or cooling the flowing air, depending on the relation of outside air temperature to the achieved output air temperature. This indicated that the work of the exchanger was ineffective for buildings. The key to optimal, energy-efficient system (EAHX-ventilation unit) operation during transitional seasons is the dynamic selection of a fresh air source (EAHX or bypass) depending on external conditions and the required output air temperature of the ventilation unit (air supplied to rooms), accounting for the increase of electric energy consumption for the fan drive during EAHX exchanger operation. Considering the results of this article, it can be concluded that transitional seasons are characterized by the high potential, compared to other seasons, for effective operation of the automatic control system for the selection of a fresh air source. This is due to the variability of the effect of the exchanger's work between heating and cooling of the supply air, as well as the varying needs of the building for cooling or heating, depending on external weather conditions and heat gains.

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ARCHITECTURAL RECONSTRUCTION AS A STRATEGY FOR RESILIENT CITES

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ABSTRACT

The resilient city is a term which recently gained currency in many disciplines and various scientific contexts. This paper examines what is often missing in resilience strategies and highlights how urban heritage conservation could contribute to this agenda. It addresses a singular, although an important aspect of conservation of urban heritage in disaster-exposed and post-disaster urban areas. It does not suggest an operative methodology for the revitalisation of the post-disaster urban territory which might have to include environmental and economic reintegration and sustainability. The focus here is on how we envision the future of destroyed cityscapes and townscapes and how that affects their residents. The ICOMOS' Nara Document on Authenticity and Recommendation on the Historic Urban Landscape, emphasising the cultural diversity and the relative nature of values, encourage heritage practitioners to address the reconstruction question anew, particularly in the context of resilience. This paper aims at examining several cases of reconstruction and regeneration of historic cities, specifically the cases of old towns destroyed during the war. The motives have been discussed which caused societies and governments to make reconstruction and restoration efforts up to the scale of the entire urban complexes and with the care of historical townscapes. Long-time results of several significant interventions of post-disaster heritage reconstruction have been also examined. The main message of this paper is that built heritage is one of the main assets that communities recovering from disastrous events wish to rebuild. Successful historical reconstructions of European cities prove that reconstruction of townscape qualities helps people reconnect with their history or understand places they are going to live in. The inclusive approach to reconstruction particularly results in sustainable regeneration of destroyed cityscapes and supports social recovery. Thus, the ability to reconstruction planning might be a key to becoming a more resilient city.

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TOWARDS IMPROVED BUILDING INSPECTION AND DIAGNOSIS IN SPAIN

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ABSTRACT

Improvement actions in the building stock are key to reach the EU climate and energy targets. At least 40% of these existing buildings were constructed before the 1960s, which strongly determines the environmental impacts from the construction sector. Actions should thus target the renovation and maintenance market, which in turn should be in line with EU strategies, including the Europe 2020 Strategy for smart, sustainable and inclusive growth. To start with, obtaining a profound knowledge of the buildings to undergone renovation enables an enhanced decision-making process. By considering that the use of advanced tools can help in capturing and storing this needed knowledge, the ROBIM project focuses on the development of a new inspection technology capable of collecting detailed and faithful information of the construction systems and pathologies. ROBIM is a four-year project (2017-2020) funded by the Spanish Centre for the Development of Industrial Technology (CDTI). The project involves six private companies and five universities and research centres, with expertise in building construction, robotic solutions, building information modelling (BIM) and sustainability. The objective of this paper is to present a results preview after analysing a Delphi consultation designed to explore the views of Spanish construction agents on priorities and needs on building inspection and diagnosis. The Delphi consultation is part of the first milestone of the ROBIM project, aiming to identity priorities in the Spanish renovation market. Within this two-round Delphi, 52 agents (80% response rate) participated in the period September-December 2017, rating on a 5-point Likert-type scale a total of 52 statements related to sectorial, security, environmental, economic, social and legal aspects. Statements are classified into phases (from Design to Maintenance) and categories (Techniques and Technologies, Auxiliary Means, Information management, Construction products, Environment Conditions). The results show the achieved consensus: 9 statements reached a broad consensus among participants (≥90% of agents rated them 4 or above), within 43 statements that attained moderate or broad consensus. The phases “Design and construction” and “Inspection and Diagnosis”, along with the categories “Information management”, “Techniques and Technologies” and “Environment Conditions” stand out among the themes of major interest. The analysis of the consensus statements enables the identification of markets of interest for the Spanish renovation sector, and to direct the developments of the ROBIM project so that the identified issues can be tackled.

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THE FACE OF ARCHITECTURAL DETAIL IN SUSTAINABLE DESIGN

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ABSTRACT

The article presents the role and determinats of a detail in sustainable architecture. A detail is the smallest autonomous unit of object which can be isolated and which combines into a harmonious whole affecting the perception of work. Sustainable architecture makes use of adranced technologies oriented to energy efficiency, thermic insulating power, acquirng energy from renewable resources nad rational utilization of resouces nad materials. A detail in sustainable architecture is determined by the application oft he technologies favouring sestainable development. It can be said that a detail is a technological component creating the form and aesthetic qualities of sustainable architecture.

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EVALUATION OF ENERGY POTENTIAL AND INVESTMENT COST OF SOLAR POWER PLANTS: CASE STUDY OF ANKAPARK PARKING LOT

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ABSTRACT

Depending on the population growth and industrialization process in the world, the amount of energy demanded in each sector is increasing day by day. The energy resources consumed to meet the increased energy demand are examined in two groups as "primary energy sources" and "secondary energy sources" in general, taking into account the amounts produced. Primary energy sources can be classified as fossil resources, hydraulic energy and nuclear energy; while secondary energy sources are solar energy, geothermal energy, tidal energy, wave energy, wind energy, and fusion energy. In order to meet energy demand, the vast majority of the energy consumed today is obtained from fossil sources. As in every sector, resources that have limited reserves such as non-renewable fossil-based coal, oil, natural gas are frequently used to meet the increasing energy demand in the construction sector, thus environmental pollution reaches dangerous dimensions. In order to contribute to the prevention of environmental pollution in Turkey, the use of renewable energy resources, which do not require imports and are low in cost, is of great importance. Solar energy from renewable energy sources is an endless energy type. In this study, Ankapark, which is the biggest theme park project of Europe realized by Ankara Metropolitan Municipality in Ankara, will be examined in terms of solar energy. The Ankapark parking lot project, which is built as the biggest solar power plant on parking lot in the world, will be evaluated in the context of solar energy potential and investment costs.

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ECO-INDEXES FOR ENVIRONMENTAL DRIVEN DESIGN OF OUTDOOR SPACES

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ABSTRACT

This paper aims to provide a proper set of Eco-Indexes to evaluate both the environmental performances and the Climate-Based needs for designing of outdoor spaces. The growing attention towards the topic of energy saving and the reduction of the environmental footprint lately has exceeded the traditional boundaries of the building envelope only, shifting the attention towards the arrangement of specific parameters and eco indexes to be translated to the scale of the urban block, public spaces and transitional areas. The environmental analysis for the urban project thus needs a rapid methodology to evaluate the environmental and energy feasibility of any mitigation, retrofit and outdoor space design actions to address the micro-urban scale design. An integrated environmental and microclimatic assessment today can be carried out by using diverse software packages, as BIMs or microclimate simulation softwares, that are based on objective scientific methods, so that the effects of eco-friendly driven design can be measurable beforehand but in separate steps, generating a very complex workflow. These tools are quite complicated to use since they are not specifically intended for architectural purposes, as they make it difficult to transpose the results into planning actions. An integrated set of Eco-indexes to address the environmental modelling towards the most convenient design for urban space is therefore extremely useful firstly to analyse a priori the energy behaviour and the environmental impact of building design options on its surroundings, and in order to evaluate beforehand the effects and environmental impacts for retrofit and micro urban design interventions. The methodology toward the definition of a proper set of Eco Index for Environmental Driven Design that also takes into account the climate based needs and its relates shortcoming is here presented and discussed. The obtained results highlight that, based on currently available information, only few environmental parameters appear to be effective in defining the overall sustainability performances outdoor space design. While several researches were indeed carried out in these last year's regarding software interoperability, there is still a lack of environmental data to be applied in case of retrofit action of existing cities, which should be necessarily deepened in future research work to obtain more reliable results.

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ARCHITECTURE EDUCATION IN ASIA

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ABSTRACT

This research on Architecture education in Asia will sure give us a chance to plan better tomorrow and talk about the Future of the Past in terms of Sustainable Development. Designing more than One MillionSquare Feet area prioritizing Passive Architecture has been key concern and main area of Focus. Area of focus will be Social Responsibility towards architecture and creating awareness about sensitivity towards Sustainable Environment. It is anticipated that this research on improving Architecture Education in Asia will enable us to create awareness in the field of Architecture and Technology and enable Architects to plan for better tomorrow. The title of the Project will be " Improving Architecture Education in Asia" and the research is originating from the indigenous context and environment. The area of focus will be the following issues: a. The Special Issues of Asian Learners, b. The Neglects in the Current Curriculum, c. Clarification of Terms Architectural Discourse, d. Acquiring Skills Before Going Forward Towards Creativity, e. Situational Design, f. Community Design, g. Climate Responsive Design, h. Hands on Experiential Learning, i. The Studio Culture and the Design of the Teaching Studio.

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HEALTHY HOUSING ENVIRONMENT IN SUSTAINABLE DESIGN

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ABSTRACT

The 21st century is a century of contradictions: great opportunities but also great hazards. The situation in which the humankind has found itself in the 21st century requires urgently that the need for sustainable development in its spatial, social, environmental and economic aspects is fully appreciated. The quality of housing environment, in which the young grow and the elderly spend most of their time, should meet the expectations and needs of contemporary man. This paper aims to investigate how the issues of growing life expectancy, the desire to spend it in good health and the trend for healthy lifestyle are addressed in the principles of sustainable development and what methods should be adopted for creating healthy housing environment promoting physical health, emotional wellbeing and social coherence. The subject of health in the context of housing environment was addressed at the conference in Vancouver on human settlements. The World Health Organisation listed several definitions of concepts related to human health. The Cologne Recommendations contained a statement that physical surroundings, just as the dwelling place itself, are the condition of well-being, they can promote social integration and positively influence children's mental development, but – if inappropriate – they may be the reason for poor concentration and memory, anxiety and difficulties in fostering inter-human relations. Abundant research on the influence of greenery, water and natural landscape on recovering from stress and intellectual fatigue shows that the role these factors play is absolutely invaluable. Research carried out by Ipsos MORI company for RIBA provides certain guidelines as to people's invariable and variable needs, which, although indirectly, give some information also in the context of the healthy housing environment. It is then legitimate to ask a question about the extent to which the goals, tasks and methods of sustainable development and sustainable design satisfy the needs and expectations related to designing a housing environment that could be called *healthy*. There are numerous lists of principles and methods of assessing the sustainability of individual structures, whole complexes or areas. Author suggests three basic features that should characterise a housing environment so that it could be called sustainable: it should be *economical, pro-social* and *beautiful.* Correct and effective combination of all aspects in sustainable design requires assiduous efforts in several areas: education and awareness-building among designers, officials and users as well as adequate policy and promotion of solutions which will encourage shaping a healthy housing environment in the urban scale.

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EXECUTIVE PROBLEMS DURING THE REALIZATION OF THE INVESTMENT IN ACCORDANCE WITH THE LEED CERTIFICATION REQUIREMENTS – CASE STUDY

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ABSTRACT

Sustainable Construction (SC) occupies a significant place in the activities aimed at achieving the objectives of Sustainable Development (SD). The construction sector has been identified as one of six markets with high innovation potential and going to meet the challenge of taking a number of initiatives aiming to introduce principles of Sustainable Construction. One of the most dynamically developing SC initiatives is the implementation of international environmental certification of buildings. LEED (Leadership in Energy and Environmental Design) is among the most popular ecological certification systems, which is designed to provide building owners and managers with a tool to identify and implement practical and measurable solutions in the field of environmentally friendly building design, their construction, use and maintenance. The authors of the article had the opportunity to cooperate with the contractor during the realization of the facility according to the requirements of LEED, observing the implementation standards processes to be met by a certified building during its construction. A building for office use was erected in the center of one of the cities in Poland and aspired for the highest, platinum level in the LEED classification. During the process of erecting, the authors could observe difficulties in realizing the assumptions that the object should meet. In this article, will be presented selected from the occured implementation problems that took place in the indicated facility.

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ANALYSIS OF THE VISUAL IMPACT OF THE TREATMENT PLANTS IN MONFRAGÜE NATIONAL PARK (CÁCERES)

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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, four treatment plants located in Monfragüe National Park (Cáceres) 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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CRITICAL APPROACH TO SUSTAINABILITY IN BUILT ENVIRONMENT

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ABSTRACT

The paper is an attempt to critically revise the notion of sustainability, particularly in architecture, urban design, and spatial planning – an overall and general review of main trends illustrated by selected examples and confronted with observed deficiencies. Thus this work will deliver the insights in various scales into some crucial aspects of energy efficiency, sustainability and conditions to be met to improve and replace labelism with true environmentally-sensible approach. In his activity, a man proves many times that although he considers his own decisions as a result of rational reasoning, he takes them in the name of ideas that are unproven and whose implementation brings bad fruits alongside the good ones. In this study, it is proposed to look at the related elements of the image of energy efficiency in its parametric aspect seen from the point of view of a user as well as regional or national managerial stance confronting legal regulations with programmatic assumptions and related performance data. The examples serve the purpose of proving that there are gaps between what people are claiming and trying to achieve versus what is the result of these decisions and activities. The proposal leads to five chains of improvements – theoretical proposal to reorganize the system with focus on purposefulness, total performance, innovation grounded in economic foundations (innovation through economic efficiency). The considerations conclude that while many noble goals are set appropriately they often remain unrelated to each other (in practice) and that principles need reorientation. This will rely on axiological analysis and criticism, on efficient energy savings, on adequate development of built environment, ultimately on yielding socially beneficial and affordable results. The conclusion is to formulate and foster propositions of systemic solutions, which may improve the functioning of sustainability mechanisms.

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MEASUREMENTS AND MODELIZATION OF THE ROSARIO CITY (ARGENTINA) HEAT ISLAND: PRELIMINARY RESULTS

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ABSTRACT

In relation to climate, cities introduce a perturbation with respect to the adjacent (non-urban) lands, since houses, buildings, industries, streets, among others, are made of materials that usually have different optical and thermal properties. In particular, they storage heat in a larger fraction than bare land. Consequently, it is of interest to analyse the main variable that can characterize this difference, the *ambient temperature.* We present results of the measurements done with a thermometer (with an estimated maximum uncertainty of 0.2 ºC) during the period June 2013 – June 2014, in different months of the year with clear sky and non-intense windy climatic conditions. The data were obtained at noon (around 13:00 local hour = Universal Time – 3 hours), traversing the city in the East-West and North-South directions. Particularly, in this work, we analyse the ambient temperature variation between the central dry Montenegro plaza and the Green Urquiza park.The first one is located among medium-height buildings (3 stories as a mean), while the second one is placed about 1770 meters away, in the border of the city, very near the coast of the large Paraná river (having it 60 km wide, including the delta islands). The mean temperature difference in the yearly investigated period was +0.7 ºC, being higher in the central dry plaza than in the green park. Results for different climatic periods are: for autumn-winter, +0.3 ºC and for spring-summer, +1.1 ºC. A possible explanation of this behaviour is the different angular incidence of solar radiation at the altitudinal level that air temperature is measured, being lower in autumn-winter (with the Sun at approximately 40º mean elevation angle) than in spring-summer (∼70º mean elevation angle). We have also made model calculations, employing the Urban Weather Generator (UWG) model, developed by Bueno et al. (2012) at Massachusetts Institute of Technology, USA. As for the introduction of the climatological and building parameters, we have used climatological data from a rural meteorological station in the Energy Plus weather file format (.epw) and a parametric description of urban area in .xml format. We have also obtained a representation of the temperature behaviour in the central plaza, considering three scenarios. Scenario A represents the rural climate; scenario B portrays the current situation and scenario C verifies the *Energy efficiency and solar protection in building N° 8757* Ordinance introduced for the first time in Argentina, by the Municipality of Rosario city. The highest temperature was found in scenario B, being 2.5 ºC higher than in scenario A. Scenario C presents a temperature 1.5 ºC higher than scenario A. In conclusion, the urban heat island data obtained is of interest in the design of climatization systems (since normally the non-urban airport temperature data is employed). Also, they can be used as a simulation at present of what will happen in the future, due to the temperature increase produced by the emission of greenhouse gases, responsible of the global warming.

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AGRI-FIBER IN 3 DIMENSIONS

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ABSTRACT

This paper presents the findings of a graphic designer, a mechanical engineer, and a professor of architecture who have collaborated to investigate the properties and potential of agricultural fibers as a resource for papermaking and in the production of materials for the building industry. The research began in 2012 with a desire to investigate if a more interconnected form of production could be fostered in the very industrialized agricultural landscape located in America's mid-west. Through collaboration with a student-run farm, and a research endeavor which sort to replace mono-crop cultivation with a woody perennial poly culture, interspersed with harvested meadow and grazing crops, Fresh Press was born. In the early years of the project a number of different native and forage grasses were explored to understand their properties and potential for use in paper manufacture. This research later expanded to include plant residue and agri-fiber bio-waste using plants such as tomato vines, the stems of the okra plant and sunflower plants. Within a couple of seasons of hands-on experience processing agri-fibers the research became a more rigorous form of enquiry in which 10 plant types were studied down to the scale of a micron. In the process a number of preliminary findings related to tensile strength and hydrophobicity were discovered. The most recent lines of enquiry have taken some of the initial findings and moved them into three dimensions. This has involved the casting with geo-polymers and experimentation with 3D printing. Thermal resistance testing will get underway in April 2018 before full-scale wall assemblies will be constructed and tested towards the end of 2018. This prescient research has value both in developed and developing world contexts. As urban centers expand the potential for locally sourced rapidly renewable building products could provide a valuable highly productive agro-industry that is less demanding on the environment than mining raw materials or being reliant on materials derived from petrochemicals. Energy modeling and building simulation, in conjunction with knowledge of local climate, culture, food and agricultural production will enable optimum solutions to be found for the growing need for affordable housing around the mega cities that will grow in the next decade.

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POSSIBILITIES OF GREENHOUSE GAS EMISSIONS REDUCTION IN SINGLE-FAMILY HOUSES IN POLAND

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ABSTRACT

Nowadays, much emphasis is put on increasing the energy efficiency of buildings which is to improve air quality by reducing pollution emissions. In EU countries, under the Energy Performance of Buildings Directive, all new buildings must be nearly zero energy buildings by 2021. In a case of existing building stock their quality depends on period of their construction, on the stage of previous retrofit and on type of building. According to a buildings database (the EU Building Stock Observatory) published by The European Commission to track the energy performance of buildings, across all Member States, most of the floor area is composed by residential buildings. Based on the results of research carried out by the Institute of Environmental Economics energy standard 72% of single-family buildings in Poland is low or very low. What is more almost 70% of them are heated with the use of coal boilers and furnaces which emit a significant amount of pollutants emitted into the atmosphere. Creating an effective system of financial support for thermal modernization of households could bring changes in this situation. The reduction of emissions: SO2, NOx, CO2 and dust as a result of improving energy efficiency, upgrading heat source and use renewable energy in single-family houses in Poland is presented in this paper. Difficulties in providing the required level of index of demand for non-renewable primary energy were discussed. Its low usefulness for assessing the energy quality of buildings has been presented. The analysis was carried out on a group of several single-family houses located in north-eastern Poland.

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USING GUADUA IN INNOVATIVE ARCHITECTURAL FORMS

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ABSTRACT

Developing sustainable building practices encompasses many strategies, one of which is the analysis and use of local resources. Guadua is one of the most promising economic and environmental solutions for contemporary architecture in the tropical and sub-tropical zones of the world. The Colombian soil is apt for this crop, which is cultivated in various departments, such as Risaralda, Cauca and Putomayo. It can grow up to 21 cm per day and reach heights of greater than 15 meters. It is able to withstand tensile stresses over 2.75MPa. So great are its structural capacities that the renowned architect, Simon Velez refers to it as “vegetal steel/acero vegetal.” In compression, guadua has a sigma of 18 N/mm2 and its elasticity is measured at 18.400 N/mm2. It also has good behaviour in tension with a sigma of 4 18 N/mm2 and elasticity of 19.000 N/mm2. (1) These traits make it an ideal structure in seismic zones. As carbon emissions continue to serve as a baseline to compare materials, we can add that guadua has significant capacity for the fixation of carbon. In a study conducted by Riano, et al., carbon fixation for 400 clump/ha over six years was 54 tons of carbon equivalent to 186 tons of CO2.(2) Further detail with regard to both advantages and disadvantages of guadua in construction will be expanded upon and analysed through a case study project. The project under examination is a contemporary maloka (typology for cultural centre common among indigenous tribes in the Andean region of South America), which we designed and developed and built with and for the inhabitants of Santa Rosa de Cabal in minga with students, urban collectives, campesinos and members of the Embera indigenous community. We explored new formal potentials for the use of guadua and were inspired by the developments of Buckminster Fuller who said, “Don’t fight forces, use them.” He was a passionate advocate of the geodesic dome, which is a spherical lattice form that is modulated by circles (geodesics) on the surface of a hemisphere, which intersect to form triangles. The structural properties of a triangle are approximately 2x greater than that of a rectangle and act as a network that distributes the structural stress placed upon the dome. When seen through the lens of being a sustainable option, one is able to argue that the geometry is advantageous for several reasons, including but not limited to; the decreased surface area when compared to box forms of the same floor area means less materials, the concave interior volume creates natural airflow, and wind turbulence is lessened. Oregon Dome Co. reports that dome homes use 30% less energy than traditional homes.(3) The dome was constructed in January of 2016. We have also constructed a roof structure that is a hybrid earth shell (variation of wattle and daub that uses cana brava with hybrid bahareque/bahreque) to protect the guadua and cover the space which will be shared to provide practical knowledge. This paper documents what was learned from this process and will provide further information into the performance of this structure. Our study also involved the comparison with several other traditional materials and the results indicate clear benefits for the use of guadua where available.

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APPLICATION OF A RELATIONSHIP DIAGRAM TO IDENTIFY THE MAIN SOURCES OF NEGATIVE IMPACT OF CONSTRUCTION ON THE NATURAL ENVIRONMENT

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ABSTRACT

The article describes the aspects of sustainable development in relation to construction. Using the relationship diagram, links between the construction industry and other sectors of the economy were identified in the aspect of a negative impact on the natural environment. Two strategies can be distinguished in the pursuit of sustainable development of construction. The first is to promote "green building". It consists in taking care of the natural environment and its resources from the extraction of the raw material, the design of the building, through construction, operation up to demolition. The article discusses in detail the activities related to sustainable construction. Another strategy is to reuse an existing building. Adapting the old building, with a long life cycle to modern standards, which is not always possible. The advantages and disadvantages of each of the strategies discussed are indicated. The research shows that there are situations where it is necessary to use the second strategy.

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INDICATORS OF ESTIMATION OF ENVIRONMENTAL EFFECTIVENESS ACTIVITIES OF THE ENTERPRISE

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ABSTRACT

In the article the authors consider the evaluation of the environmental performance of enterprises on the basis of different indicators, using different models of organizational development in complex environmental situations, taking into account disturbance factors of risk and uncertainty in order to improve the selection and justification of managerial decisions.

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INFLUENCE OF CYCLONE CONSTRUCTION PARAMETERS ON THE EFFICIENCY OF DUST REMOVAL

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ABSTRACT

Gas dedusting involves the removal of aerosol particles from them. The gas dedusting process is carried out in devices called dust collectors. The use of a specific dust removal process depends on the characteristics of the pollutant emission source and the required degree of gas dedusting. The dust removal process is a complex system of forces acting in the dust collector to remove dust particles from the gas and to deposit them on the collector surface. The centrifugal dust collectors use the mechanism of centrifugal forces by introducing an aerosol stream into rotational motion. These types of dust collectors are often used in industry due to the simple construction, the lack of moving parts, the ability to work in conditions of high temperature and high pressure, low manufacturing costs and easy operation. A cyclone with a tangential inlet is one of the types of centrifugal separators in which the gas flows tangentially to the cylindrical part, then spirals downwards where it changes direction to the opposite and leaves the cyclone with the central exhaust pipe. Cyclones are commonly used in Poland in small heating plants equipped with WR grate boilers where coal is burned. The most important factors affecting the efficiency of dust removal are the physicochemical properties of aerosol particles and their sizes. For example, a reduction in the particle size leads to a reduction in the efficiency of the forces emitting particles from the gas, and thus the efficiency of dust removal decreases. The geometric shape of the cyclone is relatively simple, but its structural dimensions have an effect on the gas movement and, as a result, the efficiency of dust removal. Increasing the efficiency of the cyclone is the subject of many studies. This publication presents information on cyclones with tangential inlet and the effect of their design parameters on the efficiency of dust removal. A total of 5 types of cyclones with tangential inlet were analyzed, including two high efficiency cyclones, two general use cyclones and one high efficiency cyclone. The analysis showed that the size of cyclone construction parameters affects the size of the particle's limit diameter, the pressure drop and, as a result, the cyclone efficiency.

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THE MICROCLIMATE IN BATHROOMS OF MULTI-FAMILY BUILDINGS

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ABSTRACT

A large number of single-family and multi-family buildings, managed accommodation facilities and institutional buildings both in Poland and throughout Europe are equipped with a natural ventilation system. The operation of this system depends, among other things, on weather conditions, and the system itself is prone to design and operational errors. The analyses of the functional programme of typical flats in multi-family residential buildings as well as of single-family houses indicate that in certain rooms, such as kitchens and bathrooms, the values of the basic microclimate parameters can differ significantly from the parameters' values of the remaining parts of the flat or building. Kitchens and bathrooms particularly require appropriate ventilation. In their day-to-day operation, these rooms are exposed to a more elevated level of relative humidity than other rooms in the flat or building. The paper presents the results of the study conducted in autumn and winter in five flats located on different floors in three multi-family buildings in Poland. All the flats under study were fitted with a natural ventilation system with exhaust ducts in their kitchens and bathrooms. The outdoor air was supplied through window vents installed in the window frames in the selected rooms. Special attention was given to the variability in the levels of relative humidity in these rooms. However, the variability in the indoor air temperature as well as the concentration of carbon dioxide were also considered in the analysis. Only buildings with a natural ventilation system and windowless bathrooms were selected for the study. The results of the analysis showed an elevated level of relative humidity persisting in the rooms in focus throughout the entire period of the study. This salient fact should be noted, since the elevated relative humidity levels combined with the relatively high temperature of the indoor air kept in such rooms in winter are conducive to the development of moisture of the partitions, and in extreme cases, to the development of mould fungi on their surface.

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COMPACT HEATING UNIT USING RENEWABLE SOURCES OF ENERGY

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ABSTRACT

Many ingenious inventions were developed during modern history, but their spreading failed due to inconvenient timing or weak propagation. In my work I processed my own survey and other researches about future constructions in European Union in order to indicate possible technological trend, which will be present in building constructions. In territory of EU can be seen great repulsion of investors and designers in usage of renewable sources of energy. However, according to research, this disinterest will gradually disappear and there will be suitable conditions for our developed device. The article contains chronologically described development, schemes of connection, method of measurement and regulation, possible process of production and future applications, direction in development of compact station is indicated. One of interesting novelties will be diagnostics of performance of whole system connected to compact station – that will bring better accuracy into controlling and it will be possible to integrate this invention into heating systems, which already exist.

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TRANSITION TOWARDS ENERGY EFFICIENT HOUSING: DETECTION OF THE "WEAKEST LINKS" IN ENERGY PERFORMANCE OF THE RESIDENTIAL BUILDING STOCK OF BOSNIA AND HERZEGOVINA

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ABSTRACT

The objective of this paper is to evaluate and distinguish the most critical segments of the residential building stock in Bosnia and Herzegovina in terms of its energy performance, in order to define the guidelines and priorities in the development of the energy efficiency strategies and building refurbishment plans. The research methodology will be explained step-by-step in the case of the most dominant typology in Bosnia and Herzegovina: the single-family houses built from 1981 to 1991. The analysis will include an overview of the average features for the selected category, which were obtained from the statistical survey, embracing several aspects: urbanism, architecture building physics and heating system. Subsequent methodological steps included the selection of the "representative" or the "typical" buildings, which are characterized by average or the most typical properties of each category within the entire database. This paper will present the analysis which intend to demonstrate that, according to their potential in terms of possible energy savings based on the presented improvement measures, the highlighted building typology – the single-family houses of 27 to 37 years of age – can be considered as the most relevant building typology in developing the strategies and plans of the residential building stock refurbishment. This paper is a part of the research on the typology of existing residential buildings in Bosnia and Herzegovina, which was initiated in 2014. Being the first-of-a-kind systematic approach on the subject matter, this research intends to catalyse the shift to the energy efficient housing models in a post-transition and post-conflict country such as Bosnia and Herzegovina.

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BIO-BASED STUDENT PAVILION: PLATFORM FOR RESPONSIBLE RESEARCH AND INNOVATION

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ABSTRACT

Most of the construction materials utilized in common construction have small or no recyclability potential. The construction industry has a larger portion of wasted by product than many other industries due to a loose regulatory environment when compared to the transportation, energy and agriculture industries. Overall it is known that environmental and energy resources are depleting and there is a great need for use of sustainable materials and renewable energy resources. This paper presents the “Bio-based Student Pavilion” project by International Burch University and Green Council which aims to propose a solution for these challenges listed above. First we propose a theoretical research and innovation model that can act as a platform for raising, discussing and experimenting to find solutions for the larger societal issues. Our Project acts as a “Sharing Laboratory” examining many issues, such as sustainable construction materials, RES, and smart building installations, using the “learning by doing” methodology and local stakeholder engagement, in a ethical, transparent and inclusive way. This approach supports dialogue with governments, by forging partnerships with industry and moving all stakeholders towards responsible and sustainable changes. The among the results are an increased engagment factor between students and students, students and professors. This “Sharing Laboratory” is an experimental building that enables collaborative work by students and professors, and is meant to be a platform for many future entrepreneurship endeavours and an integration of RRI within education.

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THE RESILIENCE AS A SUSTAINABLE DESIGN PROCESS IN THE WORLD CLIMATE CHANGE

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ABSTRACT

The World's changing climate, directs all the efforts of humanity in the adaptive nature of reducing the impact of their activities. The author focuses in the text on the idea of 'resilience' in the reorientation of design practices towards to build a bank of matter. The use of information from already occurred events, should lead to adapt in to climatic conditions, as it happens in nature. The first part, show the principles and context of building design process which is not always in the sustainable development idea. It showing the activity of architecture and construction, as negative impact on the environment which We can also experience and categorized as an effect of changing climate. The second part, attempts to determine aspects, which should characterize the early and last design stage, which defines the ecological life cycle of an architectural object – building as a creator of Cities. The conclusion, is talking about of matter in the design process – DNA – as a whole materiality (life cycle - before use, use, after use - pollutions, embodied energy, embodied carbon, serviceability) of the building. Paper refer directly to the architectural-environmental dimensions, orienting the design process of buildings in respect of widely comprehended climatic changes. Author's research results highlight the fact in the idea of the matter bank – the equivalent of city matter. Moreover, ideas are formulated as the 'resilience' which draws from the information, from already existing events and through processing, adjusts them and uses again, what build designers' awareness. The work aims to draw attention to the ever-growing methods of researching the building, such as: Life Cycle Analysis and Building Information Modelling, as the future of sustainable, conscious architecture design in a changing climate.

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POST CONFLICT RECONSTRUCTION STRATGIES IN EGYPT AND SYRIA: A COMPARISON BETWEEN THE EGYPTIAN PAST AND THE SYRIAN PRESENT

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ABSTRACT

Within the last few years, several countries in the Middle East witnessed the so called Arab Spring Revolutions. The wave of change that started in a peaceful way, transformed into an armed bitter conflict in several countries, such as Syria, Yemen and Libya. These conflicts let to the deliberate destruction of several cities in the said countries, in what can be labeled as an act of “Urbicide”. The level of destruction that took place in these cities could be easily matched to similar cases that occurred during the Second World War, Lebanon Civil War, and the Yugoslav wars to mention few. In previous cases, there had been several methods and approaches for post-conflict reconstruction. Egypt witnessed a similar experience twice in its modern history, the first during the Suez Crises in 1956,which led to a massive distruction of the city of Port Said, and the second came a decade later in 1967 during the six days war affecting the cities along the Suez Canal. This paper ttempts to run an analysis of the Egyptian experience that took place in the second half of the 20th centuary and investigate how the lessons learned from this experience can benfit the possible reconstruction attempts in the city of Homs in Syria. The city of Homs was chosen as a case study that was analyzed and discussed in an international workshop in Cairo, the paper will then look at the potential scenarios that were discussed.

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IMPACT OF WARTIME DESTRUCTION AND POST-WAR POLITICS ON THE SOCIAL RECONSTRUCTION OF A MODERN CITY - ON THE EXAMPLE OF MAGDEBURG

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ABSTRACT

Magdeburg seems to be a particular example illustrating complex urban processes of the post-war development of Central and Eastern Europe. Devastations of the Second World War are still visible in the multiple aspects of the city life – its spatial form, social aspects, cultural heritage and others. Post-war 'cleaning phase' exceeded the regular debris removal and caused further elimination of city heritage. Continued within the next decades rebuilding processes, especially under the Socialist Realism impact, transformed the new plan into a patchwork derived from alien urban patterns, neglecting and erasing previous identity. The 1990-ies commercial aspects contributed to further changes, unfortunately also redeveloping the city centre into one-use form. Unwanted urban qualities resulted after 1990 in the enormous shrinkage, followed by the vast demolition of the housing areas. The paper refers to the post-revitalisation aspects of the IBA Saxony-Anhalt 2002-2010 and further involvement of the Kompetenzzentrum Stadtumbau projects. The recent workshops have driven the attention to the housing heritage of the 1920-ies, which became the topic of the revitalization workshop prepared by international teams from University of Applied Sciences at Dresden (a coordinator), Università degli Studi di Padova, Cracow University of Technology, Lahti University of Applied Sciences and Szent István Egyetem University in Budapest. The program was coordinated by Kompetenzzentrum Stadtumbau Magdeburg with the collaboration of the Ministry for Regional Planning and Traffic of Saxony-Anhalt and the City of Magdeburg. The part of the paper presents various aspects of revitalization of the "Cracau Estate", the proposal involve traffic calming aspects and social participation.

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THE REMAINS OF THE BRIDGES IN THE CITY

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ABSTRACT

Bridges are often perceived as a determinant of progress and engineering skills and a symbol of economic potential. The potential of people, city or country - the place where they were created. Therefore, many such bridges have become very important buildings in their cities. They were important both to their originators and promoters, creators and users and to the places themselves that were in some way co-created. For the authors, the city wasn't and isn't just an urbanized space, which was created at a specific time and location, yielding to the processes of development, transformation and even devaluation. The city is an expression of spatially realized ideas and decisions made in the field of urban and social development. It was and still is a place of exchange of thought and civilization development, reflecting the ambitions, aspirations and diverse cultures of its inhabitants. It is a place of coexistence of the two spheres: material and human, which together form a complex system with interrelationships, functioning on the principle of feedback, imposing on each other distinguishing marks. The paper tries to answer the question: what traces in the spatial structure of the cities in which they were created, have left bridges that are often outstanding works of technology and art. But the search for these traces concerns the physiognomic and social realm of the city. Therefore, questions concerning them are in the field of spatial identity space. The research focuses on the analysis of archival iconographic materials in the field of construction history and contemporary satellite images from the location of selected bridges. They are supplemented with stories of cultures and people connected with these places. They create a unique story about the traces of bridges in the city. These selected places are Avignon, Carcassonne, Paris, Prague, Mostar, and small and old Polish city Klodzko.

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EXPLORING THE APPROPRIATENESS OF THE ROYAL INITIATIVE FOR HOUSING FOR THE LOW–INCOME GROUP IN JORDAN

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ABSTRACT

This research explores a large scale affordable housing scheme in Jordan, the Royal Initiative for Housing (RIH) 2008–2013, oriented towards low–income groups and implemented by the Housing and Urban Development Corporation (HUDC). The scheme aimed to enable, within five years, one hundred thousand citizens with monthly income of less than JD300, working or retired military, governmental and private sector, to own their houses at subsidized prices, in ten housing projects located in five Jordanian governorates. Initial indicators featured a disparity between design intentions and users' expectations, causing a gap between implemented planning and the target group selection and satisfaction. The purpose of this thesis is to investigate the appropriateness of RIH for the low–income group in Jordan. It was hypothesized that the beneficiary's project selection and the beneficiary's housing satisfaction were affected by different attributes including project location, housing unit design, project design, financial, infrastructure, environmental, and social issues, which resulted in low selling rates of the housing units. A mixed methods research design was used, both quantitative and qualitative data were collected from the archives of HUDC and newspaper, face–to–face interviews with the beneficiaries, and telephone interviews with the non–beneficiaries, and field observations. For the face–to–face interviews, a proportional random sampling technique was used to select the subjects, which consisted of 385 household heads who lived in the ten housing projects of the scheme. In addition, 30 non–beneficiaries were randomly selected from the applicants' names list available at HUDC for telephone interviews. Factors affecting beneficiary's project selection and housing satisfaction were investigated. Housing satisfaction was defined by satisfaction with the housing unit and satisfaction with project selection. Initial results indicated that the implemented scheme suffered from planning and design shortages, financial difficulties, infrastructural, environmental, and social problems. It was concluded that the implemented scheme did not match up all planning attributes, and did solve the new problems regarding achieving the vision of providing affordable housing for the target group. Findings implied a deficiency in the pricing methods implemented by HUDC, as well as in the financial issues. It indicated that beneficiaries from the scheme were from a higher income group and not from the low–income group. Most respondents selected the project according to its location and having convenient daily trips, and according to project design, housing unit design, and infrastructure. Meanwhile, the beneficiary's selection and satisfaction were not based on financial issues. Findings also indicated the importance of providing and operating the infrastructure facilities and services in the projects, due to significant relationship among these variables and beneficiary's housing satisfaction. This research tried to investigate, document, and evaluate and RIH housing scheme. It is hoped that it will enhance such initiatives and provide an additional value to the low–income housing initiatives in Jordan. The answer for such initiatives is not by providing new residential units, but by building a complete working project and by providing for the target group needs.

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A WASTE STREAM STRATEGY FOR A MATERIAL RECOVERY FACILITY IN GAUTENG PROVINCE, SOUTH AFRICA

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ABSTRACT

The landfills airspace in the Gauteng Province will be exhausted in less than 10 years. Developing new landfills is not a sustainable, environmentally friendly treatment solution. The landfill airspace will very soon run out of capacity, because the amount of waste increases every year due to an increasing GDP.
The current situation with solid waste disposal in Gauteng is that the waste is disposed of at landfills without any form of separation at source. Informal reclaims are active on these landfills, collecting on average, 20% of recyclable material, which is sold to recycling companies. There is however no sustainable and profitable structure in place for trading in removal and recycling initiatives. Waste stream analysis studies revealed that 43 % of the municipal waste stream consist of dry recyclable material. A further 80% of the wet component (57 %) consists of green waste that can be processed into compost. There is no fixed approach to the financing of solid waste services at municipal level. Tariff surveys conducted in South Africa revealed that initial strategy, 58% of municipalities relied on user charges for 100% of their income. The equitable share is not used widely as a direct subsidy to the solid waste account. In those cases, where it is explicitly used to support services to the poor it is generally provided as a general rebate to the accounts of identified indigent households in municipalities. It should be noted that there is a significant market for recyclables in Gauteng and in South Africa as a whole. This is however currently dominated by the private sector. It is proposed that Municipalities can tap into the recycling market as a potential income revenue stream. Municipalities can choose their role, either directly by investing in reclamation infrastructure and selling sorted material to recyclers, or by facilitating small business and industry in an indirect approach. Municipalities may be incentivised to provide the raw waste free of charge, as an implicit subsidy to encourage recycling, as well as to reduce transport and disposal costs. To mitigate the anticipated rapid decrease in landfill airspace the study proposes the development of a regional material recovery facility (MRF) to manage all aspects of solid waste recycling within the Gauteng region with the overall objective of creating an effective, efficient and profitable operation. The methodological approach was to analyse the waste stream required for the MRF, starting with a theoretical background of collection, separation and selling the recyclable fraction. The theoretical background of this process is the theory of reverse logistics. This theory focuses on reverse streams of materials, in this case, the waste stream, and the stages of the reverse stream. With this theoretical background, the study analyses the current situation with an internal and external analysis. The internal analysis focuses on the amount and composition of the waste stream as well as the processes at the MRF. The external analysis focused on external factors where the municipality does not have an influence. The internal and external analysis culminates in a SWOT analysis and confrontation matrix for developing a strategy in solving the problem. The successful operation of a MRF depends on three critical factors; a constant collection process of waste, a well-implemented separation process at the MRF and a sustainable material offset contract with recycling companies. It is proposed that the MRF is partly mechanical and partly manually operated, recovering recyclables from the general, mixed municipal waste stream. Reclaimers, previously hand picking recyclables from landfill sites, will be provided with formal employment in the MRF and removed from hazardous tipping areas. About 450 jobs are expected to be created when the MRF is in full operation. It is envisaged that as the strategy is rolled-out, less and less recyclables will find its way to the landfill. This will also contribute significantly to the reduction of waste that is disposed of at landfill sites, thereby prolonging the landfill lifespan.

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STRATEGIC PLANNING OF CYCLING INFRASTRUCTURE TOWARDS SUSTAINABLE CITY MOBILITY - CASE STUDY OSIJEK, CROATIA

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ABSTRACT

Bicycle traffic, together with public transport, is one of the most significant sustainable forms of achieving acceptable levels of citizen mobility and sustainable development of cities. In recent decades many cities around the world have started to promote cycling as a way of urban transport. However, few have been able to integrate cycling as a relevant mode of transport in the urban transport system. The qualitative shift in relation to the existing situation and the achievement of the increase in quality of the transport system and transport infrastructure in the Republic of Croatia was made by adopting the new Strategy for transport development for the period 2017-2030. Prior to strategic guide in the Republic of Croatia the implementation of these principles and the preparation of the SUMP document has begun in five Croatian cities (Dubrovnik, Umag, Novigrad, Koprivnica, Sisak) within several projects. Eastern Croatia with its relief features has a potential for the realization and implementation of sustainable city mobility plans. Osijek, as regional centre of eastern Croatia, is the city with the most cycling trails in Croatia - up to 40 kilometres. This paper presents an overview of the thematic strategic documents on local level of the city of Osijek in eastern Croatia, with the aim of identifying the existence or non-existence of the principles promoted by SUMP. In the first step, the strategic documents will be reviewed and set goals will be outlined. These goals will be analysed according to the categories of the SUMP principles, ranging from lack of mentioning, then merely quoting, implementing or prescribing the principle implementation. This will identify the lack and the need for implementation at the strategic level. Further, the genesis of planning bicycle traffic in Osijek will be analysed, in the context of the objectives set for the Relevance of non-car modes of transport in SUMP. In the conclusion, a proposal will be made for the location of strategic goals and measures for improving the cycling infrastructure at the local level.

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THE CONCEPT OF EVALUATION AND OPTIMIZATION OF SPATIAL STRUCTURES

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ABSTRACT

Human striving for perfection is reflected in the optimisation. The adjustment of problem areas, i.e. those generating so-called 'spatial conflicts' should be based on inhabitants' opinions, in order to reflect their current needs and on the so-called economic calculation. The optimisation of spatial processes makes sense when the adopted criteria reflect the actual preferences of space users. Most often, the problems under analysis require that numerous criteria for the assessment of conduct while searching for an optimum solution be considered and that a decision on a change to its use be taken. It is the tasks in the field of optimisation and polyoptimisation that are widely used for the selection and modification of the space. Additionally, the process of optimisation is described as a task aimed at finding the best variant of a solution to a particular problem, while the process of polyoptimisation is described as a task aimed at finding a set of compromise variants. The application of optimisation and polyoptimisation procedures in the process of spatial design offers a number of advantages, for example supporting the decision-making process in an effective manner, formulating detailed principles of choice, discovering new areas of a solution, building a platform for discussions while negotiating and visualising multi-faceted situations. The optimisation and polyoptimisation of spatial processes primarily refers to the reasonableness and cost-effectiveness of a change to functions of an area. This comes down to taking decisions on a change to land use, which results in specific development status and spatial structures making optimum use of spatial potential. The main aim of the study was to develop the concept and the rules of optimisation and polyoptimisation of spatial structures. As demonstrated in the study, the combination of methods of optimisation and polyoptimisation of spatial structures with a comprehensive analysis and classification not only enables an increase in the effectiveness and reliability of spatial analyses and an assessment of property market but also, in combination with appropriate tools, allows one to determine the potential of the space along with the prospects of development, which serve an extremely important role in the spatial economy.

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THE APPLICATION OF THE THREATS MATRIX IN PROCEDURE OF SPACE SAFETY DEVELOPMENT

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ABSTRACT

Human Ensuring security belongs to the tasks of public administration. It consists in preventing crisis situations and planning actions in the case of their occurrence. In order to ensure safety in space, great importance was focused on forecasting the possibility of occurrence of both natural and anthropogenic threats. This space, by characterizing the features present in specific places, generates or eliminates various threats. Appropriate early identification of endangered places, consisting in the identification, evaluation and assessment of the space features, gives the possibility of eliminating possible crisis situations. The article presents a procedure for the construction and use of threats matrix in the process of safe space development (a safe planning space). The Authors show one of the method of forecasting the occurrence of natural and anthropogenic threats in a given area and method for determining the probability of their occurrence. The matrix developed by combining the features of space (assigned to individual object classes according to the Topographic Data Base) and natural and anthropogenic threats gives the possibility of their identification and location. The study was conducted on the area of University campus in Olsztyn (Kortowo), Poland.

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TOURISM GENTRIFICATION

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ABSTRACT

This article intent is to analyse the recent phenomenon of tourism gentrification in the city of Lisbon, Portugal. This reality has been affecting some European cities and, in recent years, has gradually become more present in Lisbon's historic neighbourhoods. Gentrification is a phenomenon that has been identified more than half a century ago. This denomination arose in 1964, when sociologist Ruth Glass, while analysing some of London's neighbourhoods, identified an influx of a population segment, descendants of the rural aristocracy, who bought and renovated old buildings. Although initially this has been almost exclusively a social phenomenon, it has recently included the physical transformation of certain areas through its urban rehabilitation. This phenomenon has therefore undergone an evolution, and although it retains many identical social characteristics, it has, nowadays, different contours in some cases. This is the case of tourism gentrification. Lisbon has progressively been receiving more and more tourists, and the sought for accommodation has been increasingly diversified, requiring a market's adaptation in order to respond to this reality. As a result of this demand, there is an increase in the offer of local lodging in the city of Lisbon. This type of accommodation presents its very own challenges, assuming clear advantages and disadvantages for both the neighbourhoods and cities. Gentrification can be seen as one of its disadvantages. A study carried out in Portugal in 2016 regarding the Lisbon region revealed that, before being converted into local lodging establishments, 59% of the properties were vacant. Although this is a significant value, it also indicates that about 40% of the remaining properties were destined for housing, thus suggesting a significant loss of local population, in favour of tourist occupation. This implies a loss of the neighbourhood's identity leading to the loss of their characterization, also devaluing them at a cultural level. Such condition may even become detrimental to tourism itself, since tourists who habitually seek local lodging seek an immersive experience, meaning they want to live like the locals. Local lodging has strengthened the tourism sector by generating significant revenues and has also boosted rehabilitation works in the city of Lisbon. However, it is necessary to define specific regulations, in order to keep the residents in their historic neighbourhoods, while making sure the local tourist load capacity is not exceeded. Local lodging can generate important benefits for cities, but it is necessary to ensure that the negative externalities generated are minimalized. This article is intended as a contribution to the discussion of the consequences of tourism gentrification, but also of the possible strategies that the city of Lisbon could implement, in the future, in order to minimize its disadvantages.

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ECOSYSTEM SERVICES AND URBANISATION. A SPATIALLY EXPLICIT ASSESSMENT IN UPPER SILESIA, CENTRAL EUROPE

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ABSTRACT

Landscapes are providers of fundamental ecosystem services (ES) which are vital for urban sustainability, such as supplying commodities, regulation of ecological functions, providing aesthetics and recreation. While urbanisation, directly and indirectly, affects the performance of ecosystem processes, the potential provision of ES might eventually shrink. Urbanisation is a complex spatial process which takes place across landscapes even in areas far beyond urban cores. It is a spatiotemporal process difficult to monitor, quantify and plan. Fundamental areas providing ES, but located out of urban cores should be planned in an integrated manner. Up to date, there is no evidence on the spatial variability of the relationship between ES and urbanisation. To explore these relationships in this contribution a spatial analysis was carried out in Upper Silesia, central Europe. The aim was to explore the provision of ES and the levels of urbanisation for advancing the use of ES in planning. The potential provision of ES was assessed using a land cover approach. Technomass indicator was used to assess urbanisation as a continuous variable. To ascertain the spatial variability between urbanisation levels and ES provision across the landscape a geographically weighted regression model was used. Results show a statistically significant variability across the landscape for several ES, showing that this relationship does not remain constant. The spatial variability of urbanisation affect bundles of ES in a differentiated manner. The proposed method allows the direct use of the ES framework in landscape planning for assessing the impacts of urbanisation out of urban areas.

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CLUSTERING SPATIALLY EXPLICIT BUNDLES OF ECOSYSTEM SERVICES IN A CENTRAL EUROPEAN REGION

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ABSTRACT

The classification of Ecosystem Services is a powerful analytical tool to identify ex-ante the benefits coming to society from the healthy functioning of ecosystems. With slight differences, the existing classification systems group ES into three main categories: regulating, provisioning and cultural. While this differentiation makes sense a priori the particular way in which ES interact in space is geographically determined. This fact is determinant regarding trade-offs and synergies between ES. While bundling of ES is one of the priority areas to advance towards sustainability, the bundling of ES using the classification system might be hiding synergies or even fostering trade-offs between ES belonging to different classes. In this contribution, we test to what extent the particular provision of ES in a particular region follows the established three classes, searching for particular geographically determined patterns. We tested the clustering of 31 ES using PCA over a land use land cover assessment using CORINE. We identify five clusters of ES, which are not completely representing the traditional classes. Our results suggest that while bundling remains as a fundamental challenge for advancing in the ES application, the clustering has to consider geographically determined features, to identify bundles of ES that work together and independently. The spatially explicit characterisation of bundles of ES will be fundamental to determine trade-offs and synergies to support adequate policy making.

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THE IMPACT OF MINING EXPLOITATION ON PROPERTIES WITH ENGINEERING STRUCTURES BY THE LOCAL URBAN DEVELOPMENT PLANS

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ABSTRACT

Discussed is one of the stages of an ongoing research study analyzing the form and area of active mining impact on properties which include engineering structures. A general back analysis has been applied to the cause and effect method for defining the causes of empirically determined structural damage. One of the points of the analysis is to determine if the guidelines of The Local Urban Development Plan and thent the conditions for building permits have been correctly issued. and whether they have taken into account all the adverse effects that may affect to be analyzed engineering structures on the test field. In addition, examined all the documents which have an impact on the structure and the guidelines imposed by the local plans that takes into account the harmful impact of mining exploitation. In this publication was analysis of explores the current assumptions for mining damage forecasts for areas affected by a mine over a planned operation period, all well. Considering that mining forecasts specify the quantity, impact duration, as well as the form of static and dynamic forces responsible for stresses and deformations resulting from active mining, the information is most critical for the construction and industrial sectors. The Local Urban Development Plans for the analyzed areas are based on the final information supplied by the forecasts, and show active mining areas clearly outlined; thus making it possible to delineate the active mining impact areas when preparing guidelines for building and structure construction permits. The mining damage area parameters determine the design and construction requirements for individual projects which must comply with engineering structure foundation specification for areas exposed to other than standard and highly damaging active mining impact. Mining forecast data allow for designing adequate structural, material, and geothermal safeguards which will stabilize the soil and reduce forces negatively impacting soil serviceability limit states. Owing to the high number of problems attributable to discrepancies between the mapped mining damage areas, the calculations and assumptions used in mining forecasts, and the actual conditions, this study aims to analyze the problem. Based on the information supplied and the author's own observations supported by empirical investigations, the following conclusions have been developed.

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A NEW TOOL OF URBAN STABILITY AND DEVELOPMENT IN SPATIAL PLANNING

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ABSTRACT

The article represents a contribution to the theory of urban stability. We consider spatial planning and master plans as important tools for sustainable land development and stability. In the current spatial planning practice in Slovakia, in some cases, the imperfections of the present law are manifested. The ambiguities in the law cause a variety of interpretations in its application, which is negative in its use. This development of the area does not have to mean an improvement for the life of the population. The current spatial and land-use plans do not permit a sufficiently flexible response to current situations and oblige new projects to create such structures, forms, functions and public spaces that will improve the territory in several factors. The study points to the importance of complex analyses and assessments of the territory that are the starting point of urban design and planning. Knowledge of the area and its surroundings is a basic prerequisite for any successful new structure in urbanised areas. The establishment of urban stability is considered to be an important goal. Urban stability is not an unchangeable state but it is a condition expressing the ability not to disturb its condition. In the case studies of spatial plans application, we point out how the spatial plan can directly influence the stability or instability of the territory. The article presents an idea of a new analytical tool of urban stability, which evaluates the territory of several factors and looks for connections of these effects, which more specifically and more accurately assess the stabilization and destabilization processes of the territory. It defines the factors of urban stability and their interrelations in the form of a matrix of urban stability, which allows a more concrete and accurate estimation of the impacts of the new development on the given territory. On the basis of the theoretical model of stability, the article brings a proposal for a new analytical tool of urban stability in spatial planning, which also evaluates the precondition of new development areas.

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IMPACT OF TALL BUILDINGS ON URBAN VIEWS – THE EUROPEAN APPROACH

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ABSTRACT

The research focuses on the visual impact of tall buildings on the city interior space (i.e. streets, squares, undeveloped land, parks, lawns, palace gardens). These are areas where we can experience tall buildings every day. The study of tall buildings location in the city structure are based on the dominant perception theory. The study searches for relations between tall buildings and their surrounding development that enhance the value of the latter, and consequently improve the quality of the local public space. The research aimed at formulating basic principles of harmonious integration of tall buildings with the landscape of European cities while preserving their spatial cohesion with existing urban context, including historical components. The research involved the use of two complementary methods. The first one is the survey study developed for several cities across Europe. The study enables to provide a direct analysis of the visual impact of building facilities (in physical space of city). The second method is based on using digital techniques and 3D city models. It provides examination of the city morphology and analysis of planned buildings. The computer simulation methods developed by the author will be introduces. The combination of analogue and digital approach provides a wider picture of tall buildings in the cityscape. Research findings point to four basic issues decisive as regards the perception of tall buildings: 1) Major role played by the clusters of buildings, clear urban composition of public locations (e.g. streets with clear lines of buildings, axial development) from which a tall building can be seen; 2) Need to incorporate a tall building into the urban structure (formally important position, axial or symmetrical arrangement); 3) Necessity to coordinate the range of public space and architectural details to human perception scale ('5km/h architecture'); 4) Significance of an architectural body of a tall building (preference to concise form, coherent with urban composition). The four issues observed are going to be discussed in greater detail and supported with arguments in the full version of the article as a proposal for their application in planning. The study presented also focus on analysing the possibility of using digital tools to support the planning process. The Visual Impact Size method enables full and objective identification of all locations from which a tall building can be seen. It also enables to define the degree of its domination in the city space. The article also presents digital methods supporting the identification of axial exposure of tall buildings. The research theme is important for developing the identity in European cities with due respect for their history and tradition. It is also relevant considering that tall buildings have become a major component of the current urban development in the majority of cities in Europe. The research was partially implemented under the 2TaLL project (http://project2tall.zut.edu.pl/) leaded by the author. The research is also based on planning practice referring to the impact of tall buildings on the cityscape, made with the involvement of the author for several cities in Poland in last years.

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APPLICATION OF THE VISUAL PROTECTION SURFACE METHOD (VPS) FOR PROTECTION OF LANDSCAPE INTERIORS WITHIN A CITY

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ABSTRACT

The research concerns application of digital urban simulation techniques aimed on protection of valuable landscape interiors in the city. Such interiors are understood here as relatively big open areas within the city bordered (in a significant part) by a composed greenery system. Well known examples are (among others): Champ-de-Mars and Jardin-du-Luxembourg in Paris or Belvederegarten in Vienna. The goal of the research is to prove the application ability of the Visual Protection Surface method for analysing landscape interiors and to provide objective computer simulations useful in planning. New investments – in particular tall buildings (but not only) – may pose a threat to the composition integrity of landscape interiors. Well known example is the Tour de Montparnasse (built in the 1970s) which disharmonise the view from Champ-de-Mars (however the distance between view point and this facility is over 2,5km). It shows that protection methodology of landscape interiors should include a wide context (up to 5km form the centre of the landscape interior). Moreover, in most cases landscape interiors are historically composed and finished. They have to be protected in the form they are and visual influence of new investments is undesirable (cannot be accepted). The Visual Protection Surface method (VPS) and software (C++) was developed by the author (in cooperation with others). It has been done (partly) within the 2TaLL project ("Application of 3D Virtual City Models in Urban Analyses of Tall Buildings") conducted as a Polish-Norwegian grant finished in 2016. The VPS method allows processing of 3D models of cities to study mutual visual relationships for wide cityscape. It allows to analyse geometrical relationship between the scope of visual protection of the city and the maximum heights of new buildings. Input data include coordinates for a number of strategic views. VPS result is a surface above the city, which defines the maximum height of new buildings in such a way that no new facility can be seen in any of the strategic views. The research will be carried out on the example of the Central Cemetery in Szczecin. An open area (interior) composed within this cemetery is very representative for proposed analysis. The cemetery is one of biggest in Europe. The interior contains an axis over 1km in length, symmetrically clad with two lines of greenery and is visually closed by a historic Neo-Romanesque chapel. VPS maps will present the maximal height of new developments for a significant part of a city (over 25km2). To achieve suitable accuracy for 3D greenery representation LiDAR data will be used – in a form of DSM (Digital Surface Model) on a grid 50cm with Z-axis accuracy 15cm. Processing of such huge dataset will be a challenge. All results will be presented step by steps, inducing all stages of the simulation.

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LINEAR TRANSPORT INFRASTRUCTURE DEVELOPMENT PROCESSES AS THE OBJECTS OF HARMONISATION WITH WILDLIFE

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ABSTRACT

The most efficient way, how to avoid or to minimise the conflicts and negative effects of the transport on the wildlife is reflection of the needs to protect the wildlife in the processes of the development of the transport infrastructure. The effects and potentials for their minimizing differ depending on transport mode (car transport, pedestrian transport, bicycle transport, railways, air transport, cable lines, pipelines, waterways and channels), geographical contexts (landscape features, modes of use of the territory) and element of transport infrastructure (static and dynamic). This paper is focused on linear infrastructure represented predominantly by different categories of roads and railway lines (including supportive and complementary infrastructural elements like crossings, stops, stations, bridges, tunes etc.) as they are most common among transport infrastructure in the countryside and to big extend representative in dealing with the conflicts between transport infrastructure and wildlife. The process of the development of the roads and railway lines is very similar and includes the logic of steps starting with the scoping, via planning, designing, construction and use/maintenance and monitoring. The paper is discussing these five steps in three types of processes - development of new roads and railway lines or their parts, update of existing roads and railways (modernising, extension in former corridors, increase of capacities, speed …) and improving ecological status of existing routes and railways. Individual steps within these processes are described and discussed with objective to illustrate the contents of the phase (identification/definition of qualitative and quantitative demand on transport performance, analyses of technical, technological, economic and other framework precondition for the respond on the demand), the main challenges and problems to be dealt with (realistic identification of current and estimation of future demand on transport performance mirroring the development of the society and its economy), the advised approaches, tools and measures to be used in reflection to the identified challenges and, lastly, the stakeholders relevant for engagement within the phase are listed together with scheme of appropriate participation to help to guide the players in the development.

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NEW APPROACHES TO THE DEVELOPMENT OF THE LEAST DEVELOPED REGIONS IN SLOVAKIA

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ABSTRACT

The paper is discussing and critically looking at the new action plans prepared for the least developed regions in Slovakia (the criteria for eligibility is the unemployment rate 1.4 times above the national average in at least 9 of 12 consecutive quarters) prepared in cooperation among the experts and the Governmental Office of the Slovak Republic. These actions plans were designed in short period of time by spatial planning, education and agriculture professionals and represent special, non-systematic legal measure within the system of regional development support in Slovakia. The first plans were agreed on and legally supported in the middle of 2015 and the paper is looking into the first results reflected in the decreasing unemployment rate. The paper, firstly, portrays the situation of regional development in the Eastern part of Slovakia and explains the reasons for this step by the government and why this decision was taken relatively quickly. Then, the action plans are discussed regarding their structure and the main pillars on which the development is guided in these regions. Special emphasis is put on the financial and fiscal measures combining the national resources and EU financial support. The following part is dedicated to the analysis of the first results using the statistical data on unemployment and economic indicators. Although there are significant delays in financial means to support the regions from the action plans, the first results display slow, but steady decrease in unemployment and increased interest of businesses to these regions. One of the preliminary conclusions of larger research project focused on preparing the strategy for new regional development in Slovakia is that the prepared and agreed on action plans together with focusing on these regions by the national government are initial success factors for regional development of the lagging regions. Furthermore, the action plans are increasing the local capacities and social capital to improve the regions by empowering local public and private stakeholders to be more actively involved in the local and regional development.

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COMPARISON BETWEEN REDLINING POLICIES AND TARLABAŞI TRANSFORMATION PROCESS

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ABSTRACT

Population movements due to economic, social policies and production strategies have started a transformation in the whole urban area, especially in urban centers. With the change of space users and building functions first urban centers then the hinterlands have become urban decay. The positive application of this change and transformation, the contribution to the city and its residents will be possible by strategically planned arrangements. One of the urban transformation strategies that America put into practice in the 1930s is a 'Redlining' policy which can be defined as 'redirecting investment and lending by means of zoning'. Although the practice of politics has been abandoned at the end of 50 years, problems such as unequal service and resource distribution, decomposition and class tension, which arise with practice, have not been solved easily. Urban transformation is a concept that emerged later in Turkey than in developed countries. And after the Marmara earthquake it has entered a rapid implementation process. Although a similar proposal to the policies that have been applied in the United States is not been developed; similar class distinctions and displacement processes have been experienced as a result of urban development decisions and urban transformation applications. Urban transformation projects must be done with a very active group of actors that designer, director-controller, practitioners and most importantly local people as users who have a say. With this argument, transformation processes in cities like Chicago, Los Angeles in America and the process that took place in Istanbul Tarlabaşı region will be explained. The applications in these regions and the similarities seen in their results will be questioned. The process of displacement, dissociation and exclusion encountered, when the multi-actor application process, which is a necessity of urban transformation is not considered, will be emphasized as common problems on global scale even if different practices and policies are adopted. As a result, urban transformation is a process in which all societies are living and this process has common problems as well as settlement-specific problems. Lessons should be derived from past implementations and misconceptions in solution policies developed for these problems. In the works done, developing policies that prevent exclusion and provide social equity and integration must be aimed.

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THE PUBLIC SPACE AFTER THE ECCLESIASTICAL DISENTAILMENTS IN CORDOVA

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ABSTRACT

Cordova undergoes a major transformation in its city planning in the 19th century, after more than 500 years, as a result of one of the most relevant economic and social processes in the history of Spain: the eclesiastical disentailment. The city, on its almost 225 hectares, had 32 conventual complexes within its walls. They were, talking about size, really important Christian buildings, built in a city with an intricate and twisted street layout, inherited from the Islamic population who inhabited the city for 5 centuries. Changes experienced affected significantly the urban morphology. Thus, the research goes deeply into that process. After studying the 46 monasteries that existed in Cordova at the end of the Modern Age and their following evolution, we focus on some of the most important public spaces, derived from that transformation, that exist in the historic center of the Cordova, in order to understand the origin of the city's current configuration. After analyzing all the convents, we distinguish two situations: on the one hand we have the ones that maintain their original use, on the other hand those that have lost it. Of this second group, some of them are preserved adopting different functions while others disappear. Those are the ones that are of special interest to us, as they have led to the appearance of some of the most emblematic public spaces in Cordova within the walls. A study of these urban changes has been carried out, methodologically relying on documentary research, historical layout and bibliographic. Therefore, we have been able to conclude that, of the 37 convents in the city center (5 of them bordering the outside of the wall), 26 lost their original use, of which 10 caused important changes in the plot, such as the opening of new avenues, squares or even neighborhoods. The impact of these changes and how they had an essential influence on a key process of redefining the city throughout the 19th and 20th centuries will be highlighted.

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THE PRESERVATION OF THE CULTURAL HERITAGE OF THE REGION OF THE SOUTHEASTERN ANATOLIA PROJECT

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ABSTRACT

As a result of the functional and aesthetic concerns in the settings that have had an important place in the life of the humankind for centuries and in which the environment is transformed into a structured environment using natural data collected from the important elements of the environment, culture and its reflections on space have manifested themselves. There is no doubt that each transformation is in fact developed through the effective tools and methods of design. One may assert that structure clusters, ensembles, and other spatial elements (streets, yards, etc.) that create the cultural structure and its products in the human-space interaction and natural landscape and landscaping cover have an enhancing role in the value and quality of life. Witnessing rich examples that grow by interacting with each other and are established by cultural continuity is possible in the Anatolian peninsula, which has the cultural heritage of various cultures and values which should be preserved and sustained. The region is a historic and cultural research site where distinguished examples of cultural heritage are still preserved. It is going through a process that is defined by social, economic, cultural, human, and physical properties, which are also the determinants of that process. There is no doubt that this process is diversified through the tools used in accomplishing the goals of development and progress. This occurs along with the actuality and practicability of the decisions and strategies of planning that stretches from the macroscale to the microscale. The importance and gravity of the planning and implementation of single structure scale to urban texture and to cities as a whole accompanied by the assessment, registration and inventory of cultural properties is possible through economic policies that pursue a balance between preservation and use. It is natural to observe the consequences of economic policies at a regional and local level. The strategies, decisions, and actions that balance preservation and use should be discussed separately. Since the Southeastern Anatolia Region comprises nine provinces that share historical and cultural similarities, the region is an economic, geographical, and cultural unity. Thus, the conservation areas and archeological sites that contain the type of structures and groups of structures in which spatial and functional transformation somehow are not realized significantly change and turn into a region of collapse and dilapidation. The identities of users of conventional dwellings are adversely affected by this change, which causes the acceleration and continuation of this process. The preservation of historical and cultural values has parallels with economic developments in that there is a line of descent and thus, a cultural unity in the social structure of the nine provinces in the region of the Southeastern Anatolia Project. This economic structure was based on an animal husbandry-dependent agriculture, whereas, today, inadequacies have occurred in the economic structure as a consequence of rapidly developing urbanization and increasing population. Human life in the region began in prehistory. The region embodies the history of the first humankind. With rapidly increasing urbanization and an agricultural economy that depends on the use of soil, the conservation of agricultural lands and preservation of historical and cultural values have become requirements. Hence, it is clear that the process in which use is more pronounced than preservation and complementary, albeit different, aspects of preservation are identified should be reorganized by resorting to successful examples from countries worldwide. In conclusion, a model in which user identity and lifestyle are sustained and the molding of the spatial and usage equipment with the proper physical, social, and cultural tools and methods are realized will be described.

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THE ASPECTS OF THE INDUSTRIAL HERITAGE IN LATVIA

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ABSTRACT

The research examines the western coast of the Baltic Sea in Latvia. It is the ice-free part of the sea, which has historically contributed to the development of the production - fishery, boat construction, trade. The natural advantages have also encouraged the military strategic situation. This applies both to the 80s of the 19th century and the 50s of the 20th century when the Kurzeme area was dominated by the Russian Governorate from 1795 and the postwar situation until 1990. Until the 40s of the 20th century or World War II, the coast serves as a strong zone of development of agriculture and fishery. This carries a serious industrial infrastructure with it that has kept a powerful visual image in the modern landscape space. Alcohol distilleries, windmills, kiln chimneys, lighthouses, net huts, boat docks, fish dryers, sawmills, warehouses, ice cellars in the dunes, etc. The ecological core and its specificity have shaped not only the nature of the production building but also the scale of the farmsteads and the manor ensembles. The military bases turned the coast into an abandoned area in the post-war years where the regular business - fishery was stopped. This has contributed to the disappearing of the historical identity of the site - the language, traditions, buildings, occupation. Today, after 50 years of the totalitarian regime, the military sites are eliminated but it is very difficult to recover the lost - both the people and the historic cultural space. For the performance of this task, a research on the opportunities of preservation and reconstruction of the historic industrial heritage has been commenced. The expedition work summarizes both the archival materials and the materials of the present situation which allows solving the issue of the development of protection zones in the municipal spatial planning.

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INDEX OF DEVELOPMENT: INFLUENCE OF CITY PLAN LIMITS

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ABSTRACT

The development of modern cities is a complex living organism that includes both main zones of the city – central and peripheral. The most evident development is mainly in the peripheral zones which is caused by the enlargement of the cities. In case of development is important not to forget to the total development, because cities must work as one complex, in which every change is related to everything (for example these all are connected: road and technical infrastructure, residential, commercial and office buildings, industry zone, etc.). Primary tool for city planning is city plan and another city planning documentation, which determines the direction of development of partial city zones. But in case of development of cities exist many elements, which slow down the development. These include bad city plan, which should be appropriate for the development of the city, but often it´s not, and it is not able to react promptly to city situation. This situation is often inappropriate in designed or stabilised city zones. The result of a poor city plan is unusable city zones (land), which are either completely blocked, or there are only conditional use of these zones. These conditional use is not directly in concordance with city plan and expected development. Brno is the second biggest city in the Czech Republic, but there are big problems with city plan, moreover that Brno has old city plan, there are problems with land use and other limits which are created by collision of city plan and other limits set by any authorities. One of the biggest problem is connected to flood limits and collisions with city plan. The aim of this paper is in analysis of Brno designed residential zones and deduce the index of development level for parts of the city. The methodology is based on comparison of actual city zones in city plan and in the detection of blocked zones (plots) by any limits. The result of this paper is in given index of development based on ratio of blocked and nonblocked plots by a found limit. This paper is aimed to limits of Brno city plan and possible influence of monitored limits to development index. Main focus of this paper is to residential zones, analysis of land intended for residential buildings and its limits. The outputs of this paper are useful for private/public sector and their decision making in investment and city planning.

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"VALUE" GENERATION IN METROPOLITAN AREA WITH THE URBAN GARDENS INCLUSION

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ABSTRACT

The real estate market has undergone an intense reorganization in relation to financial crisis, fiscal policies and due to the attention paid to urban planning for the last fifty years. In recent years there has been a greater focus on quality of life as a result of good nutrition, green environment and people network. In this context, green spaces destined to agricultural activities within cities, defined "urban gardens", are able to offer answers to renewed food, environmental and socio-cultural needs. The proposed project is developed around the district called "Librino" (Catania) in the south of Italy. This district belongs to a planning project of 1970, the Japanese architect Kenzo, for the creation of a development area for Catania metropolitan city. Since the creation of the satellite district to date, there has been a gradual decline in the area with the relative depreciation of the housing value of the neighborhood's homes. In the last few years, the largest urban vegetable garden in Europe will be built in the neighborhood and in the outlying areas. The research analyzed the future scenarios in "Librino" deriving from the inclusion of urban gardens, both under the value of the residents' ties, applying the Social Network Analysis (SNA) methodology and the economic aspect through the Market Comparison Approach (MCA) methodology. SNA was useful for representing relations of power in two-dimensional space and for drawing attention to questions of concentration and hierarchy through centrality analysis. MCA was better suited for revealing the complex interplay of attributes and status categories in a multidimensional space that represents the deployment of underlying power resources (such as forms of capital). The work highlights how, starting from a redevelopment of the areas, the generation of social and economic value brought by the urban green, and specifically the urban gardens, it is of extreme interest and it could represent for some areas a development line for future application.

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BUSINESS MODEL FRAMEWORK FOR SMART CITY MOBILITY PROJECTS

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ABSTRACT

Smart City is a complex and multidimensional concept that aims to support and help cities and citizens face the challenges of growing urbanization. In this context, managing problems such as traffic congestion and reducing pollution is a critical objective for public administrators who have recently been increasing their interests and investments in Smart City solutions able to tackle modern urban mobility problems. However, while the growing interest and booming market have sparked a vast literature on Smart City and smart mobility solutions, there is still a lack of studies that investigate on the reasons why public administrations and private vendors invest in smart mobility initiatives, the ways Smart City mobility projects are designed and developed, and how they are able to achieve their goals and deliver value. To this end, this article presents an analysis of the business models of 300 Smart Cities' mobility projects implemented internationally. Projects are scrutinized according to a business model canvas framework to describe how they create and deliver value and the relationships between the projects' stakeholders. The variety of models are then classified according to a taxonomy of main similar characteristics so that a synthetic framework is given to illustrate the main strategies used by city councils and private vendors to design and implement Smart City mobility projects. The goal of this resulting reference framework is to support the decision-making processes of both policy maker and private organizations and act as a guide for the design, development, and implementation of innovative Smart City mobility solution.

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SPACE FOR LIVING: STREETS OF WROCŁAW (POLAND)

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ABSTRACT

From the very beginning the street was and still is essential for moving, living and participating in city life. At present we all struggle with communication, traffic and pollution. Now the streets have a different image of their own structure where the car has dominated its space. This research focuses on a bigger picture of the mobility in the city of Wroclaw. Twelve streets including market squares and public places were taking in to consideration while providing necessary data for this research. It is very clear that a need of a public space is necessary for a quality of daily life. Also, considering a street as a part of this public space is the main point of my research where I would like to prove that giving the street its importance back, can greatly influence on the development of the urbanized space at the city. I will concentrate on the parts of the city centre of Wroclaw. What is very important here is that these parts which in general are seen to be very busy but nobody notice anymore that cars as well as people only stream across these areas which results in these spaces becoming more and more deserted. Following this phenomenon, we can observe an increasing number of abandoned premises along these streets. The major question is how and if we can change and bring our streets back to life. I will follow it up with another question on how people can influence this situation and how to involve local residents in the development of their own streets. If we can change this, we will be able to give our streets deeper meaning in our lifestyle.

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DEVELOPMENT OF THE SYSTEM OF THE GREEN AREAS OF CRACOW FROM THE NINETEENTH CENTURY TO THE PRESENT, IN THE CONTEXT OF MODEL SOLUTIONS

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ABSTRACT

The shaping of green areas with varying degrees of arrangement and different forms of use, as well as of their structure in the form of a system within cities, are tasks that are aimed at, among other goals, the protection of the environment and nature, the integration of urban structure and the improvement of the quality of life. In modern cities which develop in a multi-central manner, it is often impossible to develop model systems of green areas featured in literature, such as the belt, wedge, radiant or ring type. Currently these are most often mixed systems, to which terms like spot, irregular and distributed are most often referred to. What is important is the continuous layout of areas of greenery, an appropriate access range and a hierarchical structure of use, ranging from the housing estate parks, that are the closest to our homes, to regional parks. The article discusses the example of Krakow - a historical city, the second-largest in Poland. Krakow occupies a prominent position among cities that are both beautiful and picturesque, which have outstanding spatial qualities and a *genius loci*. The placement of the city in the Vistula River Valley, a diverse topographic layout, in addition to varied land cover all constitute its unique natural and landscape values. Conceptual designs and the implementation of plans of the shaping of areas of the greenery of Krakow have been compared with model solutions. The contemporary spatial structure of Krakow's areas of greenery has been shaped by natural conditions and the development of its urban structure. A particular role in this process has been played by: the campaign to embellish Krakow, when many streets were given the character of avenues, the founding of urban plantations in the place of former fortifications and the Trzech Wieszczy Avenues upon the embankment of the circumvallation rail and the the Planty Dietla park in place of the river bed of the Old Vistula. A key role was also played by the successive spatial development plans, starting in 1910, as well as concepts of the development of greenery and municipal policies. The most well-known model scheme of a wedge and ring system of areas of Greenery for Krakow was developed by A. Ptaszycka and J. Bogdanowski (the 1950's). It was based on the hydrographic system and the *rocade* roads of the Krakow Fortress. This concept, ideal in its expression, was not transferred onto spatial development plans, with the following factors being responsible: the territorial expansion of the city, its contemporary multi-centrality and changing geometric shape. In 1996 a greenery system was developed featuring so-called river parks, based on the hydrographic system (wedge model). A conceptual design was developed in 2017, showing the contemporary network of green areas in Krakow with the greatest level of detail. An integrating model was proposed - a mixed network model with legible wedges in the form of river parks and compact afforestation. The author participated in the development of the last two concepts.

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REHABILITATION OF BURULLUS LAKE USING HYDRODYNAMIC MODEL, EGYPT

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ABSTRACT

Burullus Lake is considered both a lake and a wetland due to the incoming water flow type. Some of the incoming water is highly polluted as a result of waste disposal of industrial and domestic water in the drains ending at the lake. Burullus Lake has an opening to the Mediterranean Sea (El-Boughaz) which is acting as a source of fresh water to the lake. Building a hydrodynamic model helps in studying the water circulation and water quality conditions in the lake. Different scenarios are proposed and tested to enhance the water quality condition in the lake. These scenarios were grouped into four different categories (preventing discharge into the lake, change the discharge point location to another point in the lake, widening the opening inlet to increase the sea water exchange with the lake, and increasing the opening width combined with dredging a channel into the lake for some distance). To find the best scenario, RIAM (Rapid impact assessment matrix) is utilized to execute the environmental impact assessment of these scenarios and choose the most efficient scenario. As a result of comparing the different proposed scenario, widening El-Boughaz opening and dredging a channel into the lake for some distance gave the best result of improving the quality condition in the lake.

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ACCESSIBILITY ANALYSIS OF URBAN PARKS IN TIRUCHIRAPPALLI CITY USING GEOSPATIAL TECHNIQUES

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ABSTRACT

Urban parks plays a vital role in the social infrastructure planning. It provides green space for leisure time and is an important venue to foster physical activity of urban people. Accessibility to urban parks has become a prime issue in urban planning. Mostly, the urban space accessibility is measured by simple methods, such as percentage of urban parks to the total city or the urban space per capita. These simple methods will not define the precise accessibility to urban parks by all the sector of the city. The number of parks, spatial distribution of parks and the socio economic characteristics of the residents across the city is the influence element in measuring the accessibility. Geospatial technology is the efficient tool to collect, organize and analyze the data needed for the research. An attempt has been made to investigate the spatial distribution of existing urban parks in the Tiruchirappalli city, in Tamil Nadu, India. The survey has been conducted in overserved areas and underserved areas to analyze the various accessibility factors. Spatial accessibility of each census tract was computed using an stochastic model such as three step floating catchment area (3SFCA) method. The results and findings of the study displays the disparity region and also provide recommendations for future provision of new parks in the city to improve the access of residents. Site suitability Analysis of the existing and the proposed urban parks was also attempted in the study.

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GEOSPATIAL ANALYSIS OF LAND USE - LAND COVER ITS RELATION BETWEEN RAINFALL-RUN OFF USING AN EMPIRICAL SCS-CN APPROACH IN TIRUCHIRAPPALI CITY, SOUTH INDIA

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ABSTRACT

The challenges in hydrology are prediction and quantification of surface run-off. The spatio-temporal change in Land Use/Land Cover plays a prominent role in surface run-off. The accurate estimation of runoff is an important task in urban area for proper urban watershed management. The watershed is a decisive unit for planning and management of land and water resources. The runoff in a basin depends on types of soil, land use, cover and rainfall. The traditional process of calculating surface run-off the composite curve number is very tedious and guzzles a much of the hydrologic modeling time. Therefore, geographic information systems (GIS) are now being used in combination with the SCS-CN method. The curve number depends upon soil and land use characteristics. This abstract weighs the modeling of surface run off in Tiruchirappalli City using the GIS-based SCS-CN method. The Tiruchirappalli City is characterized a semi-arid region with annual rainfall ranging around 700 to 800 mm. The Curve number will be estimated for the City assuming Semi-arid conditions. This paper clearly demonstrates that the integration of GIS with the SCS-CN method a powerful tool for estimating runoff volumes in urban catchments. The result shows surface run-off quantity in various land use –land cover.

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RBAN RESILIENCE, A CRITICAL APPROACH TO A UMBRELLA CONCEPT FROM URBAN PLANNING

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ABSTRACT

In recent times, the concept of resilience applied to urban systems and the city has become one of the most successful concepts. It is an “umbrella concept” that encompasses increasingly broad and ambiguous and even contradictory definitions. Like all top trending concepts, it has been losing content because of becoming a magical solution for all problems that threaten urban systems, either as consequence of natural catastrophes and Climate Change or devastating effects of the current model of economic growth. This paper intends to make a critical review of multiple meanings of the concept of resilience applied to urban systems and planning which appear both in the specialized literature and in the official documents of different public and private organizations of important international influence. Particularly, it will focus on those definitions that link urban resilience with the capacity of the urban system (physical, social, spatial, regulatory and administrative structures) to adapt to transformations and changes that global economic model requires for its own maintenance and continuous growth. In general terms, urban resilience is considered in all respects as a dynamic concept that offers multiple ways to achieve it. Despite the apparent approach from complexity, the reality is that urban resilience has become an ambiguous concept, void of content in its desire to be an all-embraced concept that is proposed as a miracle solution for complex problems. Many doubts arise over this concept: Is resilience a state, a property, a quality or a possibility? If we are talking about the ability to adapt to a change, is resilience an adaptation that leads to the destruction of a certain urban and social structure? Is adaptation always desirable or is a certain resistance necessary? Has resilience not been converted in an excuse to avoid conflict and delegate to the populations and citizens the responsibility of overcoming crises? If as some authors indicate, taking as a reference the concept of resilience used in other disciplines such as the resistance of materials, resilience seems to be an inherent property of materials and by extension of urban systems. In the case of urban systems, resilience should be complemented with another property or quality that is resistance. The resistance, in a social and historical sense, understood as the attitude or ability to face adverse conditions and the enemy or agent that seeks to invade and destroy the urban system (as a set of spatial elements, life forms, social and historical structures, local economies, etc…). This capacity for resistance is not only built from within, but also requires a structure that confers some resistance to the system, as a shell or a frame to combat the adverse effects and stop the destruction but, at the same time, allows a certain non-destructive adaptation of the system to changing conditions. We are talking about the need for planning, as a flexible regulation system, that does not assume aggression as something natural, but that is able to re-build city from a resilient resistance or perhaps a resistant resilience.

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URBAN RIVER DESIGN: A RIVER RESTORATION CASE STUDY

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ABSTRACT

Human excessive requirements on functions of aquatic ecosystems cause that surface waters often suffer from significant morphological and hydrological alterations. Human induced hydromorphological changes of rivers belong among the most common ecological problems of the water bodies and they appear in all scales of river habitat. These changes impact their ecological status and need to be addressed in the near future. Successful sustainable river rehabilitation depends on the identification and understanding of key processes and anthropogenic stressors that enable to estimate a proper longitudinal and lateral riverine system structure including stream habitat improvements at different scales. The article summarizes the basic principles of urban river restoration that enables to approach to the state of dynamic stability and to increase the „absorbing capacity" of freshwater ecosystem. The authors also provide the background facts and principles of the restoration design of canalized reach of the River Trnavka which flows through an urbanised part of the city Trnava. The Trnavka river has regulated flow regime affected by operation of Boleraz reservoir located 14 km in upstream direction. The river channel capacity equals to 50 m3.s-1 with return period 100 years and ecological flow is Q=0,150 l.s-1. The heavily modified non prismatic channel has stone and concrete stream banks. The authors have proposed increasing sinusoity of low flow channel and decreasing it´s capacity of oversized channel by using gravel matraces with seeding different types of macrophytes. The main goal of the proposed river restoration measures was to increase aesthetic value of complex restoration design of close public space (the Rose Park) and to implement technical and biotechnical measures that may improve ecological conditions and management operation of the Trnavka River.

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THE USE OF THE PROTECTED AREA ZLATÉ PIESKY IN ACCORDANCE WITH THE SUSTAINABLE DEVELOPMENT OF A TERRITORIAL SYSTEM OF ECOLOGICAL STABILITY

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ABSTRACT

The work presents the application of the principles of the Water Framework Directive (WFD) for protected recreational areas, including water for swimming. The application of the principles is demonstrated on a specific landscape-architectural case study about the utilization of the lake Zlaté Piesky for recreation. The landscape-architectural concept shows an optimal profile and organisation of the area that will simultaneously coordinate the diversity of the land use. Emphasis is placed on a balanced relation between natural and civilization elements and it creates a recreational area of supra-regional importance. The proposed solution should ensure that the requirements for a high quality recreation would be completed. At the same time, the sustainability requirements of the territorial ecological stability system are respected. The paper also refers to the criteria for the landscape-ecological importance. The content of the work is a complex revitalization of the site focused on the creation of the ecosystem conditions targeting a different groups of organisms (e.g. aquatic birds, aquatic animals). Local biocentres act as interacting and ecologically stable areas. Biocentres strengthen the ecological functions and wider background for the symbiosis of natural communities and their optimal use by humans. It is necessary to find the most efficient and most efficient use of the water surface that must result from the real assessment of a wide spectrum of the often contradictory factors of recreation and the ecosystem of the aquatic and terrestrial area of the water surface. This is an approach with the basic principles of water use and management respecting the Water Framework Directive. Therefore, the work does not only present the urban study itself but also addresses the problematic issues with regard to the Water Framework Directive. The model area, where the research of the application of the principles of the Water Framework Directive was implemented, is a recreation area called Zlaté Piesky in Bratislava in Slovakia. The centre of a recreational interest in this area is a freshwater lake with a gravel bottom. The bottom is covered on some places with muddy sediment. The fauna contains higher macrophytes covering almost all the surface of the lake. This area has been selected as appropriate for the research because individual principles of the WFD could be applied there.

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ASSESSING URBAN SPRAWL EFFECT OF TRANSPORTATION INVESTMENTS USING REMOTE SENSING DATA AND GIS METHODS: THE CASE OF ANKARA PROTOCOL ROAD

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ABSTRACT

In developing countries such as Turkey, transportation investments maintain their popularity. With these investments, short-term solutions are being sought for urban infrastructure problems that are the result of growth-based model in construction sector. The main purpose of this study is to examine the relationship between transportation investments and urban sprawl. To this end, in the capital of Turkey, Ankara, the results of transportation investment in the protocol road that is the main route which provides transportation service to the north of the city, are evaluated in terms of urban sprawl. In this evaluation, Landsat satellite images of the study area are obtained every four years between 2004 and 2016, and land use is classified by remote sensing and GIS methods. As a result of this classification, it is observed that the built-up areas increased by 164 % and the total population by 33 %. Since the population of Ankara has increased by 27% between 2004 and 2016, it is seen that the study area has improved more rapidly with the contribution of the transportation investment, compared with the general urban area.

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INDUSTRIAL SPACE IN BYDGOSZCZ (POLAND)

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ABSTRACT

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

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URBANIZATIONAL TRENDS AND IMPULSES IN THE HOUSING CONSRUCTION OF UKRAINE

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ABSTRACT

In recent decades, Ukraine has undergone large socio-political transformations, which have also been reflected in the urbanization processes. The war in the East of Ukraine caused equally important internal and external migration of the population. There was also a change of business locations from the eastern regions to the central (capital) and western (Lviv as a regional center). Economic fluctuations are causing stagnation and booms in the construction industry. With the growth of GDP, Ukrainians traditionally invest excess revenues in real estate. An analysis of the dynamics of housing construction in Ukraine has shown that the Kiev region ranks first place of the housing construction area that put into operation by 2016 (3398.8 thousand square meters), while the Lviv region ranks second with an index of 859.2 thousand sq.m. The main construction is concentrated in the cities-centers of the regions, which have a metropolitan character. There is also a rapid reactivation of the suburban segment, which is explained not only by the outcome from the recession, but also by the fact that demand in the primary housing market is still concentrated in low-cost and small-sized apartments. In the remaining regions, this indicator is much lower - in Odessa 575.9 thousand square meters and in Ivano-Frankivsk 480.8 thousand square meters, and further this indicator reaches only 10-20% relative to the leaders. In the unchanged boundaries conditions of the city, the basic concept is an "urban concentration". For each city, the issue of new urban density is to find a balance between further concentration of the city's development, and the preservation of unbuilt territories. The practice of building, for example, of acutely deficient in the housing market habitation during the last decade, shows rather a developer example of the intensification of the usage of territories. Today, 234 residential complexes are registered in Lviv, and there are 360 residential complexes in Kyiv with a separate allocated area, formed by a group of dwelling houses and adjoining territories, or a multi-sectional building and an adjoining site. In order to understand the magnitude of the density index, we note that for multi-apartment buildings of more than 9 floors the normative density indicator in Ukraine, which provides comfort of living and functional and communicative filling, is 142 persons / ha. It should be noted that in a Vienna, which is one of the most comfortable cities for life according to the consulting organization MERCER, a similar average statistical indicator of density for 2016 is 176 person / ha. Thus, today in Ukraine one can observe the search for forms of development of a compact city, which takes place by modernizing and consolidating of the cities which are territorially outstreched and developed during the period of socialism.

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AN ANALYSIS OF IMPACT ON LAND PRICING FROM HIGH-SPEED-RAIL IN HONSHU AREA

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ABSTRACT

Several decades of High-Speed Rail (HSR) in Japan have generated direct impacts on Japanese's life regarding reducing short time travel, enabling newly accessible areas, and increasing transport market. Besides, The Shinkansen network rise passenger flow from the mainland (Honshu) and other Islands. This research aims to measure the indirect impacts of HSR network along the urbanisation sustainability regarding land pricing impacts. This study conducts the quantitative analysis to measure the effect of Shinkansen network in the prefecture with and without HSR stations. The land price data is received since 1983. In this study, the comparison between the prefecture with HSR station and without HSR station is pointed out a case study. The four case studies have been highlighted using ANOVA analysis to determine the correlation on both land pricing and population density as following the research hypothesises. Besides, the Least Significant Different (LSD) analysis is used to compare the relationship between each pair later on. In this stage, it can justify how the impact of HSR on population dynamic and land price in the area with and without HSR station. As a result, the research found that the big cities show no relation to land price with other towns due to the land prices in metropolitan areas had expensive before coming to HSR. And, the LSD analysis results show dramatically different on land price in both cases Osaka – Shimane, and Osaka – Tottori that represent high values of $|x_i-x_j|$ around 4,500 Yen/m^2. But, the comparisons of those cities with Kyoto represents slightly different on land value at 401.74 Yen/m^2.

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HIGH LINE IN NEW YORK - UNUSUAL PARK IN THE CENTER OF MANHATTAN

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ABSTRACT

An unusual park – the High Line aerial garden – is an excellent example of restoring a deserted place to life which attracts everybody who wants to find an oasis of peace in the midst of a busy city. In the 1990s, the city authorities had the idea of demolishing a railway viaduct which had been part of the heritage of NY industrial history, and forgetting about it as soon as possible. Luckily, this did not happen. The High Line history dates back to 1847 when a railway line was constructed across the city centre so that a free flow of goods became possible. Unfortunately, the line went along streets, which resulted in a large number of fatalities. Therefore, in 1929 the decision was made to construct a viaduct which took the railway line above the streets, and sometimes even went directly through factories and warehouses. The lush vegetation, footpaths with remainders of railway tracks, streams, drinking fountains, mobile deckchairs and benches located at a height of almost 10 m above the ground, were an idea of a group of enthusiasts (Friends of the High Line), who in 1999 prevented the former railway viaduct from being demolished. Reconstruction of the viaduct started in 2006, the first part had already opened in 2009, and the second in 2011. The revitalisation of the railway route initiated by Robert Hammond (the founder of Friends of the High Line) brought about unexpected results. The plan of Fields Operations, specialising in landscaping, and the team of architects Diller Scofidio+Renfro, which envisaged the construction of a park preserving the original nature of the viaduct, hit the bull's eye. The High Line is a park created on the route of a railway line crossing 22 New York blocks along the west side of Manhattan. At present it is one of the most popular leisure sites for New Yorkers and a tourist attraction visited by 5 million tourists a year. The subject of the paper involves specific terms which need to be discussed to be able to tackle the role of tradition in the High Line project. Two of these are the new urbanism and plane-platform-base. The importance of the former is due to the conscious return of the precursors of this trend to the classics, the latter is due to associations with the bedrock upon which solid edifices can be built (as taught and told by history). The new urbanism means a return to traditional (often classical) patterns and principles of urban design. The realisation of the new urbanism concept is the classical shaping of space (modelled upon historical layouts) to support the balance between various methods of using streets and yards. A path – the park – should be understood exactly as a platform. The pragmatism of understanding what the park should be and what it should look like, and the high costs of completion of the overhead project, did not have enough power. They did not cause rejection of the idea. I advance the thesis that it was the result of the unique project location and the will of the local community. This can mean that the rules are flexible and depend largely on project location, in other words the most unusual ideas in the most prestigious locations will always have a good chance of being accomplished. The other, maybe even more important, factor is a grass-roots interest in the changes. Of course, such an interest must be supported by power, which means money and influence. If enough residents have the above, then the project will go ahead. There is nothing new or innovative; it only confirms that not much changes in history. On the one hand the above mentioned thesis sounds like a cliché, but on the other, awareness of the essence of regulatory mechanisms in urban planning and the ability to use these mechanisms are the most important elements of the design experience.

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PEDESTRIAN WIND COMFORT EVALUATION FOR SUN VALLEY CAMPUS

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ABSTRACT

Public spaces play an important role in the social life and they are considered as the mirror and the reflection of the society. The uncomfortable microclimatic condition such as the air temperature, wind speed, solar radiation, etc. may encourage the pedestrian to avoid using these areas which effect directly the integration of residences and promote their segregation. In particular, the wind is considered as the parameter that influences the pedestrian comfort the most. However, it is heavily present in the design stage of urban and architectural projects at some places around the world, due to the complexity of the interaction with the urban fabric that create aerodynamic phenomena in the immediate environment of building and public space. Our subject of research focus on the living area Sun Valley inside the Laser Valley Land of Lights, which is one of the biggest research projects in Romania that aim to attract high tech industry around the world's most powerful laser, Extreme Light Infrastructure Nuclear Physics ELI NP Project. Sun Valley was the result of an architecture international competition with the objective to provide an open research ecosystem based on sustainable development. Through this paper we aim to investigate the wind environment in the design stage of the project. Mainly, we focus on the wind effects that are taking place in the large open space inside the campus on pedestrian comfort and safety, in order to provide comfortable area that promote the social life between residences. In this context, we describe the set-up of our research on the pedestrian comfort in the public space from the wind perspective, where Wind Tunnel measurement study on the pedestrian level (1.5 m to 2 m height from the ground) was carried out for 8 different wind directions in the TASL1-M Boundary Layer Wind Tunnel at the Aerodynamics and Wind Engineering Laboratory "Constantin Iamandi" (LAIV) in the Technical University of Civil Engineering Bucharest (UTCB). Furthermore, the preliminary result of the experiment performed in the TASL1-M Boundary Layer Wind Tunnel are described.

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SUPERMANZANA IN PRACTICE. ABILITY TO CREATE PEOPLE FRIENDLY SPACES UPON THE EXAMPLE OF SELECTED BARCELONA-BASED PROJECTS

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ABSTRACT

This paper is a result of an in situ study carried out in Barcelona. Its objective was to assess the effectiveness of the spatial policy of the city in terms of promoting sustainable mobility, traffic restrictions, increasing the share of public spaces, and improving basic ecological indicators, such as biodiversity, the area of green spaces, or air pollution. The analysis focuses on measures implemented within the scheme of the concept of 'a superblock' (original '*supermanzana*') on the example of two selected districts of Barcelona: Gracia, and a part of El Poblenou, demarcated by the streets: Carrer de Badajoz, Carrer de Llacuna, Carrer de Tanger, Carrer de Pere IV. Special attention was paid to the ability of the changes implemented to create people friendly spaces, where people wish to stay, and subsequently to their ability to create positive functional and spatial changes, especially on ground floors of buildings. The paper shall give the reader a sense of the exact scope of implemented measures, presented on the example of selected analytical layers, such as transport, public spaces, visual information, street furniture, etc. The study results demonstrate an improvement in terms of the majority of the urban and ecological indicators referred to above; nevertheless, the assessment in terms of the actual increase of the attractiveness of the place and its ability to create people friendly spaces, is not explicit. In El Poblenou in particular one can observe certain weaknesses in this respect, which could be particularly disturbing considering subsequent plans of the authorities of Barcelona to implement the concept of 'a superblock' in other parts of the city within the scheme of the urban grid of Eixample. Doubts are additionally raised by the legibility of the new traffic network in this location, which constitutes an impediment in uninhibited and intuitive moving around for city inhabitants themselves. A similar spectrum of measures does not always bring about the same results. The assessment of the quality of public space cannot be limited to some selected figures, which confirm – as they must – effective implementation of the assumed goals, much to the satisfaction of the authorities who are behind them. Such an assessment carried out independently from other place making factors, such as the plot ratio, the diversity of the functional programme, spatial relations in the existing development structure, which should be adjusted to man's scale, or – finally - the quality and character of greenery projects implemented, will never be credible.

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SEARCHING FOR CONTEMPORARY PUBLIC SPACE: AS AN ELEMENT OF CITY PLANNING EDUCATION

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ABSTRACT

At present the main response to changing the conditions and prospects of life is application of the principles of sustainable development in all spheres of human activity. One of the main spheres of sustainable living capacity necessary for the sustainable development of settlements is high cultural efficiency, which requires among other things high aesthetic qualities of the urban environment. Urban form and land use patterns within a city are critical determinants of its environmental quality. Today city form is determined by the interaction of countless decisions by individuals, households and businesses on the one hand, and a variety of government interventions designed to influence or control those decisions on the other. Urban design is necessary to organise and co-ordinate the different participants in order for the resulting public spaces to be truly designed. The main objectives of research work presented in the paper are: 1/Exploring the urban design solutions of shaping contemporary public spaces in cities, on the example of student's works realized at The Faculty of Architecture, The Warsaw University of Technology, especially in The Chair of Urban Design and Rural Landscape (with concentration on environmental aspects), 2/The detailed studies concerning quality of spatial composition of explored public space as well as quality of elements of this composition. The process was concentrated on research of the basic student's projects: design projects elaborated during the course Elements of Urban Composition, Housing urban complex with services, Revitalization of the fragment of the city. The main conclusions: 1/One of the most important instruments of shaping contemporary public spaces and the townscape of the city is urban design and urban composition, 2/Original and unique spatial composition of the public space has been one of the decisive elements, which influence shaping of new identity of this space. These tools could contribute to creation of the efficient spatial form and shape harmonious and sustainable contemporary structure and townscape of the city.

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MODERNISATION OF PODLASIE CITIES' MARKETSQUARES (POLAND) IN CONTEXT OF THEIR SYMBOLIC VALUES IN HISTORY AND NOW

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ABSTRACT

Public spaces in many cities in the Podlaskie Voivodeship (Poland) were modernized after 2004 (Poland's accession to the European Union). Selected markets are currently being modernized, a significant group of markets still needs revitalization. Transformations are introduced in many reasons. One of the important aspects of these metamorphoses is the exposition of the existing and attributing the next, new symbolic values of space and objects. The purpose of the work was to determine the forms and subject of new objects, which are currently used to build a symbolic program of the Podlasie city marketquares. In this sense, they build the cultural values of our age. The research was carried out in the context of historical conditions. A historical cross-section of the approach to the placement of symbolic content in the space of Podlasie city marketsquares (Poland) has been presented. It includes 40 towns that currently have city rights. The theme of symbolic content characteristic for objects placed in the space of markets in particular historical epochs was systematized. Forms of symbolic content in the following groups were defined: architectural objects (eg town halls), small architecture (sculptures, statues and fountains). Thematic groups and forms of symbolic content were established and presented to the space of the cities group markets. Formal groups were established: sculptures, statues, objects of small architecture (individually designed fountains, thematic architectural furniture, ...) and "traces" - reminiscences of historical architecture (eg drawing on the market's floor). The main thematic contents of symbolic forms that are currently located in the space of markets have been established. These are the tales that are associated with: the history of cities, the founders and people important to history, fictitious characters, building a new image (identity) of the city.

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MODERNISATION OF PODLASIE CITIES' MARKETSQUARES (POLAND) IN CONTEXT OF THEIR TRADE FUNCTION IN HISTORY AND NOW

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ABSTRACT

Trade is one of the leading functions of historic marketsquares. In subsequent historical periods, it was given a different form in the public spaces of the squares. Different types of objects located in the area of the market were adapted to various forms of sales. The aim of the work was to systematize the forms and objects of trade implemented in today (after 2004) modernized spaces of the Podlasie (Poland) marketsquares. Particular attention was paid to the context of new objects to the cultural values of the main urban spaces of cities. The research was conducted against the background of the architectural history and traditions of the region. In individual periods, commercial buildings served a useful function, but at the same time they could carry a symbolic message, as well as fulfill an important function in the spatial composition of the square and of the city. Particular attention was given to the cities like Augustów, Białystok, Bielsk Podlaski, Krynki, Łomża, Suwałki, Siemiatycze and Zambrów. The history of commercial facilities was analyzed in periods in which significant changes in the approach to shaping their form were observed: Baroque (XVIII century), partition period (1795-1918), middle war period 1918-1939, and after The Second World War 1945-1989 (1989- Poland changed political and econoic system), 1989 – 2004 (2004- Poland's accession to the European Union), after 2004. Borders of periods are based on dates relevant to the history of Poland. Nowadays, commercial buildings meet the current needs of cities. They are present in the space of marketsquares on a smaller scale than in history. In the work, their forms were analyzed in the context of currently utilitarian, symbolic and compositional functions. They often result from cultural conditions and tradition of the place. At the same time, they are a part of building a new image of cities, addressed to residents and tourists. Contemporary projects of trade objects are usually based on the tradition and history of the region. Nowadays, trade is usually located in the market-frontage of markets, adapted or specially designed for this purpose. A popular, periodic form of trade are theme fairs organized by cities. The city authorities and organizers of temporary forms of trade strive for an aesthetic expression of the objects harmonizing with the market space.

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IN SEARCH OF THE QUALITY OF CITY PUBLIC SPACE: SPACE DIRECTING – TOOL OF IMPROVEMENT

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ABSTRACT

Directing the perceiver by space – influence of the spatial environment on a human being, with simultaneous intensification of anthropogenic aspects in the state of the development of this environment (whose quality is unsatisfactory) entails a necessity for professional space directing. Professional directing, that is defining the qualities of urbanistic and architectural space with the use of knowledge, experience and intuition, concerning both the object of action (space) and this subject (human being) and consciously affecting the quality of the influence of this space on the user, on its perfecting which would be favorable for the human being. The key to the auteur attitude, space directing, is then the analysis of the "object in the process". Space directing examines the specific object which architecture constitutes in the process of its manifold relations with human being: perception (by), influence (on), exploitation (by). Space directing examines those predicted relations object-human being in the whole process of creation of the object (its designing and accomplishment) and in the process of modification of the object during its long-term exploitation. Space directing is designing of the relations space – human being in the freely predicted "theatre of everyday life", the dynamic process of exploitation of the architectural and urbanistic space: an object beautiful in intention, durable, understandable. The intention behind the reflections herein is to demonstrate the usefulness of actions in relation to the urbanistic and architectural space derived from "theatrical laboratory" of the director's procedure: a. in the director's way of thinking in the process of creation; thinking in terms of predicting the reactions of the users during interaction with space and inspiring them through selection and gradation of media employed out of the whole, simultaneously examined matter available to the space director, so as to make those reactions, stemming from the way of "interpreting" the space come into being; b. in the direction's superiority in the investment process concerning the subject matter of managing the work; this enlargement of the role and competences of the architect, from the role of the author-designer to the role of the author-director of the whole work, during its creation and during its modification all through the time of its exploitation, since consistent creative activity, namely the author-director's intellectual ability to create a synthesis of circumstances, improves the chances for a coherent (i.e. improving, not reducing the quality) accomplishment and possible further evolution of the work.

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ANCIENT CARTOGRAPHIES AS THE BASIS FOR GEOLOCATION MODELS IN PUBLIC SPACE: THE CASE OF GIAMBATTISTA NOLLI AND ITS HERITAGE APPLICATION

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ABSTRACT

In 1748, the architect and surveyor Giambattista Nolli mapped an abstract reality of the city of Rome. As a challenge to the inherited projections, it represented the city mixing streets, halls, corridors, churches, baths and markets as part of a unique public space net. The possibility of containing in a single layer all public space (including the interior of public buildings) opens a new way to design public space and rethink the whole urban system. Despite this, Nolli's plan remained a useless instrument since the hegemony of automobile mobility appeared as a pre-eminent system. By means of enhancing the graphic value of the system of Giambattista Nolli, this research tries to understand how the application of the ancient cartographies' methodology can improve the pedestrian mobility of historic cities. Nowadays, free public space is represented as empty and built ones, as solid. This proposal would revert this reified conception of the city understanding this baroque representation as an instrument of identification and valuation of the transitional heritage. The clues unveiled by Nolli seem to be able to integrate the plans of public buildings within the urban tissue, which would result in a step towards the full integration of cartography and mobility. The success of the comprehensive tools offered by large servers such as Alphabet inc. (Google) or Bing Maps confirm the suitability of the fusion of new technologies and the Big data with urban planning and the synchronisation of Smart Cities. As well as open public space can be 'walked in' from any electronic device, the application of the "Nolli methodology" would implement the model of urban geolocation with the incorporation of inner public spaces. The 'chimera' that could be intuited in the elaboration of a great global map of the public space is discussed with a tangible reality: every open public space is already housed in the Big Data and it is accessible through geolocation tools. The inclusion of the planimetry of the public buildings' interiors would contribute to develop a greater permeability between city and citizens would optimize pedestrian travel times and would be able to expand the geolocation system network as a documentary repository.

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CONTEMPORARY PARKS IN POST-INDUSTRIAL CITIES OF UPPER SILESIAN-ZAGŁĘBIE METROPOLIS

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ABSTRACT

The subject of the article is greenery in the public space of modern post-industrial cities with a particular role of city parks. The research concerns the current trends in the creation of urban parks, new forms and functions of urban greenery and ways of their introduction into the spatial structure of cities. The research is based on the cities of the Upper Silesian-Zagłębie Metropolis - one of the largest and most urbanized metropolitan areas in Poland with an industrial heritage. The article deals with the issues of creation, repair and protection activities undertaken in the 21st century related to the shaping of urban and suburban greenery in public spaces. The research presents selected activities carried out on a local and regional scale in the area of the metropolitan core. In the Upper Silesian-Zagłębie Metropolis, the slow process of increasing the area of green areas faces the processes of increased industrialization and urbanization. With the use of appropriate legal, financial, planning and organizational methods and instruments, this process can lead post-industrial cities towards „green" cities. It may also raise one's hope to improve the conditions and quality of life of urban communities and create a new image of post-industrial cities. The shaping of a new metropolis image is connected with the search for new challenges and new landscape identity. And, here is a chance in the creation of new green areas, and in particular broadly understood and much more complex than originally urban parks. The article objective is to show the role of parks in creating a new „green" image of a metropolis and impact on the quality of life of their inhabitants. It is also an attempt to answer the questions whether these activities are sufficient to make cities with an industrial heritage become „green" cities and the effect of these actions to be visible in the metropolis landscape. The article also tries to answer the questions whether contemporary different approaches to shaping urban greenery change the space and character of post-industrial cities and whether they meet the needs of a post-industrial society daily contact with nature.

TAMING THE URBAN SPACE

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ABSTRACT

The idea of sustained development can't be effectively implemented without due inclusion of social needs and designing that is "closer to the people". This approach allows the holistic design, the design of urban spaces, and the spaces that were dehumanized to date, have the chance to regain their social and town building potential. The aim of the article is to present the possibilities for accomplishment of idea of reclaiming urban space through its taming, on the example of the competition designs of town greenery in different scales in two Polish cities: Szczecin and Złotów. The idea of taming the urban space was interpreted as integrated action of three components: a. urban gardening – through appropriately chosen plant species, including edible plants and use of traditional and elevated plant beds the space created is "homely", "safe", creating connotations with a home garden, stimulating interaction of neighbors and the feeling of being the "host" of the space; b. games in the space – the use of some amusement elements and adaptation of the urban elements of small architecture and the surfaces to the needs of games and recreation, but without being too literal in that aspect, to be used by all inhabitants, independently from their age, introduces the feeling of freedom, creativity and even surprise that accompany entertainment, to the space and in effect enhances the integrative quality of the space and the feeling of comfort of staying "in our own", that is neighborly space; c. system of easily adaptable furniture – thanks to furniture elements that give the inhabitants the possibility to transform the space we enhance their awareness of their real influence on the functioning of the space and its perception as an attractive one, because it can be used according to one's individual needs. In the effect of the adopted project assumptions we achieved a pro-social space, that has the potential to become the area for integration of local community, thus filling in the idea of sustained development.

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NEW CHANCES FOR OLD TOWNS: 21ST CENTURY REVITALIZATION IN HISTORIC CENTRES OF SILESIA

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ABSTRACT

Silesia is a region of Central Europe with a complex and multicultural history. Its borders and nationality changed repeatedly over the centuries. Consequently, Silesia's identity, culture and economy were shaped throughout the region's history by Polish, Czech, Austrian, Prussian and German influences. Since 1945 Silesia has been located mostly in Poland. Majority of Silesian towns were founded in the Middle Ages creating a regular system of a settlement network in the entire region. This process started at the beginning of the 13th century and was a part of dynamic urbanization of the entire Europe. Basic features of Silesian medieval urban structures, known presently as the Old Towns, are: an orderly plan, chequered grid of streets, regular blocks of development and a centrally located market square. Through centuries historic towns in Silesia remained within their city walls, rather undergoing changes, than simply developing. It was only the 19th century that brought favourable circumstances for development. Unfortunately, as a result of the World War II, many Silesian historic centres were significantly damaged. After the period of the post-war rebuilding, the old towns in Silesia experienced the process of degradation resulting from the political and economic system of Poland in that period. The first possibilities to raise the quality of the old town areas appeared after the year 1989 with the Polish political transformation. In the 21st century, mainly thanks to EU funds, numerous projects were implemented within the historic town centres of Silesia in the field of urban revitalization. The study presents the range and specificity of these activities undertaken and the review of chosen projects completed. The results help not only to assess the effects of the actions undertaken and their impact on the quality of urban living conditions, but to relate them to the towns' identity and its spatial uniqueness as well. Finally, the work is an attempt to answer the question to what extend a new life has been breathed to historic old town structures in Silesia. The analysis is based to a large extend on the Regional Operational Programmes elaborated in the years 2007-2013 in 4 administration units, which form in various proportions the region of Silesia.

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FACTORS DETERMINING THE WAYS FOR SHAPING THE LANDSCAPES OF MUNICIPAL CEMETERIES IN SZCZECIN: PROPOSALS OF CHANGES IN THE SHAPING OF MUNICIPAL CEMETERIES

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ABSTRACT

The city of Szczecin is the capital and the largest city of the West Pomeranian Voivodeship and currently has six active cemeteries, the area of which is 204.62 ha. Cemeteries constitute a significant part of green areas in the city with a large potential for passive recreation places for residents. The aim of the research was to attempt to characterize the landscape of municipal cemeteries in Szczecin, as well as to formulate proposals for actions that would improve their current condition. On the basis of research and analyzes, the authors pointed out that the factors that influence the shaping of the landscape of Szczecin cemeteries are varied and can be generally divided into legal, spatial, historical, economic and cultural ones. It was found that the Central Cemetery, as a listed historic object, has the greatest landscape values, however, it lost much of the original landscape and cultural values due to post-war neglect and destruction. The remaining cemeteries are of secondary importance as objects of limited importance and functions of district cemeteries. Their condition is worse, and their landscapes are the least diverse. Cemeteries in Szczecin have a fairly high share of high greenery, and the low greenery is limited mainly to lawns. In order to create a climate favouring to walks and resting, the cemetery areas should be enriched with aesthetic and well thought out plant compositions from shrubs and perennials, designed by a landscape architect. It is proposed to create common "garden units" where the distance between the graves would be larger and it would be possible to create small plant arrangements. In addition, it is observed that cemeteries lack beautiful and original tombstones, which is why the return to exhibitions of cemetery art forms an important aspect. This would create the possibility of presenting modern and valuable stone art products and inspiring forms of plant arrangements at the graves. This is only part of the authors' proposals, which are quite universal and can therefore also be applied to other municipal cemeteries in Poland and abroad.

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IMORTANCE OF TREES WITH LOW-GROWING BRANCHES AND SHRUBS IN PERCEPTION OF URBAN SPACES

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ABSTRACT

The purpose of this paper is to specifically analyse the influence of trees with low-growing branches as well as shrubs on human perception and preference in large urban spaces. Such a narrow choice of a landscape elements is done in order to examine a hypothesis that trees with low-growing branches and shrubs are perceived as a legibility – a type of refuge that is an essential element of survival in a setting according to environmental psychology. Semi-structured interviews in walk-along modus are used to talk to inhabitants about the ways they see and like yards and streets in four residential areas: 'Agenskalna priedes', 'Kengarags', 'Zolitude', 'Lenina iela'. Discursive as well as nonverbal (gestures) analysis of interviews is done. The extracted information is compared amongst two groups of spaces: open-undefined category of space and enclosed category of space. The results show that trees with low-growing branches and shrubs are of a positive impact on preference and perception of size in open-undefined spaces. Whereas the impact on preference of such trees in enclosed spaces is negative or neutral. It can be concluded that trees with low-growing branches and shrubs play a positive role as a legibility element in a space that appears for a human eye too open and undefined since these elements propose safety via better readability of a space. Contrary, trees with low-growing branches in the space that is too narrow and enclosed still possess the role of a legibility element, yet, the importance of this elements is significantly smaller in such a space since it is a setting with very well defined borders and thus overseeable.

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INFLUENCE OF CYCLING INFRASTRUCTURE ON THE TRANSFORMATIONS OF PUBLIC SPACE IN CITIES AND AGGLOMERATIONS

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ABSTRACT

The aim of the article is a presentation of influence of cycling infrastructure on the diversity of transformations in public spaces in cities and agglomerations. Transformation of street sections make changes in the organization of traffic and the transport service system of the area. As a rule, cycling and heavy vehicles are separated. In some situations is necessary to transfer some of the traffic or parking of the cars to the neighboring streets. Introduction of cycling infrastructure in the street section at intersections and interchanges causes transformation in the division of the street public area, implementation of linear or point development and often the necessity of implementation of traffic lights. The cycling infrastructure in the traffic calming zones make changes in the division of the street public space and the implementation of physical impediments to reduce speed of traffic - these restrictions should not apply to bicycle traffic. In sections streets between the junctions, the implementation of cycling infrastructure into a street section causes changes in the division of the street area, taking into account the priorities and horizontal and vertical segregation of bicycle traffic from other road users and the functional and elevation shape of the terrain between the boundary lines and the carriageway. The multitude of spatial and functional limitations as well as economic limitations in connection with the habits of users prevent in the urban practice application of model bicycle segregation solutions from other users of the transportation space. This makes necessary to consistently use different models of bicycle positioning in the street transportation space, taking into account the adaptability of the bicycle infrastructure types in individual urban areas. In the new cities and newly built areas limitations are considerably less conditions for the implementation of bikeway systems than in old cities, especially in their historical fragments, due to the smaller constraints on the transformation of spatial structures and the transportation space of the streets of these cities. Roads and bicycles parking may be one of the elements of the interior design of streets and squares and the aspect of their urban and architectural shaping should be given special attention. Impacts of cycling infrastructure into transformation of public spaces will be present on selected examples from Polish towns and agglomerations (Warsaw, Lodz, Lublin, Kutno and Pulawy).

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THE ROLE OF GREEN AREAS IN THE DEVELOPMENT OF THE PUBLIC SPACE SYSTEM IN SMALL TOWNS ON THE BASIS OF CHEŁMŻA

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ABSTRACT

A small town undergoes constant civilizational and spatial transformations. They also apply to public spaces, which are urban markets, streets, promenades, parks and green squares. They perform many functions, they are a place of meetings, trade, a cultural center, a representative space that gives identity to the whole town. These areas constitute the system of public spaces of a small town, the structure of which is shaped, among others, by properly composed urban green areas. The article presents the results of the research undertaken in the field of analysis of forms and functions of green areas, which significantly affect the increase of symbolic, esthetic values, and thus the quality of life in the city. The main goal is to determine the role of green areas in the process of shaping the public urban space system of a small settlement unit. The spatial scope of the analysis concerns Chełmża, a small town located in the eastern part of the kuyavian-pomeranian voivodeship in Poland. Thanks to the revitalization activities undertaken, it is characterized by an identifiable urban structure with clearly visible public spaces. An important role in defining individual zones is played by consciously composed urban green areas, as well as the location of the individual in a landscape with diverse conditions of the natural environment. The introduction of green areas as a component of the composition, the use of natural conditions, changes in the communication system, displaying elements of the city's architecture, has created spaces that connect and identify the structure of the entire town. Public spaces along with green areas in Chełmża form an interior layout and urban openings offering many interesting esthetic experiences to the residents of the town. This system combines and crystallizes the city structure and gives the characteristics of the individual identity of Chełmża.

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THE ROLE OF PUBLIC GARDENS IN INFLUINCING THE SOCIAL DIMENTION WITHIN RESIDENTIAL NEIGHBORHOODS: CASE STUDY- PUBLIC GARDENS WITHIN RESIDENTIAL NEIGHBORHOOD OF ABU NSEIR AREA (AMMAN)

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ABSTRACT

Public gardens form an essential urban planning element of the city and at the residential areas in particular. They play an important role of the city fabric; economically, environmentally, socially and aesthetically. In addition, they upgrade the value of the social fabric within residential neighbourhoods. With the passage of time, life of Amman becomes with less communication and interaction among people. Therefore, sense of security and belonging across the neighborhoods started to disappear. With the form availability of public gardens, a space for the relations' development is created. In reality, public gardens within domestically residential neighborhoods lack the methodology to deal with them according to a method based on contemporary of urban trends in planning and design of public open spaces to provide the basic human needs and psychological through the variety of activities; recreational, cultural, social and economic. On the other hand, un clarity of this methodology left a deserted place that causes problems at the environmental and social level affecting the quality of living environment within residential neighbourhoods. Statement of this research discusses the lack of comprehensive knowledge on determinants of planning and design of public gardens based on social determinants to achieve the targeted level of social interaction, through the variety of determinants that will be selected and studied as factors affecting the social behavior and relations among inhabitants. The public gardens in Abu Nseir area- Amman is the area of the research. This research is based on a theoretical- framework, in contemporary urban trends and sustainable. These trends achieved an active and effective urban success on the design and planning of open urban spaces affecting the social dimension. Based on the design and planning dimensions on the social level, a model has been constructed to measure the effectiveness of public gardens as sustainable healthy urban areas. Finally, number of gardens will be selected and analyzed in the study area to evaluate their recreational and social role within the selected residential neighborhood. The Evaluation criteria will be based on the vocabulary and elements of the model prepared and proposed for this research.

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THE CHANGING USE OF GAS STATION AS PUBLIC SPACE IN MALAYSIA

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ABSTRACT

This research is derived from the daily observations on the rapid growth and the changeable function of gas stations development and usages that has been happening nationwide, throughout Malaysia. The cases being studied in particular are on several major gas stations within Iskandar Malaysia region, in the city of Johor Bahru, within the state of Johor, Malaysia. The research argues that the impact from the high demands and high uses of gas pumps has manifested the high potential of such a facility to becoming a public space successfully functioning for a community. Therefore, the research aims to suggest that a gas station fits to be categorized and could be included as a public space, that is significant to the development of cities. Its presence and role should be enhanced and be developed to add value to the quality of public spaces in cities. Evidently, the stations are easily accessible by the public all day, and at any time within the weekday or in the weekend. Additionally, public life also relatively has the relation with public space because it involves the co-encounter between people and spaces they used. Basically, all the gas stations have been governed by different parties or private owners following somewhat similar design templates and the modules. Those stations have been in the community since the breakthrough of petroleum and its vast petrol production. But yet, the gas stations have not yet been categorised fully as public space though largely, they have been used as a place to hang out, whilst make use of the facilities for other reasons thoroughly by the road users. Hence, the physical aspects of gas station have put forward a new approach for its architectural intervention, apart from it being only known as a facility that has been combined with other functions such as car service centre, automated car washing machines, convenience store, ATM machines locations and fast-food restaurants that is primarily serve as generator for higher profits for the owners. The perceptions of petrol stations have always been related to high commercial uses, ‘free drinks’ ‘fast-foods’. ‘dirty toilets’; and also the insecurity feelings of people who are using them. Moreover, the cases like pickpockets, explosion, robbery often been in headlines in major newspapers and news. These continuous incidents have put off the users from having confident of their safety whilst using the facility. In countering that, the research seeks to address the attributions of gas stations as a quality public space, by seeking a new module and framework of a user-friendly gas stations, a new social place for the community in the modern city living.

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SUBURBS AS THE „FORTH PLACES"

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ABSTRACT

Main focus on public open space planning is creating places that allow to establish and develop social relations. It is compliant with sociologists' and urbanists' ideas about social integration and social cohesion. It depends on the existence of the so-called „third places", which are dedicated to activities between place of work and home (place we live) where people commit, rest with friends and are watched by other people. Research made earlier (D.Mantey & A.Kepkowicz, 2016) shows other important places called "fourth places" dedicated to suburban residents and frequently used by them. Such places are often chosen due to the possibility to isolate from the others and to concentrate on family life. It means that suburbs become so called "fourth places" – places for peace and rest within small society, often in solitude. The main purpose of the research is identification of preferred activities and rest places of suburbanites. We also focused on places with connection to interpersonal links and relations by suburban inhabitants. Along the research three major activities has been distinguished: strolling in the neighborhood (alone, with kids, with pets etc.); meeting with friends at home or in the garden; jogging and cycling in the near woods, meadows or fields. It was proved that the moist preferred contacts were family relations, relations within nearest neighbors and relations with so-called "club" members. Results of the research prove that the planning of suburban public open space must take into account wide range of those special social preferences.

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SELECTED ASPECTS OF REVITALIZATION IN THE LAND DEVELOPMENT OF THE CITY MOAT IN JEZIORANY

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ABSTRACT

Old towns in spatial structures of historic towns are the areas which – same as centuries before – serve as the town centres. This is almost invariably true about small towns especially, as the inner town district is more frequently the site where a town was originally located and is often the manifestation of its historic identity. However, functional and spatial problems of many small historic towns arise from the above trend, mostly because of the frequently high density of buildings in the oldest part of a town. The intricate nature of elements creating the structure of a town's historic centre often calls for certain steps to be taken, which will ensure better exposure of an old town complex against the backdrop of the town's other areas. Numerous problems need to be solved, not only spatial but also economic and social ones. A town is a living organism, inhabited by people. The key to tackling these issues successfully lies in the creation of such revitalisation programmes that will improve the quality of space and help achieve the sustainable development of inner-town areas in historic towns. The historic centre in Jeziorany – the medieval town in Warmia – region rich in history and situated in north-eastern Poland, can serve as an example and has been investigated in the following study. The paper presents some aspects of the project management of degraded land of green areas in the centre space of a small town Jeziorany in Warmia. This area, located in the Protected Landscape Area of the Valley Symsarna, until recently, was a complex of disordered green area, surrounding the downtown of the city. Entered in the downtown revitalization program of the city Jeziorany, it became the first completed element of the creation a new quality space in the city center. Development of this area strengthens the character of downtown, promotes exhibition of the Old Town, positively creates a public urban space and also has a social dimension - improving the quality of life of the local community. Revitalisation of the town's moat in Jeziorany is a positive example of spatial solutions in the centre of a small, historic town. It is also evidence that the development and execution of programmes to repair the urban structure has a beneficial effect on town centres and their economic and social growth. Similar measures have a strong impact on creating 'an atmosphere' of a site (genius loci) in the urban landscape, which in turn strengthens considerably the sense of bonds within the local community.

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TRANSFORMATION OF URBAN OPEN SPACES: KAGITHANE HASBAHÇE AND SADABAT KORUSU CASES (ISTANBUL, TURKEY)

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ABSTRACT

When we look at descriptions of the city, almost all of them depict it in terms of a growing organism that develops over time. In this process, the dynamics of aging are similar for every city, but the effects are not the same. Growth can be considered to be in the positive direction for some cities, while it can be in the negative direction for others. We can list many reasons for this divergent dynamic, for example; geographical conditions, cultural conditions, economic conditions etc. However, when we look in general terms; cities that have entered the fast-growing economy in the framework of industrial and technological developments, are the cities that have succeeded in surviving this growth with the slightest harm are the ones with strong urban identity. In other words, cities with a strong sense of belonging and a sense of authenticity are one step ahead of the others. One of the most important factors in the formation of the urban identity is the public open spaces that allow communication with each other to support the coexistence of the citizens and create a space for creating a social memory. Public open spaces and urban parks are important areas of the city that allow the inhabitants to come together and meet as well as social and physical facilities at the same time. Especially in the cities that are rapidly growing after the industrial revolution, the decrease in public open spaces and urban parks has caused significant problems for the city and urban populace. This is the issue of many open urban transformation projects. The aim of this study is to examine the changes that Hasbahçe and Sadabat Korus in the Kagithane region have undergone, as part of the historical transformation of one of Istanbul's most important public open spaces. In this context, the changes and re-enactment initiatives that have taken place on the historical development and prosperity of the region have been examined based on the projects of local governments. Taking into consideration the feasibility of these projects and the achievement of their goals, information was gathered from the written sources about the region and the local government that the region was affiliated with, and the place and the transformation of this information in Istanbul under the light of urban identity were discussed.

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EARTHEN FORMS IN THE LANDSCAPE OF CITIES AS STRUCTURES OF SYMBOLIC VALUE

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ABSTRACT

The intentional arrangement of earthen forms in the landscape is a measure that has been used since ancient times. Their significance changed over the centuries, similarly to the scale of the structures that were being built. All manners of escarpments, mounds and embankments functioned as integral elements of a visual, religious, sepulchral and commemorative significance within the landscape, in addition to constituting the basis of the compositions of garden and park layouts. In prehistory there appeared a tradition of the forming of artificial hills, examples of which were the most numerous in areas of Ukraine, Kazakhstan, Scandinavia and central Europe (including, among other areas, Poland). During later periods, along with the disappearance of pagan cultures, the tendency had disappeared as well until the late Middle Ages, when earthen embankments were used, among other things, as tombs or in order to delineate the borders of landed estates. During the Renaissance and the Baroque, the building of so-called parnassi (from the name Parnassus), which were garden mounds, atop which pavilions were situated, gained in popularity. In modern times, in turn, mounds and other artificial embankments were erected mainly as monuments commemorating national heroes and important evens (e.g. the Kościuszko and Piłsudski mounds in Krakow). Since the second half of the twentieth century landscape architects have often employed these types of spatial elements. This fascination with the use of earthworks - both for practical (e.g. waste treatment, reducing noise and air pollution), as well as artistic reasons - provides excellent effects in the spaces of cities. It aids in the individualisation of the landscape and of individual places, in building their identity and distinctness. Despite the fact that the reasons for using earthen forms in the landscape have been changing since ancient times all the way to the present, in many cases it is the symbolic value constitutes the overarching creative idea. This phenomenon has been presented in the article. Selected case studies, primarily from Europe and the United States of America, were analysed. The use of these forms throughout history has been presented - ranging from prehistoric geoglyphs or tombs, mounds used as monuments, e.g. those in Krakow, to contemporary layouts, e.g. the Vietnam Veterans Memorial by Maya Lin, the Jacobs Javitz Plaza by Marthe Schwartz or the built projects by Charles Jencks. The mutual correlations between structures built during different historical periods - for instance common archetypes or the idea of visual and spatial connections - is also an interesting problem. Elevating the landscape to the rank of a symbol causes space to gain an intangible value and provides visitors with new experiences. The placement of these types of structures within the contemporary landscape appears to be a beneficial measure making it possible to create not only a harmonious or beautiful space, but also one that has meaning.

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NEW INTERPRETATION OF PUBLIC VISUAL ART IN URBAN SPACE

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ABSTRACT

Public space is essential for the full-value existence of a human being in the city. We are aware of its quality and the various tasks it is supposed to provide. Besides the basic needs that we inevitably perform in, it also has additional added values which it offers. One of the main tasks is to provide the opportunities for movement and the space for meetings and social interaction. The presence of works of art and elements enriches the public space and so it offers to perceiver a new enjoyment. Especially these works of art and the place where they are located may be in the environment the place of meetings, rest, and social interaction. The work deals with a new presentation of works of art in an urban environment. The subject of the research is the rehabilitation of works of art from the second half of the 20th century and the verification of possibilities of interpretation through the new technologies such as widespread and virtual reality. The research analyses the basic issues of works that have lost their natural function, their impact on public, and methods of their new use. The component part of the research is the design of a new interpretation of a chosen artwork.

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KAMIEŃ POMORSKI – HEALTH RESORT ON THE WATERFRONT – TRANSFORMATIONS OF THE PUBLIC SPACE OF THE TOWN AFTER 1945'

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ABSTRACT

Diversity of urban structures in Europe has its sources in cultural distinctness of different regions, in different pace of their development over millennia. Methods of designing towns in subsequent urbanisation periods differed. Nevertheless, frequently older structures were adapted to new needs. The question concerning the ideal of the European city remains open - is impossible to define one dominating spatial model encountered everywhere, despite attempts of ancient powers (Imperium Romanum), and by 20th-century totalitarian systems. The latter largely contributed to interruption of continuity of cities' historical development, especially in Central and Eastern Europe. Warfare and scale of destruction of the spatial/social structure in many cities in 1939-1945 were unprecedented in the European history. Examples of metropolises practically wiped off from the face of the earth, like Warsaw or Dresden, are common knowledge. This fate was shared by many other towns, especially in the Polish-German borderland. Their reconstruction after the war caused complete transformation of their urban/social structure. The study focuses on Kamień Pomorski, situated on a headland at Kamieński Lake, separated from the Baltic Sea by Wolin island. Before the war it was one of the nicest port towns in Pomerania, with history reaching back to the early Polish state and the clash of Slavic, Scandinavian, and German influences. The town, an episcopal see, bloomed in the medieval and modern times under the Pomeranian, Brandenburgian, and German rule. At the end of the WWII the centre was ruined over several days. Some religious and secular buildings survived. Traditional economic foundations of the local population, moulded for centuries, and the corresponding port structure, were nearly completely destroyed. Almost complete replacement of the local community, not fully grasping the local spatial, natural and landscape conditions, was connected with introduction of centrally planned socialist economy. The town changed its character, despite maintaining and developing some of its previous functions (e.g. health resort). Kamień Pomorski was reconstructed in forms not corresponding to traditional ones (prefabricated blocks of flats), although respecting previous transport/urban layout, which is an advantage. There were attempts to restore the most important preserved monuments –cathedral, town hall, several sections of city walls. In time these efforts brought the expected effect. In recent years several investments were implemented, referring to historical spatial layouts, following the rules of retroversion and revealing some relics. The port function was restored – predominantly as a recreational yacht and water sports marina, popular in high season. Some waterfront boulevards were renovated. Promenades are being built, the spa park is to be revitalised. To conclude, it should be stated that improvement of public spaces is observable in Kamień Pomorski, just like in its green areas and waterfront edge. This phenomenon combined with modernisation of prefabricated buildings contributes to enhanced coherence of urban composition of the entire layout. Renovations of pre-war tenements and villas and growing abundance of services activating the public domain cannot be disregarded. It seems that despite enormous war destructions, which changed the appearance of the town forever, after many decades Kamień Pomorski has become vivid again.

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QUALITY OF SOCIAL SPACE IN SELECTED CONTEMPORARY MULTIFAMILY HOUSING COMPLEXES IN POLAND'S THREE BIGGEST CITIES

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ABSTRACT

The investment boom in multi-family residential buildings observable in Polish metropolises at the turn of the 20th century seems to have slowed down. Due to the growing difficulty in obtaining and repaying mortgages, potential customers have become more demanding. Users' needs come first once again, including the need to dwell in beautiful surroundings. Developers implementing projects of multi-family housing estates in different scales more and more often pay attention not only to the floor area, but also to the aesthetics of new buildings. Many housing estates put into use in Poland in recent years are as good in this respect as their contemporary western counterparts. Quality of workmanship and finishing standards of buildings and their immediate surroundings increase, too. This study covers examples of new housing investments, regarded as prestigious, from Poland's three biggest cities (Warsaw, Cracow, Lodz), implemented in 10 recent years. The goal was to verify by means of a comparative analysis whether their architectural quality has changed compared to previous years. Does it mean that beautiful residential architecture comes into being? Is it a common phenomenon? Is life comfortable in beautiful, prestigious housing estates? Do they form real, efficient habitats, or only bedroom communities, or are they another type of investment? What are the relations of contemporary multi-family estates with the urban tissue in light of the growing spatial chaos in Poland's biggest cities? According to the study results, in recent years Poland saw more and more multi-family housing estates, attractive in their contemporary form, furnished with well-tended and carefully arranged social – predominantly green – spaces. Alas, due to a limited number of services they are usually closed enclaves, often fenced. Frequently they lack sufficient services necessary for proper functioning of the housing environment: trade, education (nursery and primary schools), healthcare, basing on the existing overloaded city infrastructure. Therefore, their contribution to building of sustainable spatial structures is limited, not to mention such obvious drawbacks as lack of continuity of the public domain in the form of public greenery systems, pedestrian routes, or squares. Responsibility for this situation goes not only to designers and investors of such complexes, but mostly to local authorities, whose goal should be to maintain spatial order in cities. Lack of coordination of individual projects with the surrounding urban tissue is visible, which is characteristic for the planning crisis we deal with in big cities after 2003. To conclude, it should be stated that there is an improvement in the quality of architectural forms of buildings and social spaces in multi-family housing estates, advertised as most prestigious, in Poland' biggest cities. These are still, however, single islands on the sea of mediocre dense residential architecture. Growing transport-related problems result from scarcity of appropriate road infrastructure and limited municipal investments in public transport and education / sports services, which do not balance the increase of developers' residential investments. One of the basic causes of this situation is the aforementioned crisis of spatial planning, observable in the three cities included in the study.

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THE INTERSTATE 49 CONNECTOR: URBAN AND SUSTAINABLE DESIGN

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ABSTRACT

The Interstate 49 Connector Project (I-49 Connector) is a major highway development plan needed for continuous access between an interstate route and a Federal-Aid highway system. The project is part of a proposed North American Free Trade (NAFTA) highway that will connect Winnipeg, Manitoba, Canada to New Orleans, Louisiana, United States. At present, Interstate 49 transitions into a four-lane highway with little control access. Connecting Interstate 10 and Highway 90 into a continuous arterial will link two economically beneficial interstate routes, and provide citizens of southern Louisiana with a safe and effective emergency evacuation route. In 2014, the University of Louisiana at Lafayette Community Design Workshop (CDW) was contracted to work with the Louisiana Department of Transportation and Development (LaDOTD)/Lafayette Connector Partners (LCP) Team to address the proposed I-49 Connector Project in Lafayette, Louisiana. The CDW University Planning Team acts as a think tank to the consultant planning firms. The CDW's duties are to provide support to the consultants at community working group meetings, public meetings and to use the studio for uncovering and exploring issues of Urban Design and Sustainable Design. During the past four years, the CDW has run eight graduate studios to study two primary areas. These studies were designated as the Northern Entry Gateway into the city and the Core Area around the downtown and traditional neighborhoods. Each area, taken from an urban, contextual perspective and environmental perspective, has its own unique character and physical makeup. Each area also contains challenging brown field sites that must be mitigated into the Environmental Impact Statement. The CDW graduate studio's design development can be attributed to three criteria: the external influences of multiple public processes, professional and government agencies' input, and the impact of regional, historical flooding. Community working groups, technical groups and public meetings continue to influence the corridor, its elevation and the exits through the city. One main purpose for I-49 is for it to become a hurricane evacuation route. In 2016, an historic flooding event resulting from a tropical storm that dropped over 30 inches of rain within a 24-hour timeframe fundamentally required directional changes to the original design. Additional design input came from professional agencies including the consultants, the Louisiana Department of Transportation and Development, and the Lafayette City Planning Organization. Public participation, public input and natural constraints all impacted the urban design, landscape design, and neighborhood revitalization projects of the CDW graduate studio.

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LIVING SPACE IN A CITY - SELECTED PROBLEMS OF SHAPING MODERN HOUSING COMPLEXES IN KRAKOW - A MULTIPLE CASE STUDY: PART 1 – URBAN VILLAS

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ABSTRACT

In the publication, the author - in the context of the global increase in population numbers - synthetically characterises the situation of the population of Poland and the development of Polish cities, as well as that of apparent - or, as others would have it - relative deurbanisation. Krakow - the second Polish city in terms of size, a metropolis that, along with its peripheral areas, including those residents of nearby communities who gravitate towards the city, and who have recently moved in here - is a metropolis that has an over a million inhabitants. The city, burdened with the "disease of deurbanisation", is a fitting field for the observation of phenomena that cause this process. The quality of the housing environment being offered in new complexes of multi-family buildings that are being built within the administrative limits of the city, especially including those in large, so-called "developer" complexes, as well as apartment prices, can affect the problem of urban sprawl in the city to a significant degree. The goal of the research that was performed was to analyse the offer of shaping the housing environment that has been expanding in recent years, and which constitutes an attractive alternative to living outside of the city's limits. Low density multi-family residential buildings that are being built in the administrative borders of cities - not only within their peripheral areas, but also on sites closer to the downtown area - so-called Urban Villas - are a form of the built environment that makes it possible to obtain housing environment qualities that are close to ideal - *living in a house with a small garden* - and can, thanks to moderate apartment prices and good transport accessibility, influence decisions regarding the selection of a place of residence. The complexes of Urban Villas in Krakow that were selected for analysis as a part of the multiple case study confirm this thesis - the apartments being offered as a part of them are relatively quickly finding buyers who search for good living conditions - such as peace, quiet, security, good contact with nature, comfortable circulation solutions - both in terms of public and individual transport, in addition to good relations with the necessary services. The results of the author's research and observations make it possible to state that this "new offering" in terms of housing is becoming a product that is sought by residents who wish to preserve good relations with the city.

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LIVING SPACE IN A CITY - SELECTED PROBLEMS OF SHAPING MODERN HOUSING COMPLEXES IN KRAKOW - A MULTIPLE CASE STUDY: PART 2 – HIGH DENSITY FORMS OF MULTI-FAMILY RESIDENTIAL BUILDINGS

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ABSTRACT

Publication synthetically characterises the situation of the population of Poland in the global context and the development of Polish cities, as well as ‘relative deurbanisation’. Cracow - the second Polish city along with its peripheral areas is a metropolis that has a over a million inhabitants. The city, burdened with the "disease of deurbanisation", is a fitting field for the observation of phenomena that cause this process. The quality of the housing environment being offered in new large complexes of multi-family buildings that are being built within the administrative limits of Cracow, together with apartment prices, can affect the problem of urban sprawl to a significant degree. The goal of the research is the analysis of the characteristic phenomenon of the appearance of high density multi-family residential complexes in many Polish cities. Despite modern architectural forms and a higher standard regarding finishes they create a substandard housing environment. The excessive building density, and thus an excessive population density often causes the lack of the necessary functions and facilities, which should accompany residential buildings in order to provide residents with the necessary comfort and the expected quality of the housing environment. The ruthless exploitation of solutions that are allowed by current legal provisions in terms of the minimal distances between buildings or the insolation time for apartments - which are solely the result of an improper understanding of the profitability of a project - because these built residential complexes to lack the necessary common semi-public or public green spaces. In many complexes there are also no basic services - such as day care facilities, kindergartens or schools. There is also no appropriate programme of commercial services. The excessive number of the residents of these complexes, combined with insufficient access to mass public transportation, leads to a greatly increased vehicular traffic load on the road network, which is unprepared for such flows of cars. Small and medium-sized apartments dominate the apartment structure of these complexes. The magnet that attracts these residents to complexes located in the vicinity of the city centre or within downtown areas is the attractiveness of these areas of the city. Locations that are farther away - more peripheral in nature - attract residents with lower apartment prices or a close proximity to places of employment. However, it should be remembered that the young demographic structure of these complexes, combined with the known problems with paying back loans and the possibility of freely changing one's place of residence will deepen the insufficiencies regarding the lack of necessary services and recreational spaces outlined above, permanently deepening the substandard of areas that have been blocked by this type of buildings for many years. The results of the author's research and observations make it possible to state that this - in many ways - substandard housing "offering" becomes a product that endangers the integrity of the urban space, as well as its functional, spatial and social cohesion.

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ŁÓDŹ - METAMORPHFOSES OF THE RIVER NETWORK

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ABSTRACT

Political transformations which affected Central and Eastern Europe at the end of the 20th century opened up new transformation opportunities before its towns and cities. Poland, burdened with its geopolitical baggage, tries to keep up with contemporary trends in urban planning, which are the domain not only of Western European countries, but which are dictated by the need to secure the quality of living in towns and cities of the entire developing world. Transformations in riverside towns and cities, strongly connected with the development of the environmental policy, are particularly interesting. The growing significance attached to the co-existence of a natural ecosystem and an urban structure becomes one of the crucial factors deciding about the quality of life in the city, and consequently about its competitiveness. Amongst complex and broad topics concerning riverside areas in cities, the topic that becomes one of the most important ones is the recovery of lost watercourses. An analysis of relevant examples all over the world clearly points to a high level of impact of projects connected with the reconstruction or renaturalisation of urban sections of rivers. The paper is divided into two analytical parts. The first one presents the topic of recovering watercourses in the perspective of contemporary urban planning solutions and an attempt to identify crucial elements that influence the attractivity of the city. The second part focuses on an analysis of the development, decline, and reconstruction of rivers in Łódź. This analysis is to lead to an attempt to define a new image of Łódź as an eco-city, based on its reconstructed river system.

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MYTHS AND REALITIES OF ADAPTABLE CITY: CONTEMPORARY CITY AS ADAPTABLE HYBRID

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ABSTRACT

Global space – both natural and cultural – is the greatest good belonging to the human community. The said community has therefore the right and responsibility to protect it wisely and in solidarity from wasteful exploitation. The postulate of public utility of this good must also presume such mutual conditioning of the rights and obligations of private owners that would minimize the chance of their infringement of collective interests. The culture of space management became an important measure of cultural level of societies at the turn of the 20th and 21st centuries, perhaps one of those moments which decide upon the future of our civilization. The conclusion that large agglomerations in particular are 'incorrigible zones of spatial and social pathology, from which we need to escape into pristine areas and there create a more perfect living environment' is unacceptable, also from the ethical point of view, both as regards the people living in those agglomerations and to nature. As far as what has been created by man is concerned, we need to assume that we are able to control and improve this material creation of our civilization. Such is the fundamental requirement of sustainable development – a difficult, but probably the only way of managing 'the global village' in the millennium that has just commenced. The spatial structure of the contemporary city as a whole is a 'broken form': it has formally expressive and perfectly composed elements, it has mutilated compositions, chaotic arrangements and 'lost spaces', finally, it has spaces that as yet have not been properly used compositionally and are still waiting for their 'role' in the whole. A broken form – in compliance with the principle of irreversibility – may not return to its original composition. Thinking about the future of the city and taking into account the irrefutable fact that a considerable part of the built environment of tomorrow already exists today, we should ask ourselves the question: can it adopt, as a whole, a composition of a different kind? If the urbanized environment, being the basic one, is also to become a full-value environment for human existence, it will require continuous and universal improvement of its quality as well as new strategies, methods and scenarios for rational organization of urbanized space that will be able to meet new challenges. It seems that 'dramaturgically consistent logic of composition' may become an original formula of urban public space. Scenarios built on the basis of the city "genotype", in which urban "layers of memory" are the basis for adaptive transformations.

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THE LOSS OF POTENTIAL: LARGE PANEL HOUSING ESTATES - CZYŻYNY CASE

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ABSTRACT

Large-panel housing estates are an inseparable element of the city structure, constituting approx. 35% of all housing resources in Poland. In the same time, they are recognised as crisis areas more and more frequently. Their functioning is burdened with a number of 'genetic' defects like mono-functionality, monotony of development, undefined spaces, the lack of integration of the housing estates with the remaining part of the city etc. However, it is undeniable that they also have their own assets, where the resource of open space and green areas seems to be the greatest potential. Many of the housing estates also exhibit unique spatial values, such as vicinity of watercourses, greenery, or areas with historic and cultural values. Finding the potential and extracting its characteristic features, spatial values etc. are measures which offer the chance for the creation of a unique housing environment. In the process of revitalization this potential could become a key element for improving this kind of structures, as well as creating complementarity and continuity of public spaces. The problem is that nowadays in many cases this potential is gradually annihilated, which is mostly connected with an ongoing change, which are dominated by chaotic densification of spaces with new buildings, modifying the initial arrangements of the large-panel housing estates, and generating subsequent spatial, functional and social issues. In such situation, while talking about revitalization process, it is necessary to mention, that not only using potential is needed but protecting it is crucial or retrieving if still possible. Against such a background of the outlined issues, this paper presents a case of two Cracow-based large-panel housing estates, located on both sides of the former runway of the airport in Czyżyny. This is an example of estates with a huge potential, where one can observe a dramatic process of destroying it. Some chances seem to be irreversibly lost, some seem to still exist. In such a context a question about the future of these housing estates arises.

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QUALITATIVE METHOD FOR POINTS APPLIED TO DETERMINE THE LOCALIZATION OF HOUSING OF SOCIAL INTEREST: CASE OF ESTUDIO CUENCA, ECUADOR

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ABSTRACT

Currently in Latin America the qualitative and quantitative deficit of low-income housing is high, due to multiple factors, social, political, economic, among them is the lack of urban land suitable for housing projects of this nature, then, the high costs of urban land, lack of provision of basic services, low density regulations in large areas, among other variables make it impossible to obtain adequate land, which makes it impossible to provide decent housing for the lower income class. Considering that in urban planning the option to sectorize and define the use of residential land, responds to the analysis of variables and territorial constants that enable decision making in benefit and safety of a population served, it must be choosed the appropriate tools and methodology for guarantee an urban planning according to the reality and needs of each territory. There are many methods to analyze the relationship between the variables and constants, however, not all of them allow us to correctly define the right place to locate a housing project of social interest, therefore, through this research we intend to provide technical and methodological recommendations to determine the convenient location, considering as a case study the city of Cuenca, Ecuador. The qualitative method by points is applied in the case study, considering the variables; cost of land, proximity to the city center, availability of basic services, provision of equipment, road conditions, local restrictions and environmental factors, managing to reduce from the universe of 21 rural parishes to six potential sectors and then to a specific sector suitable for receiving and strengthen social housing due to its social and economic affordability. The method of analysis used, although it is simple and fast in its application, is effective for its objectivity and analytical system of variables, which allows to cross information from basic level to systematic information or meta-analysis, which guarantees the reliability of the expected results. Through the proposed methodological analysis is provided with basic urban planning strategies for the benefit of the neediest sectors which makes it possible to cover the qualitative and quantitative deficit of low-income housing in the city of Cuenca.

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A SMART RURAL PROJECT FOR TOURISM (MADEIRA ISLAND)

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ABSTRACT

Everywhere, there are cities, regions and countries which are struggling in order to reach a good position in terms of attractiveness, whether to catch more inhabitants or to get more visitants. All-over the world, cities like Bangkok in Thailand, Dubai in the United Arab Emirates or London in the United Kingdom, are witnessing, every year, a process of massive tourism. Many of these touristic places are very well-known as smart cities, because of their people, infrastructures, economy, governance, mobility, environment or simply their smart life-style. The rankings focused on the territories' performances are on the top of the agenda at the global scale. On the opposite side of the popularity coin, there are the small places, settled in rural areas, which are struggling to keep the few inhabitants who still remain there, and to attract visitors, as a way of boosting their social and economic dynamics. In this sense, this article is focused on the study of rural areas and tourism, to understand how small local communities in rural areas can use the smart cities knowledge and through tourism promote the economical local development. It will present a project solution for tourism purposes having as case study the tiny rural settlement of *Fajã de Baixo*, near to the Calheta in Madeira island, Portugal. The result shows that small rural settlements have an opportunity in touristic terms, using requirements of smart mobility and environmental solutions, promoting local identity, which is their main tourist attractiveness.

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PUBLIC ART ADVANCING URBAN CONTEXT TRANSFORMATIONS: *KREUZBERG* (BERLIN)

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ABSTRACT

The proposed article focuses on an analysis of Berlin as a model for urban intervention, with proposals, both for the urban rehabilitation and for new works. The central district of *Kreuzberg*, will be studied taking into account that it is nowadays a place of artistic and bohemian focus, considered an integral part of the one of the main enclaves of power and culture in Europe. Local characterization will be carried out from the point of view of urban development and sociocultural transformation, as well as the artistic manifestations that are evident in public space, such as graffiti, which modify a surrounding urban space, either permanently or temporarily. Finally, in a logic of zooming on the city, a proposal will be presented for an urban void in a block at *Kreuzberg* east neighbourhood, which is associated with several manifestations against the gentrification processes therein. Throughout this study, it should be noted that it is still currently a challenge to define measures for the benefit of its inhabitants, leading the city in a direction that is advantageous and enriching for all, not yielding to economic interests of speculation. Therefore, an urban revitalization can and must motivate creative interventions in relation to public art, making way for the new urban planning models in city centres, pointing to more free and connected alternative lifestyles.

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THE CONDITION OF THE LANDSCAPE OF HOUSING ESTATES CONSTRUCTED IN THE SECOND HALF OF THE 20TH CENTURY: EXAMPLE OF THE GRUNWALD ESTATE IN SZCZECIN

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ABSTRACT

After the period of system transformation in Poland the spatial city planning at a national, regional and local level was only marginal, and a comprehensive program for the revitalization of housing estates built in the second half of the 20th century was and still is not even considered. The results of contemporary privatization may cause not just the decomposition of the initial design of the estate, but also influence the future structure of the urban agglomeration. The objective of the present paper is to conduct an analysis of spatial changes that occurred after 1989 in the structure of housing estates constructed in the second half of the 20th century, on the example of the Grunwald Estate in Szczecin. The analysis of the process of changes will allow us to formulate a diagnosis of the present state, and valorisation of the landscape of the investigated estate. The research conducted demonstrated that the main effect of the property divisions within housing estates after 1989 is the loss of the possibility of appropriate development of these areas into recreational, sports and leisure grounds. Current state of estate landscapes leads to counter urbanization of the urban space and contradicts the spatial policy of the city of Szczecin, as set in the its study for conditions and spatial development trends of the city. In the consequence of secondary property divisions, the residential areas no longer foster the shaping of individual character of the place, which doesn't encourage identification of the residents with their residence locations.

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LANDSCAPE PROJECTS AND ARRANGEMENTS AROUND AUGUSTUS TEMPLE AND HACIBAYRAM MOSQUE, ANKARA, TURKEY

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ABSTRACT

Haci Bayram Mosque and Augustus Temple surroundings is an important historical and archaeological site in UNESCO Tentative List, which is in the Modern Capital Ankara, Turkey. The aim of this article is to give the Landscape Designs and environmental arrangements of this important historic preservation area. And to draw attention to archaeological remains that still exist in human settlements as a part of modern life. The methodology used depends on a survey of the literature, personal observations documented during the last years and various studies. The Hacıbayram Preservation Development Plan (1984) is a region where the city has spent a great deal of effort and money to organize and repair the National History Center Contest (1986) and the Hacıbayram Square Regulation Project since the 1990s. In recent years, the Hacıbayram Mosque and its surroundings have almost been rebuilt. However, the practices have not only destroyed the Phrygian Tumulus, the 1st Degree Archaeological Site, but also damaged the Temple of Augustus and its environs. Hacıbayram Environment has been rehabilitated as a healthy and livable environment with the street regulations and infrastructure works done in the environment. The mosque square was enlarged and planted in the scope of the project, the area where the funeral prayer was performed was renewed and decorated with historical portico. While the Hacıbayram-Veli Mosque was being expanded and the women's treasures were made under the ground, the Phrygian Tumulus, the 1st Degree Archaeological Site, was destroyed.

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THE POTENTIAL OF RECYCLING URBAN TERRITORIES

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ABSTRACT

Urbanisation process is dynamic and should respond to the current needs of the society. Most of the urban fabrics of the mass housing estates in the former socialist countries, which have undergone major socio-economic changes, currently need a transformation of their spatial structure. As a result of demographic and urban changes, as well as the former non-complex strategic urban solutions, there are a number of empty spaces in the built-up structures – unused, under-utilized, less functional or dysfunctional. Research points to the potential of unused space for future urban development, with efforts to identify and find the appropriate use for these "dormant urban potentials", which could be utilized for social, economic and environmental benefits; however, it is necessary to examine and to understand the structure of the premises in detail and in the context of differentiated hierarchy and position within the city. The aim of the article is to point to the empty, abandoned spaces in the urban structure of Bratislava, in the Ružinov city district and indicate the potential of their transformation to the new functional uses, with an emphasis on the limits of the territory and environmental sustainability. The ambition of the investigated pilot urban studies is to find an innovative town-planning model and possibilities for regeneration of the empty spaces in the fragmented structure of the prefabricated mass housing estate. Urban design proposals for non-functioning premises, undefined and often circumvented territories, forgotten "crevices" in urban fabric, try to seek relevant answers on their transformation in the form of corresponding urban solutions, complementing the existing residential structure with new features, meeting the current needs of the citizens, adding infrastructure for the activities of the local community, promoting a system of green spaces, "free" pedestrian urban landscapes, open to new interpretations of the use of space. The possibilities of recycling the unused territories have been tested through proposals valorising urban structure in order to ensure optimal social and urban development, support the hierarchy and complexity of core areas, prevent the conversion of unused sites in the lucrative areas solely for the achievement of economic gains for investors and gentrification, promote the eco-friendly development with a focus on climate change and protection of ecosystems, and ensure the optimal economic land use. The lessons learned should contribute to the sustainability of the urban structure, the revitalization of abandoned and neglected areas, and support the hierarchical system of the main nodes of the model urban area. The transformation of unused territories, from the public through semi-public to private spaces, brings compactness and at the same time the diversity to the urban environment, strengthens the system of green infrastructure and the variety of social interactions, which contributes to an increase in the viability, and the attractiveness of the entire urban neighbourhood.

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ON THE TRACES OF THE DISAPPEARED CITY: THE STUDY OF THE MARKS AS A STRATEGIES FOR THE URBAN DESIGN

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ABSTRACT

The story of the coverage of the Rio Darro, the river along whose shores arose the city of Granada in the VII century b.C., has provided the opportunity to make a research in order to recognise and studying the marks left in the existing urban fabric by some very important pre-existing historical elements. The river, indeed, was the subject of a long work of cover throughout the centuries, which was started back in the XVI century with the arrival of the Catholics Kings in Granada, and concluded only in the 30's, and from which the study is started. The research was then extended to the analysis of the urban evolution of the city, which develops along the riverbed and turns as a direct result of its coverage, leaving in the two streets built on top of it the trace and the wound of this serious loss of its cultural and natural heritage. Alongside this mark, the research investigates other two systems whose traces are still visible in the urban fabric of the today city: the one of the ancient walls, mostly disappeared, at the point where they crossed the river, and the one of the bridges, now lost due of the cover of the river itself, in the correspondence of which we can now find streets that brings their names. The research wants to show how the study of this systems allows a clear interpretation of the current urban fabric, and at the same time provides the elements for a recovery project of the historic memory of the city, working with due regard to the contemporaries' public spaces. The philological study of traces and signs of historic derivation, and the strategic reuse of them, allow the coherent reconnection of the ancient public spaces arrived to the present day, while creating new ones, claiming how the recovery of the cultural heritage might be not just the purpose but the tool through which it is possible to project the modern city.

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MODELS FOR ARCHITECTURE OF CONTEMPORARY MEDIUM DENSITY MIXED USE BUILDINGS: CASE STUDIES FROM GLIWICE, POLAND

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ABSTRACT

Mixed use buildings are objects of more than one use. The structure of a typical mixed use building allows for access of at least two groups of users: both groups take advantage of presence of another. Advocates of the compact city policy argue that mixed use buildings are obligatory for reaching compactness. The demand for density in developing cities is growing since the prices of land are rising and there are nearly no vacant plots in the centres. Most of the low and medium density realisations do not use mix of uses since it complicates the building structure. Although there are no universal measures for low, medium and high density. Author believe that those can relate to the location and site characteristics. Asian ultra-high densities are generated by different conditions and local background and cannot be compared to European examples. Also, the terms low, medium and high density have different meanings and values in small, medium and big cities. This article presents 3 case studies of design for 3 mixed use buildings in the medium size city of Gliwice. All the 3 case studies illustrate local determinants set in the local development plans that limit the development by setting minimum and maximum values of urban indicators. Author conclude that sometimes planning regulations effect in very strict extreme values of urban factors that must be met by the new investment. But those are not the only answer sometimes. Planning not always can foresee and come across changing urban environment and society needs. Observation of one the realisations, which has been implemented show that hypothesis may be right.

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REVITALIZATION PROCESSES IN THE BALTIC PORT CITIES – COMMON ISSUES

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ABSTRACT

The research was commenced by characterizing the urbanisation processes of the port cities which tend to be specific. The explanation for that peculiarity might be investigated both in unique topography and the historical development of the port areas. Nowadays, with the advent of the third industrial era economy the infrastructural demands for marine industry have drastically changed. The consequences of those processes are revealed in the urban development of the port cities. The research was conducted in order to find the determinants of successful revitalization process of the port areas. There were Baltic port cities such as: Malmö, Stokholm, Helsinki, Tallin, Riga, and Polish Tricity of Gdynia, Sopot, Gdansk selected to carry out the wide comparison of the spatial development strategies. The main purpose of research was to discover the basic factors that allow turning the former industrial areas into a good quality, profitable and environmental friendly city district. There were different type of building and land use was taken into consideration - residential, office & commercial, as well as recreational areas. The spatial layout, the cohesion of the city structure, environmental efficiency together with social approval measured by the space liveability and vividness were taken into consideration as the main factors. The main conclusions were that despite the distinctiveness of each of the examined cities, the differences between the overall economic situation of the area and cultural diversity throughout the scope of chosen cases there were certain common issues observed. The major finding was that there is a high demand for residential districts in most of the compared areas that affects the development of the former port locations. The social awareness of the environmental issues causes the approval for sustainable solutions that are implemented into many diverse fields, such as building and environmental technologies, energy production and consumption strategies, public transportation, etc. This approach results in taking exceptional care of the recreational areas and protecting as well as introducing natural elements of composition such as greenery and water. On top of that, one of the most significant issues determining the successful redevelopment is preserving local identity in the process of urban renewal.

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OSLO REVITALIZATION AREAS AS AN EXAMPLE OF STRIVING FOR GOOD QUALITY OF URBAN ENVIRONMENT

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ABSTRACT

The revitalization of post-industrial spaces in Oslo has greatly changed the panorama of the city, highlighting the network of intermingling green areas creating the green infrastructure of the urban area. The natural barrier - the River Akerselva emphasized by factory buildings during the industrial revolution, became an example of the green axis of the city, a space designed for sports and recreation. The research objective was to use a case study method to describe and categorize the redeveloped areas of the city of Oslo in proximity of the Akerselva River in order to observe and understand the tendencies in urban redevelopment. Currently, the area along Akerselva is an example of careful and thoughtful care for the monuments of industrial culture that supports surrounding residential and commercial spaces located on both sides of the river. There are modern non-industrial functions introduced within the former warehouse complexes to satisfy contemporary demands of the inhabitants of the capitol city of Norway. Abandoned buildings obtained a life after life and today they are becoming the spots of creative ideas, centers of design and favorite places of meetings and recreation, which became evident due to the proximity of water, beautiful greenery and picturesque landscape. The result of the research is that the finding that the green axis introduced into the city structure complements the redeveloped areas of various use and by its accessibility, connectivity and proximity it improves the quality of surrounding residential and mixed-use complexes. The new linear park has become a favourite space for residents regardless of the season or weather conditions. One of the conclusions of the research was that it was assumed that the riverside development will improve the quality of its surroundings but it was found that although the River Akervselva Park itself is a winning enterprise and benefits from constant interest, the division of the city is still strongly perceptible and the location either on the eastern or western bank is still a determinant of the economic and social success of the investment.

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THE USE OF NATURAL URFA (TURKEY) STONE IN URBAN FURNITURE DESIGN

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ABSTRACT

Stones have been used as an important structural material since the early ages until today. Stones are used both as a carrier component and decoration component in structures as they don't harm the nature and are recyclable, durable and sturdy. Stone decoration tradition goes until 12000 years back in Şanlıurfa, one of the oldest settlement centers in Mesopotamia. It started with reliefs made on stones in Göbelitepe, the oldest temple in the world in the vicinity of Örencik Village at 20 km northeast of Şanlıurfa. Animal figures take place on these stone reliefs. "Urfa stone" continued to be used as a construction material and decoration material in traditional structures in Urfa city center. Urfa stone is a type of limestone mined at quarries located in the surroundings of Şanlıurfa. Urfa stone is an environmentally friendly material that could be used in restoration works and is engraved easily since it is considerably soft when it is mined and becomes hard and resistant when it contacts air. Despite "Urfa stone" is benefited in traditional structures, it is not ever seen to be benefited as a material in urban furniture. In this study, the usability of "Urfa stone" in urban furniture was investigated. Urban furniture made of Urfa stone in turn will be materials that are adaptable to the nature, healthy, resistant, aesthetic, visually rich, and easily maintained. For this purpose, urban furniture was designed and produced as a suggestion by using Urfa stone. It was concluded that designs could be made as adaptable to the nature, exhibiting the city identity, and caring about the use of local materials and local decoration components. It was emphasized that designs should be made in the future in urban furniture introducing the city identity and using the natural material of the district.

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DESIGN PRINCIPLES FOR BETTER OPEN SPACES AT UNIVERSITY OF PÉCS

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ABSTRACT

The campus, the quality of open spaces is a key factor in the life of universities. Thanks to the IT revolution humans can be connected anywhere, independently of space. The battle for having more students will be based on the learning environment in the near future. The principles of designing university campuses have changed; building-oriented design ceases to exist, buildings are in close association with their environment, however, neither can be interpreted without the other since the building and the outer/open space are significantly connected to each other. Contemporary universities have become the microcosm of our cities. Exterior spaces are no longer treated as hallmarks of buildings, but as a home for staff, students and the wider community in countless ways; encounters, learning, playing, training, parties, walking, etc. These new types of social spaces serve the increasing number of students on the campus, which responds to a new, constantly open and active campus paradigm shift. The life of students, green infrastructure, environmental sustainability, services and the flexibility in space usage are going to be more significant. The landscape architecture and image of universities must be rediscovered today. The campuses formerly provided a mediator type of peace like monasteries, and now they are looking for new ways to be an abounding space with services. In the age of on-line and off-campus, university spaces play a decisive role in attracting and retaining staff and students, as well as taking part in engagement, besides exchanging ideas and participation. The article summarizes the new principles in campus design and reveals the concept of the development strategy of the AOK Campus of University of Pécs.

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RESTRUCTURING OF A WALLED ENCLOSURE ALMOHADE TO AN URBAN UNIVERSALLY ACCESSIBLE AREA: THE HISTORICAL CITY OF CÁCERES

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ABSTRACT

This article presents the results of an investigation of the current urban accessibility in the within-walls area of the historical complex of the city of Cáceres, included by UNESCO in 1986 on the World Heritage List. The construction of the wall dates from the 12th century, during the Almohad period in Hizn Qazris, a strategic location for the conquest of Christian territory in the Iberian Peninsula. This enclosure was reinforced with towers and defensive bastions, which, together with the orography, elevated on a meseta, conferred an urban space protected of possible invaders. The study model is based on the comparison of that original city, which today remains as a true reflection of the originally planned, with the legislation on urban accessibility and its "true adaptation" to the significant points of public urban itineraries within the walled city. In order to develop the research, it has been used the data from the geographical information system of the City Council of Cáceres, analysing its heritage databases, architectural settings, street slope maps and other significant factors, for their functional understanding as a model of historical city adapted to the present. The technical-administrative bureaucracy and the preservation of the historical-artistic heritage coexist in a very thin line in the face of the promotion of patrimonial tourism and the need for funding for the conservation of the old part as a whole, both in terms of architecture and urban structure. Implemented actions and proposals for future interventions submitted to the competent bodies for approval are presented, applying a model of urban accessibility promotion to try to achieve universal accessibility tangible for all types of users, sometimes very limited by the existing conditions but, even without reaching regulatory compliance, could undoubtedly improve the critical points detected.

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CONSTRUCTING THE SPATIAL IDENTITY: A READING ATTEMPT OF THE URBAN MEMORY OF JORDAN UNIVERSITY OF SCIENCE AND TECHNOLOGY (JUST) CAMPUS BY COGNITIVE MAPPING

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ABSTRACT

The University campuses are a small city containing basic city functions such as educational spaces, accommodations, services and transportation. They are spaces of functional and social life with different activities, different occupants, it changes and grow like cities so it is memorizing with the same manner. Campus memory is the ability of individuals to maintain and reveal the spatial components of designed physical spaces, which form the understandings, experiences, sensations of the environment in all. “Cognitive mapping" is used to decode the physical interaction and emotional relationship between individuals and the city; Cognitive maps are created graphically using geometric and verbal elements on paper by remembering the images of the urban Environment. In this study, to determine the emotional urban identity belonging to JUST Campus, architecture students. Asked to identify the areas they interact with in the campus by drawing a cognitive map. "Campus memory items "are identified by analyzing the cognitive maps of the campus, then the spatial identity result of such data. The analysis based on the five basic elements of Lynch: paths, districts, edges, nodes, and landmarks. As a result of this analysis, it found that Spatial Identity constructed by the shared elements of the maps. The memory of most students listed the gates structure- which is a large desirable structure, located at the main entrances within the campus defined as major landmarks, then the square spaces defined as nodes, in addition to both stairs and corridors defined as paths. Finally, the districts, edges of educational buildings and service spaces are listed correspondingly in cognitive maps. Findings suggest that the spatial identity of the campus design is related mainly to the gates structures, squares and stairs.

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MODELS FOR ARCHITECTURE OF CONTEMPORARY MEDIUM DENSITY MIXED USE BUILDINGS: CASE STUDIES FROM GLIWICE, POLAND

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ABSTRACT

Mixed use buildings are objects of more than one use. The structure of a typical mixed use building allows for access of at least two groups of users: both groups take advantage of presence of another. Advocates of the compact city policy argue that mixed use buildings are obligatory for reaching compactness. The demand for density in developing cities is growing since the prices of land are rising and there are nearly no vacant plots in the centres. Most of the low and medium density realisations do not use mix of uses since it complicates the building structure. Although there are no universal measures for low, medium and high density. Author believe that those can relate to the location and site characteristics. Asian ultra-high densities are generated by different conditions and local background and cannot be compared to European examples. Also, the terms low, medium and high density have different meanings and values in small, medium and big cities. This article presents 3 case studies of design for 3 mixed use buildings in the medium size city of Gliwice. All the 3 case studies illustrate local determinants set in the local development plans that limit the development by setting minimum and maximum values of urban indicators. Author conclude that sometimes planning regulations effect in very strict extreme values of urban factors that must be met by the new investment. But those are not the only answer sometimes. Planning not always can foresee and come across changing urban environment and society needs. Observation of one the realisations, which has been implemented show that hypothesis may be right.

Session Title:

Theories and Methods

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STRUCTURAL SAFETY ASSESSMENT AND CLASSIFICATION OF TIMBER STRUCTURE WITH XYLOPHAGIC DEGRADATION

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ABSTRACT

Within the field of timber construction, the last decades were characterized by significant technical advances and developments, widening the range of application of timber structures in the building sector. Unaffectedly, this provoked an increased interest of the professional community in assessment methods for existing timber structures. Especially for the majority of timber constructions subjected to safety assessment are made according to old standards. So, structural safety assessment of existing structures is to become an increasingly important task for these structural engineers. At the design stage, it is clearly defined by codes standards, which ensures adequate protection for a suitable period of use. This practice often enables economical distribution of the limited available resources for rehabilitation. This paper outlines conceptual considerations in the assessment of existing timber structures and introduces a classification system for the structural safety assessment. Its focus on the application of failure mechanisms and stress fields changes in time the process of variable degradation depending on environmental conditions. The specificity of the degradation model depends on the appropriate conditions that are part of insect development life cycle. As an example, the development cycle Hylotrupes bajulus (xylophagous insect) was used. The various criteria of the classification system are discussed and illustrated with an example. The significant parameters in the assessment of existing concrete structures are pointed out and conclusions on structural assessment are shown. It is important the integral approach for the specificity of the issue. Since each method only allows the assessment of certain types of material properties, damages or degradation processes, it becomes necessary to combine different methods in order to derive a full picture of the residual performance of the timber structure. Although this practice guideline was based primarily for the compression structural condition assessment of buildings or the accompanying elements of the roof support structure, it can also be used for the structural condition assessment of other buildings and structures.

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TRANSVERSE VIBRATIONS OF A FLEXIBLE GROUND LAYER MODEL EXCITED BY A MOVING FORCES SET

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ABSTRACT

This paper outlines conceptual dynamic response of a flexible ground layer model system traversed by set of moving loads system. Subsoil Models are very important in civil and military engineering as structural members with high strength to weight ratios. The paper includes the study of a dynamic behaviour of a finite, simply supported tensioned string subject to set of moving forces system with a constant velocity on the top. The tensed string rests on the ground in the continuously Winkler model coupled by a linear elastic element. The moving loads set are considered, including those at high speeds. Passage analysis at high speed is results from a solution of the motion equations. The classical solution of the response of these systems subjected to forces 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. This follows from the fact that in string wave phenomena may occur. Responses of structures to extreme loadings are often complex and difficult to understand, especially because of the complex nature of vibration 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. This follows from the fact 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 solution for the dynamic response of the composite string-spring under moving force is important because it can be used also in order to find the solution for other types of moving loads assembling. The string-spring linear elastic elements can be studied as a theoretical model of composite system or prestressed ground structure in which coupling effects and transverse wave effects are taken into account.

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ARCHITECTURE & BUILDING SYSTEMS: NOTION AND EVOLUTION

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ABSTRACT

The solution of modern Housing and Urban Development problems is impossible without new approaches and methods of designing, development, management, and co-ordination of architectural, engineering, technological and industrial decisions. Architecture-&-Building Systems (ABSs) play here a very important role. This term is used to refer to a system of coordinated architectural, constructive, and technological decisions, which proceed from a universal methodology. The purpose of this research is an attempt to define the notion of Architecture-&-Building Systems and analyse the history of their development as the main material and technical means for the implementation (creation) of the architectural environment. Since the formation of each building is impossible without a complex of architectural requirements and urban conditions, it is most expedient to operate such terms as architecture & constructive systems and architectural & building systems. At the same time, the latter most accurately and fully reflects the phenomenon of the integration of architecture and industrial house-building and embodies in its name the whole complex of not only urban, architectural, constructional, but also construction and technology issues. The author understands the architecture & building system as a set of interrelated architectural, constructive and technological solutions, which are based on uniform methodological principles of housing environment formation and provide realization of a complex of socio-demographic, urban planning, functional and lay out, technical, technological, environmental, economic, aesthetic and other requirements. Analysis of the evolution of architectural and building systems revealed the two main ways of their formation and development: a. ABSs, designed for the construction of one or more buildings on the basis of specially made architectural building elements; b. ABSs, intended for mass construction of buildings on the basis of serial production of unified architectural and building products and components.

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ACCELERATORS FOR START-UPS AS THE STRATEGIC INITIATIVE FOR THE DEVELOPMENT OF METROPOLIS

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ABSTRACT

The subject of this paper is one of the strategic initiatives of the Metropolitan Association of Upper Silesia and Dąbrowa Basin, usually referred to in Poland as the Silesian Metropolis, which began its activity on January 1, 2018. The Silesian Metropolis lies within one of the largest urban areas in the European Union. The process of building a strong metropolitan center is a long-term process and will cover all areas of social and economic life, including space for the creation, development and further functioning of the start-up community with the support of the launched network of accelerators. Accelerators help nascent firms, and particularly high-tech start-ups succeed in the early stages of development by providing services such as office spaces, mentoring, networking and a variety of educational programs. Local authorities must have appropriate tools to plan the right types and structures of accelerators that are relevant to planning needs in this region. Moreover, accelerators are quite a new phenomenon; therefore, little research has done on accelerators. The purpose of this study is to contribute into explain the diversity found among accelerator. On the basis of conceptual reflection, it is shown that the configurational approach can be use in this case in particular, and in research on accelerators in general. In this paper, we have shown that research on accelerators can benefit from the input of configurational approach. To do so, we have given details of how the main concepts of ideal type, “fit” and equifinality, developed from this approach, play a part in explaining the existence of several categories of accelerators. The main benefits from the conceptual framework lie in its highlighting of five coherent structure pairings to which accelerators can be assimilated. The results of this work can be double useful. Firstly, from a theoretical point of view, future research can clearly benefit from this new conceptual framework, which provides interesting perspective for studies on management of accelerators, their evaluation. Secondly, this work may be useful from a managerial point of view. Metropolitan managers and local authorities can use the five structure pairings as a tool for metropolitan planning. They can effectively orient any founding granted to accelerators in such a way as to develop certain structure pairing rather than others. It is even possible to envisage the impulsion of new accelerators following an audit of this region highlighting the non-representation of certain structure pairings. Given the difficulties associated with evaluating the performances of accelerators, metropolitan managers can also choose to evaluate the degree of adjustment of the structure pairing for each accelerators. Finally, the managers of accelerators may adhere to a proactive approach and indicate themselves the readjustments necessary thanks to knowledge of the five structure pairings. This knowledge can also allow them to carry out a competitive analysis of their environment and thus judge the relevance of position of their accelerators.

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THE DEVELOPMENT OF A NEW USE-ORIENTED PRODUCT-SERVICE SYSTEM (PSS) DESIGN FOR CAR USERS

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ABSTRACT

Designing a new innovative product-service system design (PSS) consists of different methodologies and great deal of steps such as creating system map and creating product life gallery, etc. There are three types of PSS design depending on tangibility and intangibility; these are product-oriented, use-oriented and result-oriented. This paper focuses on a new innovative use-oriented PSS design that is online car wash valet service (OCVS) for car users by combining the components such as vehicle tracking and GPS technology. Car washing takes such a long time of car users and majority of them do not wash their car because of the time problem or do not wait in a car wash and shopping mall or generally. Car washes are more crowded because of those people who do not want to wait in a line. Online car wash valet service (OCVS) solves this problem by a new PSS design. This paper defines how to develop a new PSS design steps and methodologies that are based on online car wash valet service (OCVS) in order to solve the car washing problem.

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AN ANALYSIS OF PSS DESIGN DEVELOPMENT MODELS IN TURKEY

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ABSTRACT

This paper aims to observe and frame I-am associates' process model as an example of PSS design development models in the context of Turkey while comparing it with the existing models. PSS design is a new field in Turkey and I-am Associates is chosen as the best example to observe PSS development because it is a local company, created and developed in Turkey dealing with PSS design. This paper specifically focuses on PSS design development models, thus the existing models in the literature should have been analyzed. For better understanding how companies develop their ideas and how they work, as a qualitative method semi-structured interviews have been made with the selected company. Questions were generalized not to frame their answers. Two founders of the company briefly explain how their process works and in which phases they go deeper. The research identifies that the PSS design process reported in the literature is not representative, and lacks some sub-phases. Seven models have been analyzed and seven common phases were identified with 18 total sub-phases for creating a PSS design development process model for the selected company. Those findings help to frame basic steps in the process.

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EQUATION SYSTEMS DERIVED FROM THE ANALYSIS OF PORTICOED STRUCTURES: GRAPHIC RESOLUTION METHODS & COMPARATIVE STUDY

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ABSTRACT

This paper conducts first-order theoretical and linear analyses of a building structure using a classical equilibrium method. The structure comprises a single storey, and is made up of ordinary equal porticoes connected by means of a one-way floor slab. The equation systems for the floor slab and the porticoes are resolved with different visual procedures described previously, which were drawn up to facilitate the manual analysis of these structures. The said procedures exactly reproduce in graphic form the operations of Cholesky´s procedure and the operations of another method inspired in Cross. Some are designed to resolve generic equation systems and the other to resolve systems derived from specific types. In this paper the drawings are made freehand and the results are accurate enough because they are obtained for surfaces for which it is not possible to commit major errors. The graphic procedures used are classified according to suitability, by comparing the exactness of their results and the number of lines required in each case. It is observed that the application time: i) varies from one method to another, even though the mathematical procedures do not change; and ii) can be shortened when a graphic method adapted to the relevant type is used. It is also observed that a consistent image of all the operations makes it easier to simplify them and monitor any errors committed. This study also suggests that other graphic methods could be drawn up that would enable different types of building structure to be analysed exactly in just a few operations.

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MULTI-DIMENSIONAL APPROACHES TO THE DEVELOPMENT OF SUSTAINABLE REAL ESTATE VALUATION PRINCIPLES

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ABSTRACT

The dimensions of real estate begin as spatial within time added; and the time being includes ecological and economic self-history besides the sociality with cultural capitalized values influenced by technology and ethics. The aim of this paper is to discuss the philosophy behind the value and valuation methods of sustainable real estate development within its dimensions introduced here as ΣSoCulTΞ (Σ stands for ecological, economic and ethics; SoCulT stand for socio-cultural vales and T also for technical; and Ξ is history which stands also as a base of first three concepts included). Built environment, in a way is strategically designed, and construction industry shaping and re-shaping the environment have the most powerful influence on the “economic capital and environment” in terms of adding value to the real estate leverage in the sense of its genius logi. So called sustainable real estate have the power to highest and best use with functionality, energy efficiency, resource intensity, environmental compatibility, health, socio-cultural aspects, life cycle coast, technical quality and value/earning/worth. Value of sustainable real estate development composed of the architectural design of built environment within sustainable architectural principles, approaches, constructional criteria, and methods which evaluation included from investing stage till the realization of real estate as earned capital; also captured as intangible assets any life-cycle of a real estate as earning/worth. The dimensions which are hidden in the facts of development of sustainable real estate valuation design are captured in the ΣSoCulTΞ will be discussed by comparison as the method of sustainable architectural design, application and life-cycle of a real estate and its valuation principles. Comparing the principles both the architectural design includes the engineering projects and the way of real estate valuation, we as designers may lead also the strategical perspective of economical investment. As conclusion these approaches have to become the shared values in the strategical planning, flow from concept to concept to keep the dimensions of real estate development in the sustainable reality.

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LARGE DISPLACEMENT ANALYSIS OF ELASTIC PYRAMIDAL TRUSSES

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ABSTRACT

The challenge of basic research has become the numerical investigation of stability problems of pyramidal von Mises planar trusses. The von Mises planar truss is a bar structure consisting of two bars connected with one another in the top joint. The elastic von Mises truss model allows a deep understanding of the buckling of truss systems. The aim of the presented study is an analysis of stability loss of high von Mises planar trusses with initial imperfections. Amplitudes of initial sinusoidal curvature of bars, initial top joint horizontal imperfection and support stiffness are considered as initial imperfections. The paper deals with the critical and post-critical analyses of the behaviour of a von Mises planar truss subjected to a vertical static load at its top joint. In general, the phenomenon of loss of stability is present in the deforming structure regardless of whether the loading process is controlled by force or by displacement. In this article, the load-deflection curves were studied via displacement of top joint by auxiliary bar mechanism, which made it possible to apply the common geometrically nonlinear solution of the finite element method. The displacement of top joint is investigated as a function of initial deterministic and random imperfections. The stochastic analysis was evaluated by Monte Carlo runs using Latin Hypercube Sampling based on a small number of imperfections samples, which are randomly generated and subsequently analysed using the geometrically non-linear and materially linear finite beam element method. The results showed the effects of asymmetric random imperfections on load-deflection curves. The results represent a fundamental problem in solid mechanics, which must be mastered to ensure the safety of structures against collapse.

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A WAY TO PROMOTE SENSE OF PLACE IN THE HOUSING DESIGN PRACTICE: TURKISH CASE STUDIES

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ABSTRACT

Place-making is a critical goal in the housing design practice; but a challenging task because of the growth of new housing typologies with an extensive neglect of local, social and cultural values that accordingly causes the loss of sense of place (SoP). Therefore, it is often suggested that the new design should be in line with the tradition. However, the way that the traditional architecture is interpreted in the new design is a burning discussion and often criticised because of mimicking the old solely without understanding what really makes the residents feel belong to their physical living environment. Is it the spatial organisations, traditional architectural design elements, street formation, neighbourhood clustering etc.? This research aims to investigate how (the sense of) tradition can be regenerated in new design without imitating what has been done earlier. The study suggests that the spatial elements of the past should not be considered as timeless elements, instead they should be taken into consideration as a process. This is also important because the continuation of successful place making can be achieved when the changes occurred in an adaptive manner between old and new. The study investigated this potential amongst Turkish housing typologies. First, seven housing developments were chosen according to their built date in chronological order and their spatial characteristics at the three levels of specificity were analysed in a comparative manner whether they were the same, partly same or different. Then, an in-depth sense of place assessment was carried out amongst their residents through face-to-face interviews. The results were systematically compared and qualitatively assessed regarding what characteristics really contributed to the maintenance or improvement of sense of place satisfaction. The study identified some spatial design features at three place scales (e.g. functional zoning of individual and shared spaces at the house layout level; the spatial hierarchy from streets to building entrances, pedestrianised streets at the street layout level; and defined boundaries of housing clusters and public-private spaces at the neighbourhood level) that can potentially contribute to sense of place if taken into consideration in the future housing design. The study overall concluded that the understanding of what really contributes to residential satisfaction has changed over time together with the changing human needs; but the sense can be traced through the investigation of the adaptation process from one and another. The research thus suggests that housing design guidelines should focus on revealing this potential.

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ADVANCE HYDRAULIC MODELLING OF SEEPAGE SURFACE THROUGH A DAM

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ABSTRACT

This example demonstrates how to calculate the seepage surface using a vertical cross-sectional model. The task is to calculate the seepage surface and the seepage rate by using a vertical cross-sectional numerical model. Compare the seepage rate with an analytical solution after Dupuit. To compute the head distribution and the seepage surface, it is sufficient to consider a vertical cross-section of the aquifer with a uniform thickness of 1 m. The companion software Processing Modflow for Windows (PMWIN) offer a totally integrated simulation system for modelling groundwater flow and transport processes with MODFLOW-88, MODFLOW-96, PMPATH, MT3D, MT3DMS, MOC3D, PEST and UCODE. The applications of MODFLOW, a modular three-dimensional finite-difference groundwater model of the U. S. Geological Survey, to the description and prediction of the behaviour of groundwater systems have increased significantly over the last few years. PMWIN comes with a professional graphical user-interface, the supported models and programs and several other useful modelling tools. The graphical user-interface allows you to create and simulate models with ease and fun. It can import DXF- and raster graphics and handle models with up to 1,000 stress periods, 80 layers and 250,000 cells in each model layer. The modelling tools include a Presentation tool, a Result Extractor, a Field Interpolator, a Field Generator, a Water Budget Calculator and a Graph Viewer. The Result Extractor allows the user to extract simulation results from any period to a spread sheet.

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SCENARIOS IN STRATEGIC PLANNING OF POLISH LOCAL SELF-GOVERNMENT UNITS

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ABSTRACT

The future conditions should be considered in the planning, because it prepares future actions. The plan should account for not only the current, but also the upcoming problems. Furthermore, recognition of the future is very important in the planning process, especially in strategic planning, due to its long term. The future should be recognized on an objective basis. A scenario method is one of the most useful prognostic methods, especially in the case when the social and institutional behaviours play a crucial role. Scenarios could help to reduce the uncertainty, make the future more clear, or even build structures based on an uncertain image of the future. The author defines scenario as an ordered description of a possible or desirably predicted future of an investigated object, created with a logical sequence of events and processes. There are many types and kinds of scenarios. Experiences and research indicate that at different stages of the planning process various types of scenarios are useful. However, in the strategic planning in Polish self-government units, scenarios are rarely applied. In the paper 12 strategic plans are analysed in various types of units (rural communes, towns, cities) in which scenarios were applied. The aims of the paper are: (1) recognition the roles and the places of scenarios in the strategic plan building process; (2) recognition kinds of the scenarios applied and criteria for their differentiation, (3) analysis and evaluation of the application of scenarios in the examined strategic plans. Some scenarios do not fully meet the scenario definition because of the lack of sequences of events presented on the timeline. The scenarios were formulated with heuristic methods. They describe both surrounding and internal situations in described units. There are methodological problems of using scenarios: for each variant of the scenario, a proper variant of the strategy should be prepared. In practice, commonly one variant is prepared. In the end the author gives some recommendations for the practice of the planning basing of previous research.

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EFFECTIVENESS OF BASIC SPECIAL SERVICES AS A GUIDELINE FOR PROGRAMMING URBAN NODES

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ABSTRACT

Creation of the urban nodes is a widely studied issue. In the era of intensive development of cities, that are affected by an urban sprawl, as well as areas exposed to degradation not only through human activities (areas of military conflicts) but also through natural factors (earthquakes), it is necessary to develop mechanisms for creating urban nodes that would be applicable for various environments. In the author's opinion, an important element in ensuring the safety of life in urbanized areas is the programming of urban nodes in a way, that make them create the security system. The research conducted by the author aims to diagnose the relationship between the needs of the inhabitants of a fragment of urban area and the concentration of functions at an important point of the program of the urban node and its architectural interpretation, with time fluctuations taken into account. The research discussed here is carried out within the 'Ariadne Thread' project, and is a new approach to urban node formation. The 'Ariadne Thread' is a pilot project whose first phase focuses on an attempt to integrate four major urban systems: signage, urban lighting, local telecommunication facilities, and security systems. Through the parameterization of the factors divided into categories, it will be possible to develop a mechanism of urban nodes' creation. A flexible and universal mechanism, which - depending on the established parameters - will be applicable in slums, shanty towns as well as areas devastated by natural disasters. In this paper, author describes the principle of creating this mechanism by presenting one of the parameters adopted as a criterion and guideline for programming, namely the effectiveness of the primary services, such as emergency services, fire brigades and police. Through the series of surveys conducted among departments of special service units, confronted with data and guidelines contained in regulations for their functioning, the author obtained a pool of parameters which are the guideline for the programmed node, showing what territory the given operational base can serve, which is the basis for developing quantitative parameters for the designed node. The author also draws attention to the principle of functioning of the already existing node, in situations of events that exceed its effectiveness or require rapid intervention in emergency situations, such as terrorist attacks. This will affect the operation of the various units, where additional large units will be needed. It will be necessary to develop a network of urban node connections by developing mechanisms for linking them to airports, helicopter landing sites and important external entities.

Session Title:

Regional Planning

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LONG-TERM GLOBAL RADIATION MEASUREMENTS IN DENMARK AND SWEDEN

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ABSTRACT

The climate, especially global radiation is one of the key factors influencing the energy yield of solar energy systems. In connection with planning and optimization of energy efficient buildings and solar energy systems it is important to know the climate data of the area where the buildings/systems are located. This study is based on yearly and monthly values of global radiation based on measurements from a climate station placed on the roof of building 119 at Technical University of Denmark in Kgs. Lyngby, from different Danish climate stations runned by Danish Meteorological Institute and from different Swedish climate stations of Swedish Meteorological and Hydrological Institute. The global horizontal radiation has been measured for a high number of years at all of these stations. The values show a tendency of increased annual global radiation, most likely due to decreased pollution of the atmosphere, increased duration of periods without clouds and/or combination of both these effects. Twenty years of measurements from a climate station in Lyngby, Denmark show that the global radiation increase is almost 3.5 kWh/m^2 per year, corresponding to a growth of 7 % for the last 20 years. The global radiation variation between the least sunny year to the sunniest year is 22%. Twenty-nine years of measuring of global radiation from twelve radiation stations across Sweden shows an increase of 3.1 kWh/m^2 per year. The increase is 87 kWh/m^2, corresponding to 9 % of global radiation growth during the last 29 years. The annual global radiation varies between 838 kWh/m^2/year in 1998 and 1004 kWh/m^2/year in 2002 with an average radiation of 932 kWh/m^2/year, corresponding to a radiation variation from the least sunny year to the sunniest year of 20 %.

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THE ROLE OF ACCELERATORS IN THE DEVELOPMENT OF AN ENTREPRENEURIAL ECOSYSTEM AS PART OF THE REGIONAL ECONOMIC DEVELOPMENT STRATEGY

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ABSTRACT

The Metropolitan Association of Upper Silesia and Dąbrowa Basin, usually referred to in Poland as the Silesian Metropolis, is one of the key urban centres in the country, integrating 14 largest cities in the Silesia and Zagłębie Regions and 2 million inhabitants. It also offers the best investment areas in Poland, an absorptive labour market, unique tourist attraction and many cultural highlights. The Silesian Metropolis began its activity on January 1, 2018. In stimulating and developing the economies of cities and regions, not only the role of an individual entrepreneur, his idea and effort on the way to building new ventures is emphasized, but also the role of the entire business environment, support network which are defined in the literature as an ecosystem. The creation of Metropolis is pioneer, long-term and complex process, requiring vision and consistent work, therefore there are taken various strategic initiatives including development accelerators within the entrepreneurial ecosystem. Analyzing the ecosystem from the point of view of urban development is important, because trends show that there is a strong urbanization and concentration of startup entrepreneurship around large cities. The aim of this study is to understand the role of accelerators in building and developing an entrepreneurial ecosystem as a part of regional economic development strategy. Interviews with 61 ecosystem actors, along with a variety of published sources, informed our qualitative research method. We document what accelerator expertise looks like and how it can affect commitment to the regional entrepreneurial ecosystem. We note, that accelerators in Silesian Metropolis are, in many ways, start-ups themselves, facing the same challenges other start-up face. Our findings suggest that as these accelerators continue to build their own expertise and continue to engage in ecosystem developing process, they will benefit more fully from other expertise that emerge as the ecosystem itself, continues to develop. We describe the process that enable accelerators to enhance expertise, commitment to the regional entrepreneurial ecosystem, which is a part of regional development economic strategy in Silesian Metropolis.

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PERSONS ENTITLED TO ASYLUM CREATE THEIR OWN LIVING SPACE – CONDITIONS FOR A SUCCESSFUL IMPLEMENTATION IN THE CONTEXT OF RURAL AREAS IN AUSTRIA

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ABSTRACT

The exodus from rural areas and subsequent migration into cities results in vacated housing and infrastructure substance, leaving behind valuable assets from a resource as well as building-heritage point of view. At the same time thousands of persons entitled to asylum are distributed on a quota-based and highly regulatory approach over the Austrian municipalities. From a spatial planning as well as architectural position, this raises several questions, which have been addressed in a research project funded under the Austrian Ministry of Europe, Integration and Foreign Affairs: a. Can persons entitled to asylum be involved in the upgrading and refurbishment of vacant buildings with the purpose of creating their own living spaces? If so, which conditions are necessary for a successful cooperation? (strategic point of view), b. Which requirements must the potential empty buildings fulfil in order to be suitable for this purpose? What are the relevant criteria related to building structure, location and infrastructure in this context? (object-related point of view), c. What would be the underlying business model based on a cooperation between local small and medium sized enterprises and persons entitled to asylum? (economic point of view), d. The purpose of this paper is to present the different approaches in the field of spatial planning and architecture, resulting in a subsequent common methodological approximation towards the joint topics of rural exodus, conservation of building stock and living space for persons entitled to asylum. Due to the sensitivity of the overall topic of migration and the complexity of the associated framework conditions, the assessment has been limited to an exemplary case study of a single rural community in Austria. The empirical results support the following findings: a. Persons entitled to asylum are not perceived as a potential target group by the real estate market. b. The requirements of local companies involved in building refurbishment actions do not match the potential of persons entitled to asylum, both from a quantitative as well as qualitative point of view. c. The concept of matching rural vacancy and subsequent upgrading as well as refurbishment of buildings and towns in cooperation with persons entitled to asylum is currently not supported by the present legal framework conditions. Developing effective synergies between persons entitled to asylum creating their own living spaces and the declining rural population and subsequent building vacancy in rural Austria necessitates a viable legal, infrastructure related and market driven framework. The conclusions which can be derived from the analysed case study summarise the main criteria, which are prerequisite conditions for a successful implementation of this potential concept.

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EVALUATION OF LANDSCAPE COLOR IN THE COASTAL TERRITORIAL PLANNING

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ABSTRACT

Landscape concept, for the plurality of contained meanings, has been analyzed by numerous disciplines, with multidisciplinary interactions that have introduced the theme of color in the scientific debate within a vision linked to the relationship between man and environment. The European Landscape Convention refers to the perception that we can define as "social", that is, shared by groups, different from that of individual subjectivity. Color is one of the resources that plays a role of impact in the landscape, so that it can become the main tool for the enhancement and recovery of our territory. A designed color modulates its appearance, harmonizing it with the surrounding environment, correcting its proportions, destructing large volumes. The color in the urban landscape considered is the result of the presence of buildings, green plants, lights and shadows able to change the visual impact and therefore to recover even marginal or degraded areas. The aim of this study is, through the methodology of the colorimetric context analysis and participatory planning, to restart the urban landscape management policies with an active involvement of the company. The objective color specification should be made by spectrophotometric and spectroradiometric techniques from which to obtain both spectral reflectance factors and colorimetric coordinates in a normed space (e.g. CieLab). The results obtained constitute the chromatic landscape palette from which to plan the colorimetric palette to be used in the urban context. From the color evaluation the model foresees the proposal of three hypotheses that will be submitted to the different actors of the territory to which they belong. The proposed methodology is based on an integrated approach between participatory planning techniques (based on the establishment of the Focus Group with the various stakeholders) and the NAIADE method (Novel Approach to Imprecise Assessment and Decision Environments) (Munda, 1995), for the Multi Criterial Social Evaluation - SMCE - of "complex" information collected (quantitative and qualitative data). The aim is to develop a methodological structure made up of appropriate tools aimed, first, to the acquisition and, after, to the evaluation of the information (qualitative and quantitative) on possible alternative scenarios with respect to the proposed problem.

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RE-THINKING POST-MINING AREAS RECLAMATION IN 21st CENTURY

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ABSTRACT

Despite the technological advancement, widespread investor pressure and the global recognition of sustainable development as a 21st century paradigm, many of the post-mining areas are still waiting for reclamation and giving them a new function. The studies that have been carried out have aroused interest in the lack of development of these areas, so numerous in many regions, where the mining industry has been driving the economy for centuries. The article posed the question what factors determine today the formation of post-mining areas, and whether these processes are consistent. It was also considered what impact the idea of sustainable development has on the approach to post-mining areas. In order to solve such constructed problems, the research method of logical argumentation and interpretation was used. The author used research techniques such as: data query, literature research, comparative analysis as well as sketches and tabular statements. The article analyses critically the most important legal documents in this field, discusses the conditions and limitations of reclamation and changes in the function of post-mining areas, as well as outlines the context of the idea of sustainable development. During the research, the directions of reclamation were reviewed. Next, features of post-mining areas were presented, which have a decisive influence on the possibilities of their transformation. There were given more important conditions for choosing the direction and method of reclamation. In addition, in a paper a critical reference was made to the reclamation practice in Poland. What is more, the need to adjust the reclamation of post-mining areas to the concept of their subsequent development with regard to local conditions was shown. The article draws attention to the lack of full use of the potential of post-mining areas and the need to change this situation in the context of sustainable development, according to which space is one of the valuable non-renewable resources. The author suggests introducing the necessary legislative changes related to the reclamation of post-mining areas, and also states the need to refine the multi-criteria analyses of the possibilities and directions of reclamation. She also states that in the 21st century, any space development project (including mining and mine liquidation) should be based on the principles of sustainable development.

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BENEFITS FROM CONSTRUCTING GRADE-SEPARATED INTERCHANGE: A CASE STUDY

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ABSTRACT

The paper presents the results of analyses regarding the benefits of the planned road network development, reconstruction of a road intersection of the national road No. 25 and provincial road No. 254. Actual and forecasted traffic volumes and saturation factors on the road network were calculated based on the regional simulation transport demand model. The value of transport work performed by all vehicles traveling on this network, the value of travel time of drivers and passengers traveling during the weekday as well as the costs of impact of traffic into the environment were also determined. On this basis, a preliminary economic analysis was made as the base for a feasibility study, to proof economic benefits of such investment. Traffic analyses, the results of which were presented in this paper, were made using the actual and prognostic four-stage regional simulation transport demand models. The model for actual state was developed on the basis of comprehensive road traffic research and surveys of inhabitants of the analysed area. It was developed basing on the theory of a four-stage computational phase consisting of: trip generation, trip distribution, mode choice (as a result of these phases transport demand matrixes are computed) and finally transport demand assignment into all transportation networks (mainly private and public transport networks). The authors adopted a typical trumpet-type of grade separated interchange for economic analyses. It is a collision-free interchange, and therefore very safe in its very nature. The experience of current road practice indicates that significant improvement of road traffic safety will be the undoubted benefit resulting from the construction of such interchange. Additionally, such construction will also reduce time lost by road users in traffics. It should be noted that at present a railway at-grade crossing located in a short distance from the abovementioned intersections is the most serious source of time lost in traffic by road users. The railway line with heavy passenger and freight traffic causes each closing of the turnpikes effectively blocks traffic on main turns of above mentioned intersection. The construction of the grade separated interchange will enable collision-free intersection of the road with the railway, and thus will reduce the loss of time - a significant improvement in the functioning of the analysed area.

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THE TRANSPORT DEMAND MODEL MANAGEMENT SYSTEM

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ABSTRACT

Contemporary city management, control over its functioning and sustainable development requires the use of a huge amount of information. Transport systems are one of the basic components of the functioning of society. They are the means of meeting the current transport demands of its residents. Effective management of the current functioning of transport systems as well as their effective development requires the use of a number of IT tools. One of them is undoubtedly the transport model. Transport demand models are mainly used in highly developed countries, where the optimization of transport processes is one of the key task of the city administration. Their purpose is to reconstruct the phenomenon of the functioning of transport systems being a service to meet the current transport demands of residents, including private trips and transport of goods. One of the basic tasks of transport demand models is to provide information on the effects of changes on transport networks resulting from investment process, renovation activities or the consequence of local breakdowns. These models also allow to determine the effects of changes in the service of public transport, changes in the traffic, as well as future transport demands of residents. The calculations carried out with these tools make it possible to determine the effects of future investment activities in the field of transport, their legitimacy and rationality. Thus, they enable the prevention of erroneous investment decisions. To build such a powerful tool as the transport demand model, a large amount of data is needed both in the spatial development of the city, transport infrastructure and its users - residents and visitors. The sources of this data are located in various units of city administrators, including, among others, the urban planning council, the road administrator and public transport supervisor. Undoubtedly, one of the biggest problems of transport demand models is the validity of data collected in these models. With intensive technical and social progress, many residential, industrial, etc. investments, data is very quickly outdated. Consequently, it leads to erroneous results of transport analyses, which may lead to an increase in broadly understood transport costs. Therefore, there is a need for such organization and availability of this data to enable fast and efficient updating of transport demand models. Bearing in mind the above, the article presents a proposal for a comprehensive transport demand model management system. It proposes an organizational structure and life cycle of transport demand models as well as specific IT solutions for this purpose. In order to assess the feasibility of implementing such a system, a SWOT analysis of the proposed solution was carried out. The article is summarized by conclusions and recommendations regarding further work on the transport demand model management system.

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BENCHMARKING OPERATION READINESS OF SEOUL METRO LINE 9 BY USING ARENA SIMULATION METHOD

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ABSTRACT

Among aggressive competition between railway industry and other transportations in many countries, the requirement to extremely pushes services forwards for responding passengers' demand has been expected from train operators. Afterwards 1980, Metro or subway was firstly operated in London, United Kingdom. Congestion on traffic system favors metro over existing other public transport, and metro has been continually serviced in approximately 157 cities in 55 countries around the world. Seoul Metro, which operates in the capital of South Korea, provides extensive services within the city. Seoul Metro has been serviced since 1974 and, the latest line is Line 9 open on 2009. The line 9 services between Geawha station to Sports Complex station. Operating via essential places (Gimpo Int' Airport, Yeouido, Gangnam) in Seoul city, line 9 is believed as a critical line effecting on Seoul economics. The distinctive point represents on the faster services from the Gimpo International Airport to the city centre within an hour. However, the report from Seoul Solution (Lee and Hur, 2017) stated that Line 9 faced with an operating problem. There was occurring intensive problem during operation that is a demand for high traffic volume. The report found that an average daily traffic volume reached nearly 100% in 2010. Moreover, the application of passenger on line 9 has been increased every single year. The report also mentioned another issue that there lacked number of a train in service. This research conducted this issue and aimed at providing practical methods to improve an overall operating system. Therefore, the comparison between standard and developed scenarios will be performed via ARENA simulation. The result will be discussed based on the suitability of traffic management and resources utilisation. The value of this research can be used to develop an extension route of the third phase in 2019.

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URBANISATION THROUGH THE BENEFITS OF HIGH-SPEED RAIL SYSTEM

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ABSTRACT

High-speed rail (HSR) acts as a prominent role in society, particularly in urban areas. The requirements to extremely push services forwards for responding passengers' demand has been expected from train operators due to the connectivity of HSR implies on socio-economic dynamics and economic growth. Since 1964, the world's first HSR was launched in Japan and linked between Tokyo and Osaka. It made a huge success both in economic and society caused by the HSR system had been explored to other countries including France, Spain, German, USA, and China within a short time. This study conducts the successful case studies of HSR service to analysis on the accessibility of a region and, its effects on urbanisation. Based on the positive impacts of HSR, the land pricing and population dynamic are concerned with primary factors. Within these sections, the research pointed out the apparent benefits after servicing of the new HSR line, which can be led to sustainability improvement in future. This research aims to examine the significance of HSR impacts and its roles in reforming urban areas. Therefore, the study brings out a case study of HSR in China (Shanghai and Minhang districts) to analysis via the analysis of variance (ANOVA) methods to find a correlation of HSR services with population dynamics and property prices. Also, the Durbin-Watson statistic and Remedial measurement method are applied to eliminate the disturbance of auto-correlation. As a result, the research found that HSR significantly increased an employment rate and, it also leads to enhancing property prices especially within 5 km radius from HSR stations. Besides, the regional accessibility of HSR services and the cooperation of the city development are a key factor to generate the positives impact on society.

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PLANT BIODIVERSITY STUDY OF RING CANAL GREENWAY IN SHENYANG

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ABSTRACT

Urban greenway is an important part of urban Green space. Its plant biodiversity plays an important role in maintaining the health and function of Greenway ecosystem to recreate a similar natural environment. In this paper, the plant biodiversity is studied with the correlation to the characteristics of the greenway. The greenway of Shenyang Ring Canal consists of three artificial canals, the South Canal, the Guard Canal and the North Canal. According to the greenway spatial distribution and the nature of the plant, about 2-3·km-1 typical sample plots along the length of the greenway was selected to investigate the information of the plants and the plant communities. 12 indexes of plant species biodiversity, 4 indexes of plant community characteristics were extracted. 5 landscape pattern indexes and 4 environmental factors of greenway were extracted from the remote sensing image of Shenyang by GIS. The plant species composition and species diversity of the greenway were studied from the richness, evenness and total diversity of the species in the sample land. The data was analysed with SPSS to assess the correlation between plant diversity and the plant community characteristics, landscape pattern and environmental factors of the greenway. The purpose of this paper is to explore the factors affecting the plant biodiversity of urban Greenway, and to provide some basis for the planning, design, construction and management of urban ecological Greenway landscape.

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ECOLOGICAL FUNCTION AND SPATIAL PATTERN OF RING CANAL GREENWAY IN SHENYANG

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ABSTRACT

Since the 1990s, Greenway has been a research hotspot and frontier of protection biology, landscape ecology, urban planning and landscape design. The greenway of Shenyang Ring Canal consists of three artificial canals, the South Canal, the Guard Canal and the North Canal. In the paper the ecosystem service value and the spatial pattern of the greenway is studied that contributes to the urban economy and the construction of liveable environment. ArcGIS software was used for the grid data of the greenway and the landscape pattern indexes of greenway was extract by Fragstats software, such as average patch area, patch dimension, connectivity and spread degree, from the remote sensing image of Shenyang. CITYgreen model was used for quantitative analysis of the carbon sequestration and the air purification caused by the greenway. Subsequently the corresponding economic benefits were calculated. Based on the analysis of landscape pattern, it is shown that the ecological benefit of greenway can be improved by optimizing the landscape pattern. The composition of Greenway landscape plays a key role in the efficiency of Greenway ecological service. As an important part of ecosystem, Greenway contributes significantly to the ecological benefits of cities.

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CYCLING MOBILITY FOR A GREEN MICRO-ECONOMIC DEVELOPMENT OF THE APPENNINE INLANDS

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ABSTRACT

This paper refers to a University of L'Aquila (Italy) research project on the cycling mobility micro-economic effects in the Appennine inland of Abruzzo (Italy) that is one of the greenest Region in Europe (30% of its territory consists of parks and protected areas). The territorial context coincides with the highland of Navelli (about 800 m a.s.l.) which is internationally known for the highest quality of the saffron produced. The area includes seven historical small administrative independent residential centers, and a significant religious-architectural heritage. The highland is crossed by an historical sheep track – the ancient routes of transhumance of sheeps, which connected the mountain of Gran Sasso in Abruzzo with the lowlands of the Region of Puglia since the time of the Roman age. For its importance and extension (the longest - 244 km - and most important of the ancient five sheep tracks in Italy), it's called "Royal sheep-track". The study area was struck by the 2009 earthquake that destroyed the most private and public built heritage. The territorial and socio economic analyses revealed a common criticality of the inlands due to a difficult accessibility, lack of services, farming unprofitable, low per capita income which caused since 1900's a strong demographic move away (46% less between 1971 and 2001). Therefore, there is a large number of private dwellings that are not used. The study aims to consider the post-earthquake reconstruction as an opportunity for starting a "green" and economic development model based on i) cycling tourism, ii) territorial/architecture enhancement, iii) heritage buildings recovery and use, iv) micro entrepreneurial activities in the receptive field. To this purpose, a main cycling path (25.1 km long) mostly realized on the ancient sheep track is proposed and designed. It is associated with complementary cycle trail system articulated in order to reach all the residential centers and the highland main religious-architectural values. For compliance of the existing landscape and archeological constraints and for an environmental sustainable policy mostly (85%) of the cycling path crossing the sheep track is realized by tamped earth while the remaining part is made in ecological asphalt. A cost-benefit analysis has been carried out in order to evaluate the socio-economic impact by assuming: i) a public financing connected to the post-earthquake reconstruction for the cycling path construction and for the recovery of the damaged heritage that is some previously initiated ii) the private contribution to develop and handle the receptive activities. In addition to the health, social, sportive, ecological benefits related to this green development model, the direct economic results show that: a. An investment estimation of 2.8 million of Euro for the cycling path construction; b. A number of users/tourists equal to 14,000 per year with an average charge of 64 €/person/day; c. An investment payback time of about five years. More details will be explained and discussed in the full text.

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CHANGE OF ACOUSTIC CLIMATE FOLLOWING INTRODUCTION OF ROAD NARROWING ON DIVIDED STREET

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ABSTRACT

Challenges involving road safety in town and cities have increased recently, due to development of motoring. Local authorities are facing the dilemma of how to decrease the number of road accidents through the use of various traffic calming devices. Moderate traffic calming devices are used on throughways crossing towns with higher permissible speeds and occasional pedestrian traffic. One of such divided streets in Szczecin was narrowed on both sides by the introduction of traffic separators and U-21 road sign. The authors conducted a series of speed and road noise measurements of the street. Measurements were performed at the same traffic volume levels to assess changed road conditions and probably changed acoustic climate. The paper presents speed measurement results along the applied road narrowing and acoustic maps before and after the application of road narrowing on both sides. The narrowing resulted in non-uniform speed changes along the device. Only motorists in the inside lane, moving along heavy vehicles on the outside lane, reduced their speeds. The presented Leq measurement results of road noise along the road narrowing on both sides, on divided road, showed that the narrowing did not produce rapid changes of road noise levels. Differences of ΔLeq noise levels at successive test sections in the vicinity of the narrowing were 1-2.5 dB(A). Analysis of the applied traffic calming devices of slight lane narrowing (0.5-0.6 m) was conducted. It showed that although speed changes occurred compared to the period before the narrowing had been introduced, the narrowing was not effective and can be used only at preliminary stage, i.e. before more restrictive measures of traffic calming may be introduced. It is crucial, however, that since the narrowing was introduced no road accidents involving pedestrians have been reported so far.

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EFFECTIVENESS OF ROAD CHICANES IN ACCESS ZONES TO A VILLAGE AT 70 KM/H SPEED LIMIT

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ABSTRACT

The development of motoring has increased life quality and pace. As a result, not only cities but also smaller towns and villages with roads face transportation challenges. The fundamental problem in smaller towns and villages is to ensure road safety at pedestrian crossings on through roads. The guidelines of road building recommend to introduce traffic calming devices at places where traffic enters a built-up area, to reduce speeds at the entry of a city or village. Chicanes curve the trajectory of traffic and consequently cause speed reduction. The authors conducted a series of speed measurements in free and continuous traffic flow conditions on major local roads with different types of road chicanes. For each case, additional data regarding road characteristics in the vicinity of a chicane were gathered, including the contour of the town visible while approaching the chicane, the distance from the chicane to the nearest buildings in the village, how visible the road continuity behind the chicane was, developments of the greenery and the type of traffic arrangement used. The paper analyses road sections with 70 km/h speed limit before the chicane, as on B-33 road sign. For comparison purposes, speed measurements were also conducted at the entry to the village, where although no chicanes were built, there was B-33 road sign with the speed limit of 70 km/h. The comparative tests aimed at determining whether drivers reduce speed when they see the road sign, because of the chicane or following another determinant. Comparative analysis showed that given B-33 sign (which introduces 70 km/h speed limit) at the entry zone to the town, drivers' speeds significantly exceed 70 km/h in free traffic flow. Even in continuous traffic flow, speeds usually oscillate around 70 km/h. The speeds are significantly lower behind the chicane. The maximum reduction of speed at the entry to the village was achieved for other determinants recorded in the study, including a clearly visible silhouette of the village, closely located houses, a horizontal curve behind the chicane with limited visibility of the further section of the road. >90% of motorists behind the chicane drive with speeds <70 km/h. At the entry zone which was an open space, with a well visible silhouette of the village, with the chicane approximately 200 m away from the nearest houses or at the entry zone covered with forest and poor visibility of the built-up area, 70-77% of motorists behind the chicane drive with speeds <70 km/h. If the access to the town is preceded by a long stretch of straight road section, with poor visibility of the silhouette of the village, only approximately 50% of drivers enter the village with speeds <70 km/h. Depending on the determinants recorded in the study, motorists in most cases exceed 70 km/h and enter the village with much greater speeds if there is no chicane.

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SYNERGY EFFECT OF SPEED MANAGEMENT AND DEVELOPMENT OF ROAD VICINITY IN WRZOSOWO

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ABSTRACT

In the era of increasing traffic volumes, traffic calming problems seem to be fundamental challenges that connect a number of related, although at face value independent, issues involving different social groups. The fundamental problem in smaller towns and villages is to ensure road safety at pedestrian crossings on through roads. The domestic and international guidelines of road design recommend to introduce traffic calming devices at places where traffic enters a built-up area and in central zones, to reduce speeds along the road cutting through a village. One solution is to construct traffic calming devices in entry zones. As a result, one obtains the so-called speed zoning even before a zone directly related to the scattered or dense housing development. The second issue is to apply traffic calming means in the built-up area. It would seem that the task should pose no difficulty and that it should be the responsibility of road workers. However, research and analysis into the effectiveness of traffic calming devices show that best effect is obtained through synergistic efforts of road builders, local authorities, urban planners and many other specialists. The example discussed in the paper, a village of Wrzosowo, clearly supports the thesis. The mere application of traffic calming devices may not necessarily bring the expected results. Combined efforts of road builders and urban planners can, however, be successful in effective control of speed zoning and reduction in some road sections. The paper presents results of speed reduction measurements of a pedestrian crossing on a regional road in an exemplary village. Measurements of road conditions were conducted three times, before the reconstruction, after it and after the introduction of all the elements of traffic calming, as designed by road builders and urban planners responsible for the development of the vicinity of the road. Analysis of results showed that the chicanes constructed in the entry zones to the village, if used alone, did not provide speed reduction along the throughway cutting through the village. It was only a combination of traffic calming devices and elements of road vicinity development that brought about the expected speed reduction, providing better environmental conditions and improved road safety. Conclusions drawn on the basis of conducted analysis confirm that the location of chicanes, the use of central reservation strip and traffic barriers must be closely linked to the development of the road vicinity and the location of road signs that inform motorists about the built-up area.

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PROBLEMS OF BALANCING THE URBAN AND NATURAL ENVIRONMENT ON THE EXAMPLE OF THE RIVER AREAS OF THE CITY OF CZĘSTOCHOWA

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ABSTRACT

The paradigm of sustainable development gives a new look at urban planning issues regarding shaping the cultural and natural areas of cities. An important element is the new view on the relationship between the river system and the city and its role in the urban biosystem. The river system was and is the main urban-creating factor, determining to a large extent the dynamics of urban development, as well as maintaining their settlement continuity. In the article, the author presents an example of the development and current problems of riverside zones as significant urban-forming elements, affecting directly the concepts of development of the city of Częstochowa. Starting from the mid-nineteenth century, the processes of anthropopression have accelerated rapidly. This phenomenon was related to the development of heavy industry (mining, metallurgy) and the textile and paper industry. Technological processes related to the extraction of raw materials and the production of industrial products resulted in changes in the urban and functional structure of the urban space. As a consequence, there was an increasing degradation of the natural environment and violation of the ecosystem. At the same time, intensive industrialization had a positive impact on the dynamics of the city's development in the 20th century. Częstochowa has become one of the important industrial and urban centers in Poland. The creation of an area of significant industrial zone and the use of "dirty" technologies led to the degradation of river areas. An attempt to solve problems of biological and cultural regeneration of the riverside zone and river valley areas concerns the reclamation of river areas and revitalization of post-industrial areas. The area of the Warta River is an important link between protected areas - including the valley of the Warta River, as well as natural forest clusters, landscape parks of the Warta river basins (Cracow-Częstochowa Upland, Forests of the village of Herby). Restoration of the riverside zone as a valuable cultural and natural area to the urban organism is an indispensable activity.

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BROWNFIELDS IN FUA OSTRAVA (CZECH REPUBLIC)

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ABSTRACT

Function urban area Ostrava is situated in the northern east part of the Czech Republic consisting of more than 1 million of inhabitants. Project Implementation of Sustainable Land Use in Integrated Environmental Management of Functional Urban Areas – LUMAT- CE89 supported from Interreg CENTRAL EUROPE Programme identifies environmental threats in sustainable development in this region. Important examples of them are brownfields sites and loss of agricultural soil. Start your abstract here… 250 to 500 words concise and factual abstract is required. The abstract should include the purpose of research, principal results and major conclusions. References should be avoided, if it is essential, only cite the author(s) and year(s) without giving reference list. Prepare your abstract in this file and upload it into the registration web field. Brownfields pose an opportunity for new utilization instead of building up farmland. But brownfields as such cannot fully compensate for greenfield construction. The main reason is various limitations that these sites bring with them. The paper focuses on the results of the analysis and the subsequent evaluation of the major brownfields in the area of Functional urban area Ostrava. In this region there are brownfields of industrial, mining, agricultural, transport or social nature. The analysis focused on the realistic use of the selected groups of areas. The reality of the use or temporary use was assessed both from the point of view of legislative constraints and from the point of view of ownership structures, and also from the perspective of their physical state and location. An expert estimate of the time needed for temporary or permanent based on similar examples was performed within the assessment. The evaluation respected the future use option that was the most realistic for each particular site. The assessment is supplemented by the information on the change of the built-up area in FUA Ostrava in the last decade, which documents the gradually increasing share of the built-up area. The objective of the evaluation provided in this article is to demonstrate the realistic use of brownfields as an equivalent of newly built up territories and to identify those brownfields that can be revived in the short term horizon. The approach and type of interventions is described for these site, that would accelerate the regeneration process. Suggested intervention options are implemented in the Brownfield Management Strategy Action Plan, which was also developed within the LUMAT project.

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SUSTAINABLE DEVELOPMENT OF THE MEDIUM-SIZED CITY: THE EXAMPLE OF OŚWIĘCIM (POLAND)

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ABSTRACT

The primary objective of the city is to provide a high quality of life of the residents. It is one of the reasons behind the migration of the residents, causing an outflow of the people or attracting them. Moreover, needs and requirements connected with the inhabited area are undergoing a constant change. All of the decisions taken in the cities and concerning their development are connected with the quality of the living environment and the quality of the urban space. The condition of the urban and natural environment has an important impact on the health and safety of the residents. The promotion of the city's development with protection of land against the urban sprawl, with respect for the cultural heritage, efficient infrastructure and social balance has become the main task of the medium-sized cities. Spatial structure of Oświęcim was determined by the development of Oświęcim Chemical Company. Multi-family housing units, together with the necessary services were created in the near vicinity of the company. The attention of the local authorities was directed on this part of the city called the estate. At that time, no investments in the historic part of the city were made. Oświęcim is an old town, with the history that dates back 800 years. The Old Town remained underinvested for a long period of time, which is visible to this day. The tragic heritage of Auschwitz – Birkenau, a former Nazi Concentration Camp has significantly shaped the image of the city, and historical legacy of the city remains in its shadow. This uneven development of the urban structure resulted in a number of social, spatial, economic and environmental problems visible today. Using sustainability in order to provide integrated development to urban areas has become one of the most important tasks of the city's development. "Sustainable development" perceives the city as a complex, connected and dynamic system, with many interacting processes of social, economic and spatial development. Numerous activities undertaken in Oświęcim are aimed at sustainable development of the city. This article presents selected actions which increased the attractiveness of the Old Town and its surroundings. The presented program is a part of the land development strategy called "Oświęcim Space for Meetings" prepared for the area located along the Soła river and the Old Town district, which are to serve the residents and tourists visiting Auschwitz- Birkenau National Museum. The areas selected for the program will undergo revitalization activities that will improve the quality of the urban space. There will be friendly, integrating green public spaces, and the areas will be activated by making them "attractive" also for newcomers – the tourists.

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REHABILITATION SPACES – ARCHITECTURE FOR CHILDREN WITH MULTIPLE DISABILITIES

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ABSTRACT

Supporting the development of children with multiple disabilities and raising the level of their autonomy requires the creation of a safe and inspiring environment. Conditions which it is supposed to provide decide about the effectiveness of the support and, in consequence, of the whole rehabilitation process. Developing the concept of rehabilitation space for children with complex, coupled or multiple disabilities, including intellectual handicap, requires making continuous attempts to answer some fundamental questions: what do we know about the possibilities of rehabilitation, what can we achieve by creating friendly architecture and what features should it possess? The aim of the publication is discussing the idea of creating spaces with the highest level of accessibility for users with a broad spectrum of disabilities. Based on a special school modernization project conducted in cooperation with the students of The Faculty of Civil Engineering, Architecture and Environmental Engineering (Technical University of Lodz), the Author discusses the strategies for providing children with the most comfortable and independent ways of taking advantage of the existing architectural facilities. It should be emphasized that the design team was expected to develop solutions allowing the preservation of the existing construction and functions of the school, having made an assumption that all kinds of interference would be restricted by the scarce funds which had been allocated for the transformation of the facility. Due to the fact that the school modernization project was based on the universal design principles, according to the regulations of the United Nations Convention on the Rights of Persons with Disabilities adopted on 13th December 2006, the designers resigned from many solutions that are currently considered as being operationally too difficult, costly, unaesthetic or stigmatizing, which in the future should become a new standard of architectural design. The paper presents examples of rational improvements realized by the application of varied, economically and aesthetically attractive design solutions, which could enable the creation of universal spaces. It also analyses the needs of an intuitive user, which can be fulfilled by employing simple methods of clear navigation within the buildings and in their surroundings. The possibilities of eliminating the barriers and supplementing hard-to-access stimuli with stimuli appealing to other senses as well as the use of orientation elements are being discussed. The Author makes an attempt to answer the question: what principles should be followed in the process of transforming degraded and unfriendly buildings and facilities into spaces which would inspire children to develop their maximum individual potential and build the highest possible degree of independence.

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URBAN GREEN INFRASTRUCTURE FOR SHRINKING CITY: CASE STUDY CITY OF OSIJEK

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ABSTRACT

Urban planning of contemporary city is challenged to ensure a quality environment, inclusive green infrastructure toward sustainable urban development. Recent studies of urban green infrastructure consider green areas in cities in the context of different cultures, different social and economic circumstances, as well as diverse urban trends. Changes of the green urban infrastructure in Eastern European cities have been endangered by construction abuse but also by changes caused by urban shrinking or urban sprawl. The aim of the paper was to provide a framework that enable creating data base of urban green infrastructure regarding its functions for the shrinking city. The framework was created for several urban levels starting from the whole city area, urban district, urban neighbourhood and green element. Four objectives were set in the paper: a) to review the existing classifications, typologies and functions of green infrastructure b) to provide a proposal for an analytical framework for multilevel classification of urban green infrastructure and d) to analyse green infrastructure of the city of Osijek, eastern Croatia, according to proposed levels and classifications. For the Osijek case study, the population density, the share of green infrastructure was presented for the whole area of the city and at the level of the city districts. The most populated and the least populated district were further examined according to the neighbourhood morphology and green functions. Lack of the classification of urban green infrastructure for the neighbourhood level was elaborated and a framework was proposed.

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THE EFFECTS OF URBAN SPATIAL DEVELOPMENT ON COASTAL ECOSYSTEMS: THE CASE OF MERSIN, TURKEY

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ABSTRACT

In the process of urbanization, protection of ecosystems and ensuring the continuity of the services they provide are very important in terms of the functionality of life support systems. Otherwise, degradation in ecosystems can have negative consequences for different dimensions, such as biodiversity decline, over-consumption of resources and climate change. In this context, as a result of urbanization, the loss of surface water drainage areas, the interruption of the continuity of green corridors and the increase in the size of impermeable surfaces cause problems in terms of sustainable development. Therefore, the attempts to ensure urban spatial development in harmony with natural areas in coastal areas are one of the most important issues of the planning agenda. The aim of the study is to reveal the relationship between the urban development pattern and the natural areas in the context of sustainable urban development, in the case of Mersin a coastal city in southern of Turkey. For this purpose, an interdisciplinary approach by using geographic information systems and remote sensing has been applied to understand the urban spatial patterns of Mersin. A multi-temporal change by using a series of satellite images for the three periods of 1987-2000-2015 have been analyzed. Threshold values was employed to detect built-up land and non-built-up land on the images. The results revealed that Mersin has spatially grown more than 6 times since 1980. The spatial growth is observed to increase by 80 % between 1987 and 2000 and by 60 % between 2000 and 2015. Under these circumstances, the development in Mersin has resulted in critical problems about decreasing of natural area in size, disconnecting of green network and degradation of coastal ecosystem. The results of the paper highlight the importance of determining the measurable variables for analyzing problems of urban forms for the future development strategies of cities.

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THE INFLUENCE OF VOLUNTARY ASSOCIATIONS OF MUNICIPALITIES FOR THE DEVELOPMENT OF THE TERRITORY

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ABSTRACT

The aim of the article is to analyze the current state of the register of municipalities in the Czech Republic with a focus on their influence on the development of the territory. Voluntary associations of municipalities represent one of the ways of interregional cooperation, the purpose of all associations of municipalities is to provide public services to their members. The first voluntary associations in the Czech Republic were founded in the early 90s. Association of municipalities is a public corporation which can be voluntarily created by municipalities for the purpose of mutual cooperation, protection and promotion of their common interests. Association of municipalities is mainly responsible for the fulfilment of public administration tasks in the areas of education, social care, healthcare, culture, fire protection, public order, environmental protection, tourism, communal waste and sewage, technical infrastructure, local roads and public transport. Since voluntary associations provide a wide range of services to their members, it is possible to identify the areas in which the investments needed for the sustainable development of the area could be directed. With the exception of the facilities for drinking water supply, drainage and wastewater treatment and building a common sewer system where the associations have already set up their own organizations to ensure these needs, the area of investment cooperation could be particularly designated as the area of environmental protection, common facilities providing pre-school childcare, social services focused the elderly as well as social housing. In this paper are mapped volumes of municipalities established in individual regions with a detailed analysis of the situation in the South Moravian Region.

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THE PRACTICE OF THE THERMO-MODERNISATION IMPLEMENTED IN HISTORIC BUILDINGS AND THE PRESERVATION OF ORIGINAL FAÇADE FABRIC OF HISTORIC BUILDINGS IN POLAND

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ABSTRACT

The striving to reduce the emission of harmful substances to the atmosphere as the resulting from the combustion of fuels for heating purposes, makes the building more environmentally friendly. All activities related to reducing emissions into the atmosphere are motivated by the increase of ecological awareness of developed societies and alarming reports on the effects of global warming. In Poland, the answer to this issue is legal regulations. In accordance with the regulations, it is necessary to aim at reducing the limit values of the heat transfer coefficient for partitions in rebuilding. These values will be successively tightened up to January 1, 2021. The fulfilment of the limit values of the thermal conduction coefficient is also required for historic buildings. For obvious reasons, historical buildings not to comply with the requirements of technical conditions imposed on the modern architectural objects. Structural technique of partitions in historic buildings and the building material used in them require additional measures to insulate the building. The practice of thermal insulation of historic buildings, so that they can meet the assumed technical requirements, is a challenge for designers and producers of materials used for building insulation. The first part deals with the issue of the influence of modern methods and techniques of thermo-modernization of historic buildings carried out in the light of legal provisions on the preservation of the authenticity of the historical tissue of the monument. In the work was analysed traditional and newest methods and materials used in the practice of thermal insulation of external vertical partitions in historic buildings with wooden and brick structures. In the second part, based on the conducted analysis, the effectiveness of the adopted thermo-modernization practices was determined, the type of threats resulting from the methods used to authenticate the historic structure of the facility. At the same time, a set of factors important for maintaining the authentic character of the historic buildings was determined. Summing up, as a result of the conducted research it has been shown that the currently used methods of thermo-modernization of historic buildings consisting in insulating vertical partitions from the building's interior are methods that do not devastate the authentic wall structure, but do not provide the expected and required technical parameters, and in the case of wooden architecture lead even to accelerated its degradation. Effective thermo-modernization methods involving external insulation of partitions destroy the value of the authentic tissue of the monument. The effect of tightening the law and the lack of good thermo-modernization methods may be the necessity to exclude monumental objects from use.

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AIR PURIFICATION FACADES IN THE CULTURAL DISTRICT CITIES

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ABSTRACT

Air pollution observed from the beginning of the industrial age has a negative impact on the health, quality and life expectancy of the inhabitants of urban agglomerations. The problem of particulate and gaseous pollutants in PM 10 fine particulate matter and PM 2.5 suspended in air is a particular threat. The emission of harmful substances is spatially and temporally differentiated in the urban area and depends on the degree of urbanization and the level of vehicular traffic as well as the season of the year. City centres filled with compact buildings of historic character are a special issue in the planned and implemented urban regeneration strategy. The multidimensional issues of the protection of the historic structure of the city centre are more and more important in the aspects of revitalization processes in line with the sustainable development of cities. The surface of the facades of the tenement houses currently undergoing renovation works can be used as the surfaces for air cleaning processes. The first part of the paper presents technical and technological possibilities applicable to the development of facades of architectural objects. In addition to vertical garden technologies, which are increasingly successfully used in architectural realizations, the latest developments are technology and material engineering using the importance of titanium dioxide (TiO2) - TiO2 nanoparticles, as a component of building and finishing materials, such as cement and facade paints. Titanium dioxide from the 1920s was used as an effective component of paints with excellent properties of opacity and bleaching pigments. Building materials containing TiO2 nanoparticles have revolutionized the building materials market at the beginning of the 21st century thanks to their special self-cleaning, bactericidal, anti-static and air-cleaning properties. These materials have also been used in conservation work. The second part presents examples of preservation work implementation using the latest material technologies and examples of green wall projects and the effects of these works. In conclusion, the paper focuses on the issue of facades in architectural objects of inner-city buildings and adaptation possibilities of these areas for the purpose of air purification and improving the quality of life of urban residents.

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HISTORICAL EARTH ARCHITECTURE IN TERMS OF CLIMATE CHANGE IN THE TEMPERATE CLIMATE AREA (CENTRAL EUROPE)

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ABSTRACT

The paper deals with the earth architecture and the assessment of the impact of climatic change on its external constructions. Under the concept of the earth architecture is meant of a *construction* which uses as an building material an unfired, raw soil. This material, being the structure of the oldest building structures, was also widely used throughout Europe until World War II. The preserved historic earth architecture represents the wealth of technical solutions and creates the European cultural heritage that should be protected. Unfortunately, in modern times, objects included in the earth architecture are subject to intense interference as a result of the need to adapt them to thermal parameters increased as a result of climate change. According to conservation rules, the only correct action in the case of thermo-modernization in this type of objects is the introduction of insulating material inside of the partition. The aim of the conducted research was to determine the optimal solution in the field of thermal insulation of external partitions for the two most popular earth architecture technologies found in Europe, namely: a structure made of compacted earth (pisé) and a half-timbered structure filled with trusses or braids and then covered with ground with chaff (colombage), or filled with raw or burnt bricks (bolt construction). The first part of the paper defines materials for inside thermal insulation of external construction partitions, from traditional (cork boards, sheep wool, wood wool) have been collected and described by the latest, such as aerogels made of silica with nanoporous structure and vacuum insulation - VIP (Vacuum Insulated Panels). The second part presents, theoretical, exemplary calculations for selected types of walls of earth architecture from the walls made of compacted soil with a thickness of 1 m and a half-timbered construction with 14 cm thick filled or plaited braids were carried out. The computer program WUFI Light was used to carry out the calculations. The conducted research suggests that in the case of walls made of compacted soil, the use of any insulation technology has a positive effect on its durability and efficiency, while for walls with a wooden structure filled with unexploded soil, available insulation materials are unsatisfactory.

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ECO-STRATEGIES FOR THE URBAN SPACE IN THE OLD CITIES

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ABSTRACT

The paper deals with the devoted to ecological architectural projects undertaken in the areas of historic urban spaces. In many Polish and European cities, historic urban areas have been preserved, including many completed in the 19th century. They create a valuable cultural heritage, which is currently undergoing a process of revitalization, the aim of which is to transform degraded areas in social, architectural and economic terms. The first part of the papers defines the main eco-strategies used during revitalization activities in historic urban areas. A division has been made: a. permanent eco-strategy being an intervention into the historic structure of buildings introducing techniques and technologies using renewable energy sources, energy-saving and environment-friendly installations, and b. temporary eco-strategy involving the introduction of architectural and artistic facilities within public and semi-public spaces using ecological techniques and technologies. The second part presents examples of implemented actions in Polish and European cities, which focused on temporary eco-strategy in public and semi-public spaces. The conducted research suggests that revitalization programs are often long-term and often destroy the original, well-preserved structure of buildings, which should be protected and used as a cumulative "embodied energy" (energy and labor load invested in the construction of the building). The answer to these problems can be ecological project activities consisting of small spatial treatments, with minimal effort, which thanks to their creativity and originality ensure high efficiency. These activities combined with the limitation of a thorough modernization of a historic building substance can be ensured by a successful revitalization process.

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THE CONTINGENT VALUATION METHOD IN THE STUDY OF ECOSYSTEM SERVICES ON THE EXAMPLE OF THE URBAN NATURAL SYSTEM OF LUBARTÓW

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ABSTRACT

The urban natural system (UNS) has a considerable impact on the quality and standard of life of residents of towns and cities. The system plays a key role in planning projects carried out at various levels. It also forms a principal issue in the shaping of landscape quality and the visual attractiveness of towns and cities. The progressing urbanisation and the intensification of building developments have contributed to the shrinking of urban green spaces. These circumstances accompany a growing need to improve the condition of the urban environment and to provide the residents of towns and cities with recreation areas close to their places of residence and work. The study results of the economic value of nature's ecosystem services are currently one of the strongest arguments for nature's protection and may prove particularly effective when supporting the sustainable development of towns and cities. One of the many methods of studying ecosystem services is the contingent valuation method. Its objective is to attain information on the respondents' willingness to pay for particular ecological services (WTP) or the amount of compensation they would be willing to accept for their loss (WTA). The aim of the research was the estimation of the value of ecosystem services provided by particular elements of Lubartów's UNS. The survey was conducted online in 2017. The monetary value of UNS was evaluated with the use of the contingent valuation method. For this purpose, the amount defined by the respondents in the survey which they were willing to pay (WTP) for the improvement of the quality of the environment and other advantages resulting from UNS, or for the sole certainty that a particular asset existed, or the amount of compensation (WTA) expected for the loss of that asset or limited access to it. The urban natural system of Lubartów (approx. 265 ha) was estimated by the residents at PLN 5,832,756 for WTP, and PLN 5,502,600 for WTA. Moreover, the respondents declared that annually they were willing to pay PLN 212 to ensure a non-degraded and correctly functioning natural environment or they were willing to accept a compensation of PLN 200 for its loss. The respondents considered the urban park to be of the greatest importance, but they earmarked the highest amount of money to the upkeep of kitchen gardens and garden allotments.

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LIGHTING OF THE URBAN INTERIOR IN THE RESIDENTIAL ENVIRONMENT

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ABSTRACT

Sustainable development is an inclusive concept, which has, among other things, significance for the shaping of architecture and urban planning assumptions related to the principles of sustainable design. They include the need to respect the land, care for present and future generations, rational management of the natural resources, energy efficiency and the use of alternative energy sources. The indicated attitude in the field of project activity is vital for its effect, which directly influences the comfort of living and social satisfaction, so important for the success of the investment. Sustainable design requires expressing the concern the natural environment, which is an inseparable part of the human habitat. It affects the comfort of living, the shape of pro-health conditions, and also has a positive effect on the psychological well-being of a person. The study aims to assess the impact of the climatic conditions on the quality of residential areas. Rational use of the characteristic features of climatic zones and the conditions that are associated with them determine the improvement of the quality of the built environment shaped by the man. Climatic factors such as solar radiation, temperature, air circulation and air humidity are essential for low-energy building, whose indicators depend on the use of appropriate technologies and materials as well as on natural factors such as climatic features. The object - in its full life cycle, taking into account its parameters or the energy demand, is controlled by the BIM standard, which gains an ever-growing number of supporters. It is also a technology obligatory in many countries, applied in the field of design practice, which is of particular importance for facilities with large cubic capacity. Control over bigger structures allows to minimise errors in the functioning of the facilities or plan the costs associated with their maintenance, including scheduled repairs and modernisation. BIM is particularly useful for controlling energy indicators of the facilities, whose sizes depend on the relationship between the natural environment and the constructed one. The analysis of the indicated compounds allows to formulate guidelines useful at particular stages of shaping housing development, and thus forming buildings and urban spaces. Variable meteorological factors are possible to be defined by conditions allowing the determination of climatic zones with their characteristic features. The degree of solar radiation depends on: the state of the atmosphere, the properties of the ground and other surfaces, the geometric layout of the considered urban interior including biologically active areas, population density, the size of the city, and the extent of its industrialisation. The temperature is also influenced by the size of the urban centre and the developed areas, population, the morphology of the place and accompanying meteorological factors (cloudiness, windfall). The article presents the influence of the insolation on the architectural object and housing conditions. It should be emphasised that solar radiation is necessary for the physical and biological processes on Earth, essential for human life. In addition, the energy of radiation is obtained without inputs associated with the source of the origin. Therefore, it is crucial for spatial planning, conditioning proper lighting of urban interiors and promoting thermal comfort in places of residence, using a natural source of heat.

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INTEGRATED SPATIAL PLANNING, LAND USE AND SOIL MANAGEMENT: NATIONAL REPORT SLOVAKIA

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ABSTRACT

The article focuses on summarization of key output of INSPIRATION project supported by European commision under H2020 programme at the level of Slovak Republic. National needs and requreiments for land use, land-use changes and soil management are formulated in the article based on the workshops and interviews with a wide range of crucial stakeholders in Slovakia. The national report was an input for an end-user oriented strategic research agenda (SRA), to scope out models for implementing the SRA and to prepare a network of public and private funding institutions willing to commonly fund the SRA. The article is a conclusion of project outputs „National report on the synthesis of collated information following the template and national workshops Slovakia“ and „The Europeans' Strategic Research Agenda for Integrated Spatial Planning, Land Use and Soil Management - June 2017 Green Paper“.

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URBAN PARKS AND SOCIAL INEQUALITIES IN THE ACCESS TO ECOSYSTEM SERVICES IN SANTIAGO, CHILE

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ABSTRACT

In emergent economies, severe social inequalities can produce high exposure to deprived environmental conditions, affecting people's wellbeing. Urban parks can greatly help to increase the urban environmental quality by providing fundamental ecosystem services, such as local climate regulation, recreation and sense of place. Urban parks are, therefore, key elements for urban sustainability. This is particularly important in urban settings where investment in green space is deficient. In this work, we monitor the relationships between socio-economic features and the provision of local climate regulation. To look at the potential mitigation of air temperatures we analysed a sample of seven parks and their surroundings in Santiago de Chile. Three physical variables were measured: land surface temperature as a proxy of air temperature, and vegetation cover and soil imperviousness as predictors. These variables were obtained from calculations based on Landsat imagery (2015), using the thermal bands, and estimated through normalised differences of vegetation (NDVI) and built-up (NDBI) indices. We used socio-economic as another predictor variable. This data classifies households in five groups according to the family income and education level. The socio-economic data was obtained at census track level and served to explore the relationship between physical variables (LST, NDVI and NDBI) relate to socio-economic data. In addition, we measure air temperature using 8 in-situ sensors inside and outside of each park measuring each 150'' during two days of high temperatures (over 25°C). Results showed that LST correlated significantly with vegetation cover and imperviousness (r spearman = -0.706 and -0.910, respectively). Socio-economic variables correlated with the same variables, where wealthier neighbourhoods correlated negatively to LST and NDBI but positively to NDVI, while poorer neighbourhoods had higher values of LST and NDBI and correlated negatively to NDVI. Differences between air temperature inside and outside parks were higher in poorer than in wealthier neighbourhoods with an average difference of 2.5°C with a maximum observed difference of 7.1°C. Our results highlight the importance of implementing urban parks in deprived urban settings, to contribute to reduce shortages and inequalities in the access to ecosystem services.

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MECHANICAL PROPERTIES OF COLD RECYCLED BITUMINOUS MIXES WITH CRUMB RUBBER

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ABSTRACT

Cold mix recycling technologies based on asphalt emulsion have been acknowledged for allowing to reduce the environmental burdens associated with road pavement maintenance and rehabilitation. In fact, mixing and placement are conducted at lower temperatures leading to energy savings, a reduction of asphalt aging, fume and odour releasing, and a general decrease of airborne emissions. However, there are still several concerns related to the high variability of reclaimed asphalt pavement (RAP), the lack of standard mix-design procedures and the fair/low mechanical performance often achieved especially due to poor moisture resistance. On other side, the addition of crumb rubber into hot mix asphalts is considered an environmentally-friendly and cost-effective practice in several countries. Producing bituminous cold mixes containing crumb rubber to develop a “greener” paving material with a performance level comparable to that of conventional materials, represents a great challenge to materials engineering. This paper presents the results of a laboratory investigation concerning the mix-design characteristics of cold 100%-recycled asphalt emulsion mixes, using crumb rubber to improve cold recycling engineered properties. Mechanical and volumetric properties were assessed through dynamic modulus and indirect tensile strength on dry and water-conditioned specimens.

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CHARACTERIZATION OF RECYCLED CONCRETE AGGREGATE AS POTENTIAL REPLACEMENT OF NATURAL AGGREGATE IN ASPHALT PAVEMENT

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ABSTRACT

The Construction Industry around the world generates the largest amount of waste and uses generally tons of non-renewable natural resources. The state of the art shows the potential use of Construction Waste and Demolition (C&WD) in different construction fields as its composition presents a wide range of materials. One example of C&WD with potential use in Pavement Infrastructure is Recycled Concrete Aggregate (RCA). RCA have been studied as possible replacement to natural aggregates in asphalt pavement, results have shown good performance and important environmental and economic benefits from the use of RCA with respect to conventional aggregates. This paper aims to evaluate the feasibility of using RCA obtained from different resources as a replacement material to natural aggregates in asphalt concrete mixtures. Natural aggregates (NA) from regional representative quarries were used in this investigation. Instead, RCA was obtained from two different sources; one source, was obtained from a concrete pavement demolition project (Recycled Concrete Aggregate Pavement source- RCAP), and the second source was obtained from the demolition of some concrete structures coming from a baseball stadium in Barranquilla´s city (Recycled Concrete Aggregate Building source – RCAB). Characterization of RCA and NA includes determination of physical, mechanical and chemical properties according to Colombian standards. Laboratory test results indicates that RCA could be a viable option as potential replacement of natural aggregate in asphalt pavement and to reduce the carbon footprint during the production of asphalt mixtures. Nevertheless, some intrinsic properties of the material must be considered with special care, e.g. absorption, abrasion resistance in both wet and dry conditions, pH, ignition loss and organic matter content. Finally, scanning electron microscope (SEM) provided images about RCA's surface topography and composition, finding significant differences between RCA and NA.

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INDUSTRIAL SYMBIOSIS AND LAND USE

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ABSTRACT

The industrial ecosystem can function analogously as biological ecosystem. Part of the industrial ecosystem field is industrial symbiosis, which engages *traditionally separate industries in a collective approach to competitive advantage involving physical exchange of materials, energy, water and by-products. The keys to industrial symbiosis are collaboration and the synergistic possibilities offered by geographic proximity.* Opinions differentiate among the researchers on the need for geographical proximity for industrial symbiosis to succeed. Two models of industrial symbiosis exist: self-organized industrial symbiosis model and planned industrial symbioses model, which is eco-industrial park. The paradigmatic example of the first model is Kalundborg in Denmark, while the second model is a conscious decision to identify various industrial companies that can share resources at the same location. Whilst we have, for centuries, precisely defined categories of land use in the field of agricultural use, which have shrunk to a smaller number of categories in modern times, we do not know of such precise classification for industrial areas. Basic categorization distinguishes simply between rural and urban land uses. Land use is an instrument of traditional spatial planning, while strategic spatial planning relies on elaborated vision, strategic goals, tactics and operative projects. However, social and economic activities in particular areas bring to the fore the relationships among various types of use. A precise inventory of various industrial uses, which includes waste products, offers answers to the questions in what way and to what extent the cooperation between industries could take place. Land use managing can contribute to developed holistic approach for industrial symbiosis, which promotes the instruments of land use planning and an adaptive management of the territory.

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HYDRAULIC, CONSTRUCTIONAL AND LEGAL CONDITIONS FOR BUILDINGS IN FLOODPLAINS: CASE STUDY OF KALISZ CITY (POLAND)

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ABSTRACT

The 2000 Water Framework Directive (WFD) and the 2007 Floods Directive (FD) have forced member states to introduce specific regulations and rules related to the development of flood plains. An important assumption of the introduced regulations is the gradual postponement of buildings from areas endangered by flooding. This is a rational approach from the point of view of minimizing the risks associated with flooding. However, many cities are located on rivers. The development of these cities is not possible or would be very limited without the possibility of developing areas very close to the river. Therefore, a conflict of interest arises between local self-government authorities, entrepreneurs, private persons and institutions responsible for flood protection and water management. The first group see urban areas close to the river as economically attractive and the second as the potential increase in the risk of flooding. The main purpose of the work is to present the scope of hydraulic, design and construction analyses supporting the decision making process on the development of flood plains. In the conducted research, a case study was used for the city of Kalisz located in central Poland on the Prosna River. It is planned to build a housing estate in Kalisz within areas threatened by flooding. Both residential, administrative and industrial buildings of Kalisz are located very close to the Prosna River. Unfortunately, the city has a weak system of flood protection caused mainly by the lack of funds. The local water management board is very reluctant to refer to projects related to the further development of areas close to the river, which, in its opinion, will further increase the risk of flooding. The paper shows that carrying out detailed hydraulic, design and construction analyses significantly supports the legal process of issuing permits for the development of areas threatened by floods.

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A METHOD TO CONTRAST THE IMPACT OF EXTREME PRECIPITATION: A CASE STUDY IN CENTRAL ITALY

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ABSTRACT

Climate change, which is affecting all over the world, leads to different impacts on the environment and therefore on human life. One of the most important impact is the increasing of extreme precipitation. Increases in heavy precipitation may not always lead to an increase in total precipitation, over a season or over the year. Heavy precipitations increasing has also been documented even when mean total precipitation decreases (Dore M. H. I., 2005). This may occur when the probability of precipitation (the number of events) decreases, or if the shape of the precipitation distribution changes, but this latter situation is less likely (Buffoni et al., 1999; Groisman et al., 1999; Brunetti et al., 2000). Some climate models forecast a decrease in moderate rainfall, and an increase in the length of dry periods, which offsets the increased precipitation falling during heavy events. Climate impacts are compounded by urban development, which removes the vegetation and soil that slow and filter water, coming from rainfall. Urban sprawl also increases impervious surfaces, which move water over the land and put them, directly, into receiving lakes, rivers and estuaries (Centre for Climate and Energy Solution, 2018). To contrast these negative impacts, a solution may be to limit the use of non-permeable surfaces, like concrete, in the urban areas. In this regard, the authors, as researchers of “Sapienza University of Rome”, are studying the possibility of using, in the parking areas of a central Italian city (Rieti), pavement with "green infrastructure", that can reduce runoff and flood risks during storms. The construction of the pavement with "green infrastructure", can first mitigate the effect of exceptional rains, secondly reduce the soil consumption. Permeable, or pervious, pavements reduce runoff by allowing rain and melting snow to infiltrate (Centre for Climate and Energy Solution, 2018). A first study of the materials, that can be used as parking paving, has led to estimate the possibility of absorbing 4.9 l/s of water per square meter. In the case study, object of this paper, the authors have first calculated the area, in square meters, of the municipal parking areas of Rieti city. Secondly, they have valuated the possibility of change the concrete pavement, today present in this areas, with a "green infrastructure" pavement, and they have estimated volumes of water that will be infiltrate, in case of extreme precipitations. This estimation was made through the real precipitations data of the last 15 years, measured by the National Hydrographic Service of Italy.

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THE EFFECTS OF GREEN SPACE MORPHOLOGY ON URBAN AIR ENVIRONMENTS

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ABSTRACT

Texas is known one of the most polluted states in the United States. Urban and suburban sprawl and public invest in car-oriented infrastructure exacerbate the environmental quality especially in large cities. Although there are progressive efforts to revitalize urban spaces across the state, the triple bottom line (TBL) that supports sustainability from environmental, social, economic perspectives has disclosed an imbalance in many urban planning and design practices. As a measure to gauge urban sustainability, this study examines the relationships between urban form, green space morphology, and urban air quality focused on particulate matter. Using spatial data from selected six cities in Texas, the amount and spatial pattern of urban green spaces including parks, gardens, tree cover and canopy, and other green space-related features were explored relative to the city-wide pollution level. In addition, the elements shaping urban form such as city size, urban density, and street canyon dimensions were taken into consideration as a variable to understand the urban air quality issues. Although the urban form factors were not significantly associated with the level of air pollution across the case cities, the quantity and quality of urban green spaces has relevance to the urban air environments. This suggests that at any given city with varying degrees of density and urbanization intensity, there is substantial scope for maximizing environmental performance through careful planning and design interventions for urban green spaces. Although the direct correlation would need a sophisticated experimental setting, the findings reinforce the contemporary body of research investigating the effects of green spaces in the provision of ecosystem services in urban setting, and has urban policy implications for guiding urban development that will mitigate urban air quality problems and promote environmental sustainability and human health, simultaneously.

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CITAGRA: THE COMPACT CITY WITH INTEGRATED AGRICULTURE AND ECOLOGY

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ABSTRACT

The growing problem of urban sprawl – low-density, fragmented, and car-dependent development on greenfields – is increasingly serious for both Europe and the rest of the world. It brings with it a number of negative consequences for human health, well-being, social and economic performance, and negative ecological impacts, including emissions contributing to climate change. Therefore, in order to improve urban quality of life and address the “20-20-20 strategy” global objectives, we propose a series of pilot projects that introduce significant planning, managerial and technology initiatives combined to enhance cooperation of the European citizens with experts. To increase the extent and health of the urban cultivation and maximize the benefits of an urban canopy, cities need integrated approach and innovations from city planners, engineers, landscape architects as well as citizen advocacy and participation along the lines of public-private partnerships. We presume that even if various actors share a common vision, it needs more knowledge for maximum benefits to develop. Our thesis is that urban cultivation can have not great in amount, but significant role as a catalyst for socio-economic sustainability. Comparing benefits from urban forest and agrarian functions, which in many places would rival for the same space, would be necessary. There is now an increasing body of knowledge that several measures of high urban density, including residential, retail and service density, street-intersection density, and land-use diversity, might have important public health consequences. With more evidence, one can plan neighbourhoods that are more compact and more attractive (thanks to the activity-influencing factors such as local services, public transport, leisure, agrarian activities and more), halt invasive sprawl, promote physical activity and social interaction, and shield from environmental and social negatives such as pollution and feeling unsafe. In this project, the Nature-Based Solutions concept will be applied to improve impact on quality of life. In this sense, CitAgra would leverage the EU agenda by making the project a form of pilot implementation. By leveraging European expertise and experience, we can provide benefits for other parts of the world confronting related challenges.

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ONE DIMENSIONAL HYDRODYNAMIC MODELING OF FLOOD WAVES PROPAGATION USING MIKE11

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ABSTRACT

In the recent years, the climate changes have determined the increase of the frequency of the flood, and concurrently, negative effects of these weather phenomena were amplified by other factors (the deforestation, needs of the hydro technical works, etc. Thus, it is required to develop tools for flood prediction and prevention. Current paper presents a research of 1-D mathematical modeling of flood wave propagation application on Rausor River of Ramania, the modelling is based on the Saint-Venant equations. A flood wave is a rapid rise of water in a creek that occurs when a head of storm runoff develops and moves downstream. In this paper, it has been used MIKE 11 software for modelling. The channel flow is desscribed by using river modelling system , Mike – 11 , which solve one dimensional Saint – Vennat equation. Flood wave propagation along rivers is significantly influenced by the storage capacity of floodplain and bottom valley. In order to correctly reproduce the reduction of the peak discharge along the water course, the inundation of floodplains must be carefully simulated. In order to map the flood prone areas, it is common practice to apply 1D mathematical models to simulate the propagation of flood waves. The river network and cross- sections, for the study, were extracted from the field surveyed contours of this river. Finally, the results of this study show simulation of the flow, making the comparison between the estimated and observed stage hydrograph.

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FAST – IMPROVEMENT OF URBAN PERIPHERY WITH PUBLIC SPACES

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ABSTRACT

Urban environment should be created or transformed with the respect for its multiple uses, requirements, and meanings. It should enhance people's environment increasing its sustainability and fragile balance between constituents. One of significant categories of components within urban space is public space, an important type of areas being the container of multitude of social behaviours, interactions, social, economic, and cultural activities. Standards for sustainable development aim to foster designers' performance based on objective basis, to find relevant and reasonable means of this kind of improvement. The idea described in the paper relies on parametrisation and objectivization of design process related to either master plan or advanced urban scheme in which demographics, related group behaviours, fluctuations or time-related phenomena are acknowledged and present in analyses and simulations of urban design results. The analyses start from establishing the capacity of area and incorporate preliminary concept of functional distribution as well as local road system taking into account structure of ownership and geodesic divisions. These pieces of information provide the initial input. Then two parallel analysis and simulation courses are processed: one related to estimated parametric behaviour of the area (capacity – inhabitants, generated traffic of different types of users, energy performance and related requested media development, etc.) and the other being part of multi-criteria assessment established within FAST methodology. Integration of quantitative and qualitative data returns test results of efficiency of these public areas in giving adequate possibility to fill them with appropriate activities. The structure of the paper will present the methodological structure of the research (FAST methodology related) and attempt to compare different urban environments in the process of the making: one single family housing area and one multiapartment, medium-height and density housing estate. It will advocate for extensive yet reasonable and quality-driven implementation of public spaces in urban peripheries, quite often plagued by spontaneous and uncontrolled development processes.

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QUALITATIVE RESEARCH OF CONTEMPORARY ARCHITECTURE AND SPACE OF EUROPEAN CITIES IN THE ASPECT OF CORRELATION: THE PRINCIPLES OF A SUSTAINABLE ENVIRONMENT, THE PERCEPTION OF SPACE AND TECHNOLOGICAL SOLUTIONS OF OBJECTS

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ABSTRACT

The environment built in modern Europe is undergoing constant change. Changes occur both in terms of functional needs of users of architectural space, as well as in technical and technological requirements of the objects themselves. A particularly important aspect in the study of architecture is the use of modern, ecological building technologies while maintaining such features of the building and space as: identity, cultural heritage, environmental context, aesthetics. Aim of the research: qualitative research of contemporary architecture and space of European cities in the aspect of the occurrence of correlations between the principles of a sustainable environment, the perception of space and the technological solutions of objects. As main results; contemporary realizations of space and architecture show the application of many technologies and principles of a sustainable environment, respect for the natural environment, and the use of analogous systems to those found in nature. It was also observed to adapt the environment built to the changing climate and the effects of these changes. The studies also show the connection of new objects and spaces with the tradition of a given place, as well as taking into account the habits and needs of users. It can be concluded that Contemporary European architecture, despite having to adapt to changing conditions.

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CITY LIGHTING MASTER PLAN AS A TOOL FOR BUILDING A CITY DEVELOPMENT STRATEGY

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ABSTRACT

Term "city lighting master plan" seems relatively easy to define. This is the plan of the night image of the city. However, as the examples of analyzed cities show, each lighting master plan must be defined individually. Each city has its own topography, identity, culture, history, tradition and ambitions. They need to be skilfully determined and then hierarchized. As a result, the lighting should be so balanced that it would improve the quality of life in the city. Model of life of contemporary societies evolve, there are new needs, new investments in buildings and public spaces designed to spend time in the late evening and night. In such context, illumination plans and proper coordination of lighting is becoming increasingly important. It is not just about creating the image of the nocturnal landscapes, but also about associated efforts to: a. reduce the consumption of electrical power, b. reduce the level and duration of illumination and the associated greenhouse effect, c. reduce light pollution in both the landscape and the atmosphere, d. focus illumination efforts in the places most predisposed to do so. Skillful usage of darkness, avoidance of the nighttime's overexposure of the landscape and lack of introduction of visual cacophony of images of nocturnal space becomes the special premise of the lighting design. Currently, each of illumination and lighting design should meet certain economic criteria, energy and environmental issues such as energy savings, reduction of light pollution, respect for the world of plants, animals and dark sky. The ambition is that the environmental aspects are included in all concepts of illumination and lighting as an indicator of the quality of creating a night landscape. Given that almost every economic crisis translates into budget and energy restrictions, in the plans of illumination and lighting, these aspects must make an important element of verification of design intent. Article aims to present lighting master plan as a tool for building urban development strategies and to present the inversion of a lighting master plan into a darkness plan that is already taking place in many cities.

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EFFECT OF DISCHARGE CHANGES ON THE QUALITY OF WATER RESERVOIRS USING THE C-EQUAL MODEL: CASE STUDY OF TAHAM DAM

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ABSTRACT

The restriction of water sources, population increase and economic growth, process of industrialization of cities, and its subsequent increasing process of growth in demand in different fields, has resulted critical conditions for water sources of world, and especially for our country. Due to the shortage of water resources and the shortage of drinking water supplies as the most important demand, all aspects need to be considered in terms of quantitative and qualitative supply of high-capacity research. Nowadays, water quality simulation models help the experts to evaluate future potential scenarios according to extensive various conditions. The two-dimensional hydrodynamic model and water quality CE-QUAL-W2 provide potential solutions for water temperature management, and evaluates quality indicators under different operating scenarios. In this research, by selecting the Taham Reservoir Dam as a case study, changes in temperature conditions and quality indicators during the months of September 2016 for one-year exploitation are examined. Investigation of the effective factors on thermal shear and qualitative layering (TDS) show that reducing the wind impact coefficient (wsc), which has the most effect on the calibration of temperature in the Tahm dam, reduces the temperature in the roll and between the layers during the layering period. While in the mixing period, the reduction of this coefficient reduces the reservoir water temperature throughout the reservoir depth. In this research, the study of qualitative characteristics based on discharge changes has been considered. Increasing and decreasing of 5%, 10%, 20% of annual discharge has been done and all changes in reservoir have been analysed using CEQUAL-2w model. The results of the modelling indicate the occurrence of the phenomenon of thermal layering and, on the other hand, increase the quality of improper parameters in the event of a decrease in the discharge. The model was heavily sensitive to the rate of discharge, with its reduction, salinity has largely been overtaken in one year.

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THE IMPACT OF PROJECTED SPATIAL DISTRIBUTION OF CITY RESIDENTS ON THE DEVELOPMENT OF TRANSPORT INFRASTRUCTURE

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ABSTRACT

At present transport analyses related to road traffic and public transport in Europe and Poland are widespread used. They concern both the actual state, especially at the scope of functioning of existing transport solutions and proposed changes, for example in the public transport service as well as the forecast period. The inhabitants' expectations are usually much higher than the budget possibilities of local governments. This also applies to investments co-financed by the European Union within the funding period of 2016-2020. Therefore, it is necessary to take measures to rationally invest in the development of transport infrastructure, taking into account future transport demands. Such transport analyses constitute an indispensable part of feasibility studies aimed at demonstrating the economic viability of a given transport investment. However, the key assumptions in the area of future transport demand of residents that form the basis in transport analyses raise doubts. Often, in this type of analysis, the indicator method of transport needs growth is based on the extrapolation of historical data. It can be a critical point in these analyses. The article presents an example of traffic analysis carried out with two methods - an indicative method and based on spatial development plans, taking into account spatial arrangement and both demographic trends and changes in the age structure of residents. Differences in the results of analyses and the possible consequences of applying each method in economic analyses of the legitimacy of transport investments are presented. The paper is summarized by conclusions and recommendations in the field of methodology for determining transport demands of residents in investment areas.

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SUSTAINABLE LAND USE PRINCIPLE AS EMPLOYED IN THE REVITALIZATION OF A ZINC SPOIL HEAP LOCATED IN RUDA ŚLĄSKA, POLAND

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ABSTRACT

Part of the project called “Implementation of Sustainable Land Use in Integrated Environmental Management of Functional Urban Areas - LUMAT” comprised the revitalization of a zinc spoil heap in Ruda Śląska, Poland. The first step was conducting a meeting with the local community inhabitants by The ARCA Studio in order to learn their expectations and propose ideas for the area development. The next step was making a thorough study of the area conditions by The IETU Institute and HORTUS Studio. The area is located in the neighborhood of a highly populated settlement and can be potentially used as a recreation place. The main problem to solve was the high contamination of heavy metals in the heap and the remediation of the area surface. An additional danger was the steepy slopes of the spoil heap. The 2017 design created by The HORTUS Studio provided a broad program for the heap surface remodeling by covering it with protecting clay and soil layers. Besides, the majority of the area is turned into a meadow with plants of special protection features for phytostabilization. Part of the area is dedicated to the gradual rebuilding of the plant cover species composition. In order to protect the local biodiversity nearly all the designed plants are native. Some parts of the existing plant cover are left to demonstrate the historical metallophyte plants together with a sharp rock of spoil material. The functional program meets the local expectations, having been consulted several times with the inhabitants and local authorities. The recreation program contains a playing field, grill spots, view points, a Street Workout, a playground, bicycle jumps, field hammocks and education paths. To support the local identity a playground was designed with the forms taken from industry; the educational paths provide information about the history of the local industry, the features of the spoil heap deposits, the local architecture, the natural plant communities and the birds living there. The aim of the paper is to show the complicated ways of design on postindustrial brownfields as related to sustainable land use, biodiversity protection and respect for local identity.

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CLOSED URBAN BLOCKS VERSUS OPEN HOUSING ESTATE STRUCTURES: SUSTAINABILITY SURVEYS IN BRNO, CZECH REPUBLIC

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ABSTRACT

A prominent place in the spatial arrangement of Czech as well as other post-socialist, Central European cities belongs to 19th century closed urban blocks and the open panel housing estates which were erected during the socialism era in the second half of 20th century. The urban characteristics of these two fundamentally diverse types of residential structures have, as we suppose, a different impact on the sustainable development of the urban area. The amount and character of local greenery, the spatial arrangement and accessibility of the courtyards, the spatial forms of the surrounding buildings and many other factors can influence the ecological stability of the area, its hygienic qualities, the intensity and way of using by various social groups, and also e.g. the prices of real estates. These and many other phenomena indicate the ecological, hygienic, social and economic sustainability of the urban area. The research methodology evaluates specific measureable indicators of sustainability within a range from 0 to 10 points where 5 points correspond to the general standard in the area, 0 points indicate degradation, and 10 points indicate the highest contribution to sustainable development. The survey results are reflected in the overall sustainability index and in the residents' satisfaction index that reflects the subjective satisfaction based on questionnaires surveys. The paper analyses the residential structures in the Central European city of Brno, Czech Republic. The case studies of the urban blocks near the city centre and of the panel housing estate Brno - Vinohrady are compared. The results imply that a considerable positive impact on the sustainable development of the area should be ascribed to the green closed urban blocks near the city centre. These urban blocks with a closed courtyard provide a quality outdoor environment with a certain level of privacy. This factor can significantly support the development of local community.

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OPTIMAL DESIGN OF BUILDING FOR URBAN WIND ENERGY UTILIZATION

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ABSTRACT

In Bratislava broader central zone began intensive construction of high-rise building with total height of 90 to 125m. The article deals with numerical and experimental investigation of wind flow in roof area and optimal design of input parts, where is possible to use IRWES system (Integrated Roof Wind Energy System). Orientation of some high-rise objects is suitable for using wind power. In the first phase the selected building was investigated using CFD simulation in the ANSYS program for creating space for three VAWT small wind turbines in the area of 2 technical floors. For the solution of 3D steady RANS equations was standard k-ε model used. For near-wall treatment the standard wall functions by Launder and Spalding were used. According wind pattern we designed three sections and optimal shape of the top of building. Possible variants of small wind turbine with vertical axis are based on mean wind velocity more than 8 m/s. By using 3D print technology, model of the structure in scale 1:300 with rough façade was created. Experimental measurements were performed in Boundary Layer Wind Tunnel in Bratislava. To measure the mean wind velocity and standard deviations in open top of building we used the Irwin omni-directional probes, which were evaluated using digital pressure scanner DSA 3217 from Scanivalve. Pressure taps were placed on the façade in height 92,7m and 97, 8 m to measure external wind pressure. Model was placed on rotating table with step of rotation 15° for simulation of various wind direction. Measurements were made for 3 reference wind speeds, which fulfilled flow similarity of prototype and model. We have compared the results of the numerical simulations and experimental measurements and obtained information on the average wind speeds at the VAWT site. Due to the significant increase in small vortices at the entrance, that have been experimentally and numerically detected, it is necessary to insert a rectifying grid in inlet region. Comparison of the mean wind velocity and external wind pressure coefficient obtained by CFD simulation and experimental measurements showed a good match. Considering the annual average wind speed at about 100m above sea level, we compared the wind acceleration at the turbine site. The wind speed distribution results obtained by CFD end experimental measurements in BLWT allow us to select a suitable VAWT type, see Battisti et al. 2009 in this area and height above ground in Bratislava city center. In accordance with power curves it appears that three-bladed configuration H-rotor DU06W200 and 2-bladed H rotor NACA0018 will have maximal annual energy output. The wind energy potential is based on average local wind velocities as well as the IRWES wind energy characteristics. Annual energy output for wind velocity higher than 8m/s for the considered turbines and three buildings should give 70 MWh/year.

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"WATER SENSITIVE CITY" WITHIN CITY AS A STRATEGY TO ACTIVATE POLLUTED URBAN AREAS

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ABSTRACT

The paper deals with the possibilities of urban and architectural design to benefit human condition, which encompasses physical well-being, environmental quality of life in big cities during the Climate Change era. Cities are dependent on the ecosystems beyond the city limits, but also benefit from internal urban ecosystems. This paper focuses on issues relevant for urban areas, the attention is on direct and locally generated services relevant for Szczecin. The first part of the paper depicts what the term "water sensitive city" means in urban design as a way to encapsulate a fuzzy concepts of an ideal relationship between people, governance, built environment, infrastructure, living ecosystems, resource use (e.g. energy) and water. This section also includes the example of North Harbour project, Northern Europe's largest new urban development area in Copenhagen where this concept is implemented. The second part of the paper presents the results of the research for Łasztownia Island in Szczecin by Jakub Golebiewski and Tomasz Sachanowicz team (West Pomeranian University of Technology in Szczecin). Currently, Łasztownia Island remains a degraded and polluted area in Szczecin's inner city. In conclusion, the paper emphasizes the implementation of the "water sensitive city" concept in the desired strategy for reactivation this urban area. This also allows the ecosystems close to the city centre to be linked with larger ecosystems outside of the city.

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Session Title:

Urban Sociology

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CITY, SPACE AND PUBLICNESS: PERCEPTIONS AND EXPERIENCES IN THE CASE OF ISPARTA (TURKEY)

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Cities has been the bedrocks of state as an organized form of societies in the process of development of civilizations. The German saying “urban air makes individuals free-stadt luft macht frei” emphasizes the importance of cities in the lives of societies and the social lives of humans. Streets, squares, parks, urban open spaces are the areas of personal and group freedom and relations or conflict and collaboration where urban dwellers come together, meet and get closer, express themselves individually or together with others, breed, enhance and experience urban culture. Urban space and the meaning and functions attributed to it are the basic determinants of societal and personal relations and communication. Space is the constructed environment surrounding humans and, to some degree isolating them from their environment, but enable them to maintain their actions and lives. Thus, urban space is a three dimensional representation of gap, distance, relations and communication of humans with other humans and their environment and the positioning of urban form in urban space. Cities are constructed social spaces with their urban forms, buildings, work places, streets, roads, sidewalks, parks and gardens, squares, lightings, urban furniture, opens paces etc. Urban space involves open and empty space as well as constructed space. The main characteristic of urban space is that it houses social life and texture. This social life could be private or public, personal or in group, and individual or institutional. It provides a public arena for humans to maintain their lives, get socialized, communicate with others, and help build an urban identity encompassing the whole city. Urban space could be divided as “public” and “private”. Public space is the common arenas used for social and public purposes open to all public whereas private space is the areas that belong to individuals for their own personal or familial use. In recent years, the meaning of public space has become blurred. Public service areas and structures owned or / and operated by private entrepreneurs such as malls, entertainment centers, airports, parking areas, GSM transmitter/receiver stations, among others, as well as socioeconomic and technological transformations has increased the complexity of the distinction of public and private space. In this study, after the concepts and phenomena of city and space are defined conceptually, and their theoretical foundations are provided, they are evaluated on the base of perspectives and perceptions of the urban dwellers. The field research of the phenomena questioned is conducted in the city of Isparta, and data is collected by questionnaires, visuals and observation in all the neighborhoods of the city. According to the data collected through the field research, the phenomena of city and public and private urban space are evaluated. Besides, how the Ispartans perceive and experience city, urban space, private and public space and differences are explored. Moreover, on the base of the findings, the importance of the city’s “public spaces and places” in the lives of the Ispartans are discussed in terms of publicness.

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URBAN TRANSFORMATION OF KHEDIVE'S CAIRO: A STUDY OF URBAN AND SOCIETY CHANGES IN ONE OF THE OLDEST DISTRICTS IN MONARCHAL CAIRO

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ABSTRACT

In recent years, the arab world, especially Egypt have witnessed several political transitions, and that experienced its influence on several attributes in the Egyptian community. Several changes were basically clear in several fields; the social life, the media, and the culture of the Egyptian society. Thus, those transitions had their own reflections on the use of entire spaces, which made the place interchangeable with the culture of the contemporary community, who had various needs and requirements. The Research illustrates these political transitions in a certain community and the reflection of those evolutions on the culture of the inhabitants and therefore on the entire use of space. Therefore, the research monitors one of the maven spaces in Cairo which lived from the age of the monarchal era till the present time, and was influenced by the revolutions, and the variables occurred to the community. Consequently the main objectves of the research are, monitoring and tracking changes in the structure and characteristics of communities (community and individuals, urban and cultural context, urban production) in some of the oldest urban ranges in Cairo. moreover,illustrating the social, cultural, political and economic changes and their reflection on the physical and non-physical aspects , like the social and cultural aspects, throughout the twentieth century in general and in recent decades (and even the current situation) in particular. The chosen case study space is the *Falaky* space near *Abdeen Palace* in the heart of the monarchal Cairo which is named by Egyptians "*West El Balad".* The space is analyzed and the changes are monitored to find conclusions.

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THE ATTRACTIVENESS OF CITY AS A PLACE TO LIVE: THE CASE OF YEKATERINBURG (RUSSIA)

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ABSTRACT

Within increasing competition between cities for human resources a problem to enhance attractiveness of urban life is coming to the fore. While planning and designing urban environment major focus is given to the needs and interests of different population groups. Hence, a city should become a place of attracting creative people, individuals and groups which possess special knowledge and skills necessary for promoting, developing and improving an area that could become appealing to business, investors, tourists, etc. With this purpose much attention should be paid to student-age youth as a potential driver of the area development by transforming a place of residence into an attractive urban environment. The purpose of this study is to analyse how student-age young people of Yekaterinburg percieve and assess attractiveness of the city as a place to live. Yekaterinburg is the biggest Russian industrial city that claims to be the “third” capital (after Moscow and Saint Petersburg). In 2017 we worked out an author’s questionnaire containing 10 questions and conducted a standardized sociological poll of students of Yekaterinburg. 71 men and 129 women aged 18-25 of different academic fields participated in the survey. 42% of poll participants are local residents of Yekaterinburg (they were born in it and live here on a permanent basis), 58% came here from other places (80% of respondents moved to Yekaterinburg to study in higher educational establishments). Research findings showed that Yekaterinburg as a place to live is attractive for students due to a wide range of malls and shops, extended cultural and leisure facilities, opportunities for higher education and self-actualization. Meanwhile, the students pointed out some problem zones of the city like ecological situation, pavement condition, pollution, corruption and impossibility to take part in solving city problems. The young people consider park areas, transport accessibility (subway availability), extended network of cultural and recreational centers to be major attractive factors of urban life. General results of the poll and students’ assessments indicate that a city as a place to live has two facets: a “comfortable” city with parks and gardens, cultural and leisure facilities, conditions for creative self-fulfillment and innovation and an “instrumental” city as a place for career development and material welfare.

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SPATIAL ANALYSIS OF THE LEVEL OF SUSTAINABLE DEVELOPMENT IN POLAND: DYNAMIC APPROAC OF THE VOIVODSHIP

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ABSTRACT

The issues of sustainable development in the last years is closely related to the green economy concept. In 2008 United Nations Environment Programme UNEP called for an agreement - Global Green New Deal, recognizing the possibilities and opportunities for overcoming the global economic crisis through the development of green economy sectors.Analysis refer to the Sustainable Development indicators, which were used to classification voivodships in Poland. The indicators are grouped according to the Sustainable Development Goals (in terms of the 2030 Agenda) and according to the thematic areas under four domains: social, economic, environmental, and institutional-political (with regard to the national, regional and local modules). The research of the classification difference in time, which include one of the thematic areas under four domains: environmental, which relate to the green economy concept.Environmental domains includes changing of climate, energy, air pollution, amounts of sweet water, usage of lands, bio variety and waste management.The Green economy concept includes: environmental and resource efficiency, natural assets base, the ecological dimension of quality of life, economic opportunities and political reactions and socio-economic context. Missing variables will be selected from the group of sustainable development indicators. In the paper the authors applied the method of ranking the voivodships by means of a synthetic measure that took into consideration groups of variables characterising the examined phenomenon. The study will be carried out for selected years from the period of the 2004 - 2016.It's on purpose to demonstration of the dynamics classification changes. The results could be compare with the classification from the Central Statistical Office's indicators in the in subsequent years, which are still under development in Poland.

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EFFECTS AND LEARNINGS OF HOUSING SUPPORT IN HUNGARY, 2015-2017

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ABSTRACT

Construction industry in Hungary was heavily affected by the economic crisis starting in 2008. Although there was a slight increase due to infrastructural investments as of 2012, residential construction reached a critical level in 2013. In 2015 a new housing support policy was introduced in Hungary. Main target of the regulation is to help families to implement their new home. On the other hand, government wanted to create demand on the residential market to revitalize the industry. Since then every year changes happened to the enactment which were supposed to facilitate admittance of families to the financial sources. After three years of experience it is important to evaluate the effects of this regulation and to give a short-term prognosis based on learnings. Purpose of our research was to collect and evaluate data to enable a many-sided analysis of residential construction industry in the recent past. Areas of our analysis were as follows: trend in number of construction and occupation permissions; size, location, price/sqm and technical content of residential projects starting after 2015; change in the number and sum of support applications; ratio of credit in support applications. According to our results there are areas where fine-tuning of regulation is necessary. Firstly, location and price of several projects shows that not always indigent families make use of state support. Secondly: growing number of residential projects is partly caused by postponed and advanced constructions. Therefore capacities of the industry can not be used balanced. Thirdly: current projects are planned to be finished by 2020 because reduced VAT for the industry is valid only until then. Further support of residential market is questionable and may effect problems in continuous and sustainable development. Fourthly: lack of minimum energetical efficacy in regulation effects a lot of new-built flats which will be inefficient by 2021.

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THE CLUSTERS PHENOMENON AND SUSTAINABLE REGIONAL DEVELOPMENT

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ABSTRACT

Regional development is closely related to a region and its competitive advantages that affect the competitiveness of the region. Regional policy, structural policy or cohesion policy have a single subject of research. Disparities are this subject of researches and analysis. The concept of regional disparity means that there are differences in the economic, social and environmental levels of the regions. Disparities cause uneven development of state territory, regions, but also cities. Disparities represent undesirable differences between states, regions, but also cities. Disparities cause, by their existence, the slowdown in development and economic growth. They represent the weak side of the region or the cities. At present, there are a large number of policies whose actions are geared to sustainable development. Policies are directed from the local level, across the regional level to the national level. The European Union's cohesion policy is aimed at addressing all types of disparities, economic, social, and territorial. Activities that create synergy effects are supported in this respect. Sustainable regional development is closely linked to sustainable urban development. Therefore, it is essential to focus on observation sustainable urban development, which can be used to ensure sustainable regional development. The cluster phenomenon is growing in popularity, becoming prevalent in strategies for economic development of countries. It is perceived as an important development tool by many organizations, such as the Organization for Economic Co-operation and Development (OECD) or European Union (EU). The goal of research is to analyse cluster policy and the relation between cluster policy, and sustainable regional development. The analysis is oriented on the Slovak Republic. The research is processed by using a wide scale of the scientific methods and procedures. The first part is based on preparation and explanation of key terms, such as the cluster, the cluster policy and European cohesion policy. Results part consists of the main findings and is prepared by using a comparative and causal analysis.

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MANAGEMENT INPUT OF VARIABLES AND ITS IMPACT ON THE OVERALL DEVELOPMENT OF CONSTRUCTION COMPANY

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ABSTRACT

Common definition of management accounting can be described with its benefits for effective management and decision making. As this accounting is not regulated in law, its form may differ from company to company. Today's form of management accounting implies the integration of several areas. These areas include cost accounting, financial accounting, controlling, financial plans, financial analysis, price calculations, budgets, etc. Using financial analysis indicators, it is possible to compile the evaluation of the construction company from the perspective of financial stability and its performance. Approaches to measuring business performance have undergone some development. The indicators include a traditional group based on accounting data such as Return on Equity (ROE), Return on Assets (ROA), Return on Investment (ROI), and on indicators based on financial flows for example Cash Flow Return on Investment (CFROI) or Net Present Value (NPV). The last group consists of indicators that, according to the microeconomic theory, are based on economic profit. This group combines both accounting and market data. Indicators include Economic Value Added (EVA) and Market Value Added (MVA). This paper is aimed to evaluation of the construction company using the economic value added of economic index EVA. Due to its compilation this index became a variable evaluation tool in the companies. The EVA indicator, compared to other value indicators, appears to be a simpler benchmark of performance and its economic content is easily understood. The aim of the article is to compare the rating of selected construction companies based on the economic added value indicator. The impact of different inputs on the overall development of the construction company will be monitored. Variables will be controlled by sensitivity analysis. The results of this paper can be used in the future for management of companies through management accounting.

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INTERNATIONALIZATION AS A MECHANISM TO PALLIATE THE CRISIS IN THE REAL ESTATE SECTOR: NEW MARKETS

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ABSTRACT

The research defines a system for the pre-selection of countries with a multi-term analysis model with the purpose of making decisions on real estate investments for SMEs. One of the most important novelties that have been brewing in the real estate market for some years, is the internationalization of activity and the search for new markets with business opportunities. The internal situation of the housing sector, with a drastic reduction in demand, blocking of mortgage credit and great difficulties to undertake and market new projects, has led the promoting companies to focus their attention on markets less affected by the crisis. For the development of the research, the data sources are official public and private organizations that will offer us information about each country. As for the methodology, we will select and analyse certain parameters of each country, apply it to Chile, Mexico and Poland, and finally, they will be analysed and compared for their subsequent selection of the country with the best conditions to invest. The study method will be a matrix of multicriteria analysis for the most convenient solution. The methodology to be followed in the present investigation is the following: establishment of additive value functions for the different countries whose values allow us to make a first ordering of the selected countries. The steps are 1. Decision criteria. 2. Allocation of weights. 3. Alternatives (choice of countries). 4. Collection of data from the selected countries for the purposes of determining the assessment matrix. 5. A matrix of assessment or decision. 5. Determination of value functions and comparison of them. 6. Sensitivity analysis for different weight hypotheses. 7. Results and obtaining conclusions. The criteria defined are 1. The legal framework for investing. 2. Financial framework of investment. 3. Market size. 4. Economic framework. 5. Growth prospects. The evaluation or decision matrix: once the criteria and their associated weights are established, the decision maker is able to give, for each of the criteria considered and for each alternative of the choice set, a numerical value that expresses an evaluation or judgment of the alternative. This evaluation can be represented in the form of a matrix, a valuation matrix or a decision matrix. Each row of the matrix expresses qualities of the alternative "Ai" with respect to the "n" criteria considered. Each column of the matrix collects the evaluations or judgments issued by the decision maker. A multidimensional value function of additive decomposition has been established to apply to each country: $Fj(x) = \sum Ki \cdot Xij$, where Ki = weight of the criterion i; Xij = normalized value assigned for criterion i in country j; Fj = global value of the alternative. With all this, we obtain data for the decision making of real estate investments.

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ANALYSIS OF COSTS AT THE PRODUCTION OF FINISHING WORKS WITH GUARANTEED QUALITY LEVEL

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ABSTRACT

The aim of the work is to analyze the cost of finishing works. Objective of the research is paint application process on building products and design. Information is provided on the results of the cost analysis in the process of painting the surface of building products and structures, depending on the level of defectiveness at each stage of the process. Recommendations are given to improve the efficiency of the painting process, the application of statistical methods for managing product quality to the analysis of the process for obtaining paint coatings with specified properties. Determined, that in terms of the number of standard deviations and the level of defectiveness, the greatest attention is required by the surface cleaning operation, the priming of the cleaned surface and hardening of weak bases, as well as application of putty on the surface. Thus, consideration of economic costs on each stage of the process will allow the enterprise to find reserves for increasing production efficiency. The real way to reduce financial losses is to increase the number of standard deviations of quality indicators in the tolerance field, which is recommended by the six sigma methodology. To successfully reduce the cost of correcting defects, it is necessary methodology "six sigma", statistical methods of control and quality management of products, carry out preventive and corrective actions, as well as to evaluate failures leading to a decrease in profits, regardless of the reasons for their being caused.

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Session Title:

Risk Management and Mitigation Planning

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SEISMIC VULNERABILITY ASSESSMENT AND LOSS ESTIMATION OF AN URBAN DISTRICT OF TIMISOARA

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ABSTRACT

The seismic risk evaluation of built-up areas is associated to the level of earthquake hazard, building vulnerability and level of exposure. It is well known that the large-scale vulnerability assessment is a very important topic for the protection of historical buildings and the mitigation of effects of natural phenomena on the built-up. In 2020Timisoara will be the Capital of European Culture and, therefore, the knowledge of the number of unusable and collapsed buildings under possible earthquakes is a crucial point to plan suitable future intervention strategies from structural and urban points of view. Based on these premises, the proposed research is conducted in collaboration with the University of Naples "Federico II" with the main purpose to focus on the seismic vulnerability evaluation of buildings located within an urban-sector of Timisoara through the EMS-98 macro-seismic approach. First of all, the typological vulnerability classes of buildings according to the RISK-UE method have been defined in order to classify them from typological and structural viewpoints. Subsequently, a vulnerability form appropriately conceived for masonry aggregates has been filled for the study area buildings and the typological fragility functions have been derived for them aiming at identifying the most vulnerable constructions. Finally, parametric analysis has been carried out by varying the seismic magnitude and site-source distance in order to estimate the seismic loss estimation under earthquakes.

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IDENTIFICATION OF RISKS FOR INDIAN HIGHWAY CONSTRUCTION

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ABSTRACT

Highway projects carry out higher risk than other construction projects because they entail high capital outlays and intricate site conditions. Although the research currently available provides many valuable insights into the issue, however identification of risks pertaining to Indian highways construction was neglected. This paper presents the findings of questionnaire survey conducted on the critical risk factors affecting the successful performance of highway construction in India in terms of cost, time and quality. The critical risk factors in Indian highway constructions are change of scope of work, land acquisition delay, poor preliminary soil information and investigations, schedule delay caused by rejection of unqualified materials and change orders by political pressure. Further, critical risk factors were explored through factor analysis and categorized them in five factors viz. construction risk, public sector management risk, engineering risk, resource procurement risk and social risk. The identified risks will be useful to the field engineers for design of proper risk mitigation strategy during planning stage.

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VULNERABILITY ASSESSMENT WITH SCARCE INFORMATION FOR A QUANTITATIVE FLOOD RISK MODEL: CASE STUDY MONTERIA-COLOMBIA

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ABSTRACT

A quantitative flood risk assessment requires that vulnerability and hazard are evaluated quantitatively as well. In our research we assess the flood risk of a south east suburb of the city of Montería Colombia.
We proposed assess vulnerability through damage functions development and their incorporation in the flood risk assessment. Risk is quantifying in expected annual economic loss. Vulnerability is estimated based on the relationship between the physical condition and the contents of the households, with their ability to resist flooding. Flood damages in movable assets, structures and public areas were stablished through depth-damage functions. Data for construction of these depth damage functions were obtained through a poll and field observations of the entire selected area. In order to identify the damage, we have taken advantage of the recent memory of the communities regarding their perception of real damages during a flood occurred in July 2010. Structural elements and movable assets were classified in categories and people were asked about damage in these categories. Additionally, the water marks on walls, doors and other structural elements were recorded. In order to quantify the hazard, we calibrate a simple hydrological model and a hydraulic model, based in the records and water marks left by the July 2010 flood. A quantitative model of risk was applied incorporating hazard and vulnerability quantify in this way. Depth- damage functions developed are a useful tool that can be used in other regions in Colombia and Caribbean with similar socio-economical and climatic conditions. Results shown that it is possible to typify the houses and the surroundings by means of the construction of functions and it is possible to obtain the quantitative risk contributing a practical tool for the urban planning of this zone of the city.

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STATISTICAL APPROACHES FOR THE ASSESSMENT OF LANDSLIDE-RELATED ECONOMIC LOSSES

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ABSTRACT

Natural disasters of a geodynamic nature like mass movements occur extensively around the world with economics consequences and fatalities greater than any other natural disaster. Globally, 14% of economic losses and 0.53% of deaths from disasters caused by natural phenomena are landslides-related, with estimated economic losses over $1 billion in many countries. In developing countries of tropical mountainous regions, rainfall-induced landslides occur almost every year causing huge economic and human losses. Hence, the municipal authorities in charge of the planning of cities in these countries need to develop investment plans for the prevention and mitigation of disasters by mass movements, for which they must allocate an important budget item. In the quantification of this aspect there are some uncertainties, both temporal and spatial, due to the very nature of the hazard in terms of its magnitude, frequency and probability of occurrence, and the expected impact on the infrastructure of the cities. For this reason, it is convenient to carry out a quantitative risk analysis (QRA) to which the urban infrastructure is exposed because a potentially damaging event, which allows estimating the level of damage and the associated economic consequences, taking into account the uncertainty of the infrastructure costs, in order to perform cost/benefit analysis between preventive measures of a mass movement vs. post-disaster management actions, allowing to optimize interventions to bring the risk levels to an acceptable level encouraging authorities to invest resources in the most landslide-prone areas. Different statistical approaches are employ to consider several scenarios of hazard and infrastructure vulnerability to measure the magnitude of the mass movement and to quantify the economic costs. In this context, we employ the techniques of simulation bootstrap, Monte Carlo and variance reduction in the context of Monte Carlo in order to compare the values of the economic losses before a potential disaster in an objective, standardized and reproducible way. With the purpose to explain the proposed methodology, a case study located in one of the most landslide-prone zone of the city of Medellín-Colombia is analyzed, comparing different structural scenarios for a total of 48444 exposed buildings supplied by municipal Cadastral Office. Also, different seismic scenarios of landslide hazard were considered, varying the horizontal acceleration (A_h) that can act as one of the triggers of the mass movement. The novel proposed methodology permits to obtain an estimative of the probable economic losses by a certain landslide, and also to get better estimates by reducing the uncertainty in the estimation and compare the results between different statistical approaches, taking into account the uncertainty of the exposed building costs. Since most of the data are obtained from secondary sources, our methodology is economical and provides a basis for decision-making in the planning of large areas and prioritize areas requiring further economical and technical studies.

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TOWARDS LARGE SCALE SEISMIC RISK ASSESSMENT IN ALGERIA: CASE STUDY OF THE CITY OF BLIDA

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ABSTRACT

In recent years, the use of large scale seismic risk assessment has become increasingly popular to evaluate the fragility of a specific region to an earthquake event, through the convolution of hazard, exposure and vulnerability. These studies focus on the vulnerability of the built environment of the region and the evaluation of the human social dimension, which has great importance when determining the ability of a community to attend to a disaster and to eventually resume normal activities. This study, developed within the scope of the EU-funded project ITERATE (Improved Tools for Disaster Risk Mitigation in Algeria), focuses on the development of a web-based framework for integrated seismic risk assessment in Northern Algeria, primarily focused on the city of Blida, chosen as first case-study. For this purpose, alliances with local institutions, web-based data mining techniches and specifically developed research were used to obtain: an updated seismic hazard model, and exposure and vulnerability models for local buildings and bridges, which are proposed and implemented in a web-based platform which allows the calculation of the seismic risk at a municipal level in terms of probabilistic losses. Furthermore, a social vulnerability assessment is implemented at the same level and combined with the physical vulnerability to enable the identification of the regions that are more vulnerable to earthquakes. Such framework will, in turn, empower Algerian stakeholders to perform the evaluation of earthquake scenarios at a regional scale and provide valuable information to decision makers for the implementation of risk mitigation measures in vulnerable areas.

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SEISMIC LOSSES SCENARIO FOR CULTURAL PROMENADE IN TIMISOARA CAPITAL OF CULTURE 2021, ROMANIA

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ABSTRACT

Timisoara is an European city, located in the western part of Romania, in a seismic area, characterized by shallow earthquakes with most probable magnitude 6 Mw and intensity 7. Timisoara was selected to be the European Capital of Culture 2021, transforming the city into a centre of interest for cultural agenda. One of the major intentions of the city that was highlighted during the selection for the 2021 European Capital of Culture was to connect the visitors to the local community lifestyle, through a lot of outdoor events, where the participants will have to change to feel the real life on Timisoara's streets and to interact with its citizens, especially in the historical urban areas, where the specific atmosphere was kept the most. In this context, there are expected many tourists to visit the city and many events are planned to occur in the historical zones. Along those historical zones, there was proposed a cultural promenade that will connect the most important touristic attractions of the city and the best places for outdoor cultural events. Taking into consideration the age of the buildings that will host events or that will be near the outdoor event spaces, appeared the problem of safety. In order to be able to secure the wellbeing of the visitors and Timisoara's citizens and also the city's most important buildings, there is mandatory to evaluate the current state of the buildings along the proposed cultural promenade and to determine the possible losses scenario in case of an earthquake occurrence. This paper presents seismic scenarios for different intensities and evaluates the possible losses in terms of human life, homes and jobs, architectural and historical values and of course economical losses. The knowledge represents the base of every action, so this study represents only the first part of a larger one that will propose interdisciplinary strategy for prevention and intervention in case of an earthquake occurrence.

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EFFECTS OF WATER STRESS COEFFICIENT VARIATIONS OVER THE GREEN WATER FOOTPRINT IN SAN LORENZO (COLOMBIA) INDIGENOUS RESERVE

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ABSTRACT

In searching of efficiency in the use of water for harvesting irrigation, and at the same time, looking for sustainable systems, ecological approaches represent important tools to implement in rural zones. Water footprint assessment is suitable for the establishment of the impact of water use from different stakeholders over a land portion. The results of this modelling can be used as new inputs in the frame of the Integrated Water Resource Planning. A quantification of such indicator for different crops over a pilot zone of the San Lorenzo Indigenous Reserve, in The Andes Mountain Range In Colombia is shown, considering that farming activities carried out by locals are addressed to reach land sustainability. In this work, a sensitivity analysis of water stress coefficient (Ks) based on rainfall depth variations was made. As a result of that, changes in water footprint were observed and discussed. The approach adopts the FAO CROPWAT 8.0 methodology, considering different crop water requirements and crop water programming options in order to stablish a range of evapotranspiration values for different scenarios. As a relevant result of modelling, important changes in green water footprint were reached as Ks fluctuations were set.

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BREACH FORMING SCENARIOS AT CONCRETE FACED ROCKFILL DAMS

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ABSTRACT

Rockfilled dams with reinforced concrete facing, as the proposed study case of Bolboci Dam on the River Ialomita, Dambovita County, centre Romania, are characterized by a very high operation safety. On the international level, there is no record of failed concrete faced rockfill dams. However, during their usage there have been several incidents mainly due to the unsatisfactory behavior of the reinforced concrete masks. Specifically, in an ICOLD statistic that presented 17 cases of damages to rockfill dams with reinforced concrete facing, 14 were due to the unsatisfactory behavior of the reinforced mask. The other 3 cases were due to piping phenomena or percolation through the dam foundation or the lake's shore. The failure scenarios of this dam type, Bolboci Dam including, can be as follows: the retaining structure overspilling during floods due to an insufficient or poor operation of dischargers, top and/or bottom. The overflow gradually erodes the body of the dam until the breach occurs; concentrated infiltrations with a high gradient through the dam body as a result of a serious malfunction in the concrete facing sealing, with material carving in leading to breaches in the dam body; piping in the dam foundation / slopes that could finally lead to slippage and finally dam failure (improbable due to the existing geotechnical conditions); bypassing the safety guard of the dam's crown leading to the discharge of the dam, as a result of irreversible excessive subsidence due to exceptional incidents. There have been studies on three statistical methods on how characteristically breaches occur: MLM Empirical Method, Washington State and Froehlich. The Froehlich method has been endorsed and modified, because Bolboci Dam is a well built, well executed and a well-used dam. The failure hypotheses of the dam were done with applications using MathCAD software, their algorithm being based on the finite differences method. It must be specified that the statistical approach of dam failure is a trap, due to the fact that it is well know they are a work of one of a kind engineering art. This fact shows the difficulty of the elaboration of the failure scenarios and the need of a sensitivity study for the comparison of the scenarios. The results show that the failure of rockfilled dams with reinforced concrete facing is highly improbable and leads to small flows with a sluggish evolution of the breaches.

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Session Title:

GIS-Based Modelling for Mitigation Planning

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APPLICATION OF UAV AND GIS IN THE PROCESS OF ESTIMATING DAMAGES IN CULTIVATION BY GAME ANIMALS

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ABSTRACT

Last years have been a definite increase in the awareness of people involved in agriculture in relation to the rights and duties they have in the area of damage caused by game animals. Damages caused by game animals especially in the way they are calculated raises great doubts which are associated with high dissatisfaction of social groups, which this concerns both - hunters and farmers. There is a noticeable conflict of interests between renters of hunting districts, in most cases they are hunting grounds and farmers, in this case owners of agricultural land, on which damage caused by wild game occurred. In relation to both groups, this is associated with specific financial effects, which always result in disputable situations. New initiatives are emerging to improve both existing legal provisions and, what is believed by the authors of the study, more important methods and technologies for estimating wild game damage seem to be. In this article, the author based on the conducted research using unmanned aerial vehicles (BSP - drone) as a tool for acquisition of information while using technologies related to spatial information systems show the possibilities of improving the quality assessment of the damage. Data obtained by means of drones, and then developed through the application of the GIS type, constitute an indisputable, durable and objective collection of information that allows a very precise determination of the amount of damage while significantly reducing the cost of estimation. The authors, on the example of specific BSPs over crops and the application of GIS in chamber work, present procedures for which the application seems unavoidable in the estimation of damage caused by game animals. The presented procedure based on the achievements developed in the field of geodesy, in particular geoinformation systems and photogrammetry, allow to indicate their high credibility and utilitarian character. In addition, trends and the growing importance of geoinformation in human activity speak for the use of the aforementioned technologies

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ASSESSMENT OF RESIDENTIAL AREAS OF CITY ON THE EXAMPLE OF OLSZTYN

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ABSTRACT

The contemporary city is undergoing dynamic transformations, as well as public urban space, which is an elementary part of it. Rapid urban development causes an increase in the number of inhabitants, who are looking optimal living conditions. Creating them is the main aim for urban-planners, which can prevent urban sprawl and depopulation of its central parts. Nonetheless it's possible only when we can constantly monitor the quality of the city's residential areas. That purpose requires new tools for assessment of residential areas. One of the main aspect of those ratings should be to determine the usefulness of housing estate. The term usefulness of city space should be understood as basics needs of inhabitant accessibility. Their availability in the area of neighbourhood guarantees a high standard of living for its residents. Sometimes this access is limited as a result of which the functionality of the area is falling and this part of city become unattractive for living. Over time, this may result in a decrease in the value of the space and even its depopulation and eventually degradation of the city space even in its central districts. The main aim of the article is to develop a method for assessing the useful value of residential areas based on criterion of distance to forms of basics services for residents. The article analyses this problem in residential areas located within the city, which are also determined as city's separate administrative divisions. Real-time maps of availability for selected basic services prepared during the studies were the basis for the futher studies. Mainly with their help we can indicate the directions of shaping space by planning development specific services in the specific areas. The article presents the results of assessment of residential areas of city on the example of Olsztyn. This example show that presented in article approach and methodology could be very useful tool for urban-planners and private investors. Moreover, the biggest advantage of developed methodology is that it indicates specific location of investment deficiencies.

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THE IMPACT OF SPATIAL DEVELOPMENT OF STATE AGRICULTURAL FARMS AND UNIFICATION OF RESIDENTIAL DEVELOPMENTS ON THE CULTURAL LANDSCAPE OF RURAL AREAS – REVITALIZATION ISSUES

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ABSTRACT

The form of rural development of Western Pomerania forms a distinctive cultural feature of this region due to its typology and traditional timber frame and brick structures. Factors that influenced the condition and the preservation state of rural areas in the first years following the Second World War are vastly connected with the political situation of Western Pomerania, spoliation and the destructive activity of the Red Army. What also had a significant impact on the current form of architecture and deformation of cultural landscape of rural areas was the creation of State Agricultural Farms. The development complexes built in 1960s and 1970s were characterized by their use of repeating forms of construction development. In the effect what was characteristic for the image of villages up to the mid-20th Century, later became subject of total unification, by use of identical, typical solutions, straight from RBM catalogues. The character of these buildings very rarely shows any connections with regional buildings, which is closely connected with the creation of new social class of the so called worker-farmer. The pseudo-urban objects created are of a scale that is inappropriate for rural areas and are devoid of any architectural detail. The typical and ready designs used in their construction, together with prefabricated elements caused the total unification of development. The problem of today is how to revitalized these areas in a way that will take into account the typical objects that are patterned after urban objects and thus extremely incompatible with canons of rural development. The problem of transformation should be considered as an interdisciplinary issue, as it is object to various disciplines, and thus every time perceived from different angle. The rural areas revitalization schemes introduced in recent years in Western Pomeranian voiveodeship and based on development strategies, already brought significant results, and the support of local authorities for social activity promoting local cultural heritage forms a significant aspect for further development of these areas.

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DIGITAL SYSTEM FOR SPATIAL ANALYSIS OF THE AREA AND DEVELOPMENT DIRECTIONS

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ABSTRACT

The idea of creating a digital system for spatial analysis of the area and development directions is to build a digital tool that would allow for a complete automation of administrative processes in spatial planning offices. Such procedures accompany the decision-making process with regard to the conditions for development (location) and are closely related to the automation and systematization of site analyses, which takes into account all aspects of spatial conditions listed in the Act on Spatial Planning and Development for Poland (minimum scope of the area covered by the analysis, land use, characteristic parameters of existing buildings, the height of the construction, the height to the eaves, the shape and material of the roof, its inclination, occurrence of roof dormers, technology of erecting the building, its intended use, building area and biologically active area). Another function of the system will be the possibility to perform analysis of local plans concerning the special development (the analyses take into account the records of plans already in operation in the area, the characteristics of utility areas and their transformations over the past years, which will allow to determine the expected development directions). The secondary feature of the system will also be the automation of obtaining a local plan extract from the existing spatial plans for a given location. Due to the use of a digital tool for the analysis, its impartiality together with the speed and precision of operation should be assumed. It will undoubtedly affect the quality and decision-making processes regarding the spatial development. The recipients of this tool will be primarily rural communes, where the scale of activities is not so large, compared to urban agglomerations, and due to the lack of local spatial development plans, in most of these areas, it forces the communes to create these plans in order to carry out procedures related to the issue of documentation related to conditions for development. The digital system for spatial analysis of the area and development directions will be based on the free of charge, QGIS software, along with the necessary plug-ins created for this purpose. This article is to show the way of creating such a system using "open source" software, along with publicly available data, downloaded from various mapping websites and WMS and WFS sources, which will contribute to creating objective analyses of spatial conditions and determining possible development directions for small and medium-sized rural systems.

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ASSESSMENT OF THE LAND-USE/COVER CHANGE DYNAMICS IN THE BHARATHAPUZHA RIVER BASIN, INDIA

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ABSTRACT

As a result of industrialization and population explosion, the whole world is undergoing tremendous land-use/cover changes (LULCC). The LULCC can be observed spatially from micro watershed to the continental level and temporally from seconds to several decades. Manual analysis of the transformation of land-use in a micro-watershed for a decadal period itself is a challenging task due to constraints such as data availability, time requirement and so on. However, developments in technology have helped to make the assessments more accessible and accurate. In this century, remote sensing (RS) and Geographical Information System (GIS) have emerged as cost-effective, reliable, rapid, and advanced techniques for monitoring and assessment of LULCC on a spatial and temporal scale. In this study, evaluation of the LULCC in the Bharathapuzha river basin, the largest river basin in Kerala, India, during the period 1973 to 2017 was performed. Freely available, medium resolution satellite images for the years 1973, 1990, 2001 and 2017 were used to produce LULC maps of the area with the help of ERDAS Imagine software. The five land use categories in the basin such as waterbody, sand/soil, vegetation, rocky terrain, and settlement were classified by spectrally oriented supervised classification procedure. These classified maps were generated with an overall accuracy of more than 90%, and Kappa index around 0.8. Results indicate large-scale loss of vegetation and expansion in urban area in the basin. If the current trend in the land-use change continues, it will adversely affect the water resources in the basin. The developed land-use/cover maps can be used to predict the future LULC dynamics, and the computed statistics of the land use change can be used to formulate sustainable management policies for the river basin.

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Session Title:

Computer Aided Design

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DESIGN OF A STEEL ADDITIVE MANUFACTURED VALIDATION MODEL AND OPTIMIZATION OF THE SIMULATION PROCESS

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ABSTRACT

Within the scope of this article, additively manufactured validation models will be designed and experimentally tested to help the prediction of laser-melted steel. The typical tensile specimens are usually utilized to predict the material behavior in the form of ultimate tensile strength, breaking strength and maximum elongation. The dilemma when it comes to additive manufacturing lies in the anisotropic material behavior due to the printing direction. To analyze the anisotropy; uniaxial tensile tests for specimens that are printed with different orientations (building direction) must be performed. However, the obtained results only account for uniaxial loading directions, disregarding the effects of multi-axial loading, which leads to the second dilemma. Moreover, that is experimental results on multi-axially loaded additive manufactured test specimens are rare. Anisotropic materials provide a strong fiber orientation, multi-axial loading can lead to premature failure of the material. Hence, the stiffness and the stress limit states under multi-axially loaded additive manufactured specimens must be investigated. However, biaxial tension tests are expensive. Therefore, a numerical validation model under uniaxial tensile loading was designed in such a way that a strong triaxiality occurs during testing, representing complex stress states in the test specimen. The results will be used to improve the simulation process of the additive manufactured elements and help the prediction of the behavior for additive manufactured construction components. The process will be in the form of a comparison between the results for the simulated validation model and the tested ones to improve the simulation accuracy. The idea is to reach an average value that can be used later on for design processes without the need to physically test each additively manufactured element.

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DAMAGE DETECTION IN CARBON FIBER REINFORCED COMPOSITES USING ELECTRIC RESISTANCE CHANGE METHOD

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ABSTRACT

Modern composite materials, such as carbon-fibre-reinforced polymers [CFRP], are used extensively in the fabrication of high-performance structures for a variety of engineering application. Composite laminates often show considerable advantages of stiffness and strength over homogeneous materials.
CFRP are widely used in civil engineering as the construction material and for strengthening of civil structures. However, external mechanical loads, repeated cyclic stresses, and impact lead to damage in laminated composites due to their low delamination resistance. Damage in a structure may cause failure leading to tragic consequences and therefore structural health monitoring and damage detection in civil engineering structures has become one of the most important keys in maintaining the integrity and safety of a structure. Several methods have been developed for structural health monitoring of composite structures. In this paper the self-sensing damage detection method based on the electrical resistance measurement of laminated composites is proposed. The basic idea of the method is that damage such as fibre fracture or delamination between plies will cause a decrease of the electrical conductivity in the damaged region leading to a resistance or voltage change. In the present study, 2-D numerical analysis of strip-type specimens of laminated composites with and without damage are considered and numerical investigation is carried out by using the finite element program ANSYS. Electrical conductivity of the composite laminate in the longitudinal direction is given constant, while electrical conductivity in the through-thickness direction is used as a variable in the parametric study. The resistance changes for each case due to delamination is estimated by comparing the obtained resistance with the corresponding value of the specimen without delamination. Applicability and effectiveness of the proposed method are investigated by using various locations and lengths of a delaminated crack in the specimen. The surface resistances are numerically calculated according to the two-probe and four-probe methods. Applicability and effectiveness of the proposed methods were investigated by using various lengths of a delaminated crack in the specimen. The results obtained show that the four probe method for the resistance measurements is valid only when the through thickness conductivity is comparable to the longitudinal conductivity. However, for the delamination detection in commonly used composite materials the four probe method is more effective. The present study shows that the resistance percentage change is dependent on the location of electrode pairs used for the resistance measurement with the respect to the location of delamination. Thus, the resistance percentage changes could be used not only for the detection of the presence of delamination but also for the localization of delamination.

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DETECTION PRESTRESS LOSS IN PRESTRESSED CONCRETE SLAB USING MODAL ANALYSIS

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ABSTRACT

One of the main problems in the analysis of prestressed concrete is the estimation of the loss of prestress in tendons. The loss of prestress occur during the process of stretching and anchoring the tendons as result of damage or severing of prestress strands. This paper presents a method to non-destructively detect the loss of prestress in prestressed concrete slab using a modal analysis. In recent years, development of damage detection techniques based on modal parameters was extensively studied. It is possible to identify damage of structure by comparing typical dynamic properties of the damaged and undamaged structure. This method is widely used because it is very simple in use. The 3D finite element models of the prestressed hollow core slabs were simulated using commercial finite element software ANSYS16.0. The procedure for performing a modal analysis of prestressed concrete slab in finite element program ANSYS is concerned by the effect of initial stress on the dynamic response of concrete structure and include structural and modal analysis. This stress was applied using the ‘‘initial state” (INISTATE) command. Loss of stress in prestressed concrete slab was modelled by decreasing of initial stress in the strand that located in the center of prestressed concrete slabs. The models were analysed with its self-weight. The results are obtained for typically slabs with 1200 mm width and standard thicknesses 200 mm. The span varies since 7 until 10 m. The slabs is prestressed by seven-wire stress-relieved strands of 12.7 mm diameter. The jacking stress was 70% of the strands ultimate tensile strength. Core slabs are analysed for four ultimate compressive strength of concrete. The effectiveness of using percentage changes in modal frequencies as indicators of the loss of prestress and effectiveness of the proposed method was investigated. The effects of span and material properties of concrete on the modal frequencies of the concrete structure under initial stress were studied. The present study shows that modal frequencies percentage change is dependent on the span of slab and compressive strength of concrete.

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

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ABSTRACT

The shift in sustainability and computer aided design in the field of architecture caused a remarkable change in the architecture philosophy, new aspects of beauty and aesthetic values are introduced. The paper attempts to answer questions, what is beauty in architecture and how the canon of beauty has changed in view of extending the possibilities of geometric control and the development of digital technology. In the first part of the paper the classical beauty is discussed. The aesthetics of forms based on the belief that there was an objective beauty that the antique understood mathematically are presented. Through semantic and syntactic aspect analyses, this study revealed the effects of the concept of beauty on the formation of digitally designed architecture today. The second part of this paper presents the author's research, in terms of different computer form generation designs methods, (algorithms, parametrisism as well as morphogenetic) for defined how the classic concept of beauty has shifted architecture thinking into a new era. A results of this research selected samples are presented as a case study the new beauty concept in current architecture. The beauty is represented by multi-curvature structural forms form of high complexity. It refers to the Baroque its harmony and fusion of the arts and the sciences, the structural 'truthful' efficiency of the Gothic, which nowadays is experiencing a revival under the premise of the parametric approach, of virtual scripts, and formal organicism (understood as evolutionary mimicry). In conclusion, the paper emphasizes that the concept of beauty in the digital age should be regard as a complex set of new aesthetic aspects related to economic, environmental, social values and scientific technical values.

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MULTIPLE MODELING OF HEAT TRANSPORT IN LAYERED STRUCTURES USED IN CONSTRUCTION ELEMENTS

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ABSTRACT

The purpose of research was to verify the analysis of heat flow transfer through elements of layered structures by means of multiple modelling software to calculate computational fluid dynamics, i.e.: Altair Flux and Autodesk CFD. The analyses are directed to the development of structure systems, focused on effectiveness of the thermal insulation of partitions and loss reduction by partition elements. Two system were tested. Double-layer wall made of ceramic hollow blocks and thriple-layer wall made in the formwork system of foamed polystyrene with a concrete core. All these partition elements types were modelled as 3D objects and for each of the models, thermal analysis was carried out in both selected programs Flux and CFD. The results showed the increasing insulation efficiency of components within certain limits. On the basis of the results obtained, it was found in which partitions heat transport is the most advantageous, however some particular details of modelling differed from each other. It has been proven that verification with one model is insufficient. It is necessary to carry out check analyses using various models, because each model has its simplifying assumptions. Special three-dimensional analysis requires checking by various methods, also due to the approximations used in the creation of the finite element mesh (used in methods and calculations) of computational methods. In Autodesk CFD programme heat transport calculations are performed in accordance with the Fourier transformed equation: $\rho C_p \frac{\sigma T}{\sigma t} + \rho C_p u \frac{\sigma T}{\sigma x} + \rho C_p v \frac{\sigma T}{\sigma y} + \rho C_p w \frac{\sigma T}{\sigma z} = \frac{\sigma}{\sigma x}\left[k \frac{\sigma T}{\sigma x}\right] + \frac{\sigma}{\sigma y}\left[k \frac{\sigma T}{\sigma y}\right] + \frac{\sigma}{\sigma z}\left[k \frac{\sigma T}{\sigma z}\right] + q_V$

where: T- temperature, °C; ρ - density, kg·m^{-3}; q_v - capacity of internal volume heat source, W·m^{-3}; C_p - specific heat, J·(kg·K)$^{-1}$; t - time, s; u, v, w - spatial components of a unit vector, m; k - coefficient of thermal conductivity, W·(m·K)$^{-1}$. The process of analysis performed on a model carried out by one program provides information on how to create and shape the finite element mesh in the discretization phase of the area and introduce additional nodes. Then working with the other software both created meshes can be analysed to compare. Usually, generating a mesh in an automatic manner is not enough. But when there is a significant volume difference of elements and their shapes suggest some ununiform field areas of the model, it is possible to adjust and set the mesh nodes manually in order to get the correct values. Thanks to the performed simulations, it was possible to receive a comparative analysis of the results and their correction with the use of both tools. The analysis also pointed out the distributions of temperature values over the entire width of the partition and showed the advantageous thermal insulation properties that could be achieved in the partition made of the formwork system of foamed polystyrene with the concrete core.

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PRACTICAL ASPECTS OF THE USE BIM TECHNOLOGY FOR EXISTING BUILDINGS

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ABSTRACT

In the analysis process enabling the renovation of existing facilities, the use of BIM technology becomes more and more common. It results from the increasingly widespread dissemination of IT solutions, which can be successfully used in situations where it is necessary to implement new concepts of using objects, but also when it is necessary to quickly adapt the structure to different load conditions. At the time of making the decision to implement the reconstruction of buildings, it may turn out that the use of BIM technology to create a full digital model will be one of the better-used investment funds in correlation with the effect of final solutions. In the work, research was undertaken to determine in which types of objects measurable effects can be obtained from the use of new technology. This is extremely important when making the decision about the need to incur additional expenses to perform the necessary macroscopic research and sometimes outlets of the existing structure in a manner adequate to the possibility of later use in the process of creating a numerical model. A different issue is the undoubted usefulness in obtaining new opportunities when used for historic buildings, whose period of use should practically be unlimited. The article will specify the possibilities of using BIM in the processes of building identification and construction structures, as well as the necessary data to be obtained during the preparatory works. Model solutions will be discussed that will allow the use of multi-criteria analysis of the selection of the most optimal solutions in terms of costs or time expenditure during the renovation process. Performing the above work by building a numerical model of the facility allows at each stage of verification by authorized persons inventoried solutions and enables tracking and changes in the situation of identified exceptions in relation to parameters determined at the initial stage. The work will be summarized by the results of the conducted analyses with an indication of the utilitarian aspects of the completed research.

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BIOLOGICAL PATTERN BASED ON REACTION-DIFFUSION MECHANISM EMPLOYED AS FABRICATION STRATEGY FOR A SHELL STRUCTURE

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ABSTRACT

Generative architectural design processes aim to apply the principles of biological morphogenesis to the design and building of mechanical or architectural structures. However, despite the revolution in computation aided design and interdisciplinary upgrades of digital fabrication technologies, they fail to acknowledge materials, tools and construction logic in an early stage of the design process, as manifested in nature. As a result, the realization of specific fabrication processes and their individual constraints often lead to amendments to an already established workflow by making desperate adjustments to rationalize the design. The objective of this paper is to introduce a design workflow of three digital fabrication techniques (viz. CNC milling, laser cutting and 3D printing), that integrates material properties, tolerances, constraints, capacities, machine limitations and interactivity. Based on the knowledge of the tool, design intuition and aesthetic criteria, the method tries to translate biologically inspired processes to fabrication processes incorporating three different materials and procedures in a single parametric workflow. In addition, structural stability, skin performance and landscape continuity of the emerging design (a shell structure), are examined. In this project we employ computational techniques of weighted-mesh representations for the generation of 2D geometrical configurations of stripes, analogous to the skin patterns emerging from biological morphogenesis through reaction-diffusion (RD) mechanisms. This research offers a methodological framework of identifying a suitable surface pattern with similar features to a RD-based stripe formation. We computationally explored and geometrically defined the patterning algorithm with explicit reference to biological morphogenesis and Graph Theory. This approach uses a mesh relaxation process and mesh segmentation algorithms for the 3D model surface (Figure 2,3) and for the landscape. During the relaxation process, a real-time dynamic physics engine allowed to visually and intuitively interact with “virtual” physical forces applied to the pre-defined polygonal topologies of particle and spring networks using a series of fixed initial anchor points which are taken by the segmentation algorithm as starting points for the generation of parallel surface stripes and profile landscape lines. Eventually, the relaxation process is linked with the segmentation process to give the stripe effect. The FEM shell analysis gave a clue of the spatial distribution of physical tension across the structure, validating the assumptions and revealing the prototype’s vulnerable areas in relation with the RD pattern and relaxed mesh. As a conclusion, we argue that the proposed method has many design potentials as stripe organization for fabrication, thus opening a new field for interdisciplinary investigation. Future research in the field of adaptive systems could address the temporal dynamics of changes in the pattern, as occurs in the skin stripes of fishes formed by waves, or the viability of 3D RD-based mechanisms for architectural construction processes.

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TOWARD THE NEW MIXED REALITY ENVIRONMENT FOR THE INTERIOR DESIGN

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ABSTRACT

The paper presents a computer-aided design (CAD) system for interior architecture design called Design3R. The main assumption of this project is the implementation of the achievements from the field of augmented reality (AR) and virtual reality (VR) in order to embed the design process in the first person perspective and perceptual scale. It allows to work with furniture and other interior elements in real size, directly in the realistic view of the designed interior. Design3R is developed by the author of the paper as the cross-platform software as the cooperation in the field of research and development with 3R Studio Mobile company. The continuous development of CAD systems is possible thanks to the technological progress of hardware and software environments. In the past, VR, AR and mixed reality methods required expensive equipment or allowed only for insufficient quality. Both limited their wide spread in design practices. At the same time, the researches referenced in the paper indicated a significant potential of such solutions, which both improves the architectural presentation and also allows for effective, intuitive design. Design3R project is aimed to take advantage of the possibilities offered by HTC Vive and Google Tango to create a design environment in which the real space of building interior and the emerging interior design are completely integrated. Therefore, the aim of the project is to use the HTC Vive Headset to transfer the designer into a virtual reality for better presentation and exploration of the new first person design environment. The choice of such a device ensures both a broad access and high quality. In contrast to existing solutions, in this case it does not serve only as presentation of the model prepared with external tools, but it contains its own dedicated interface for interior design. Moreover, the project involves a depth sensor to obtain a room scan in the real time. It allows for the very stable effects of augmented and mixed reality. Furthermore, it provides the tools and interface for automatized measurements and modelling directly in the existing interior. At this stage, the real time interior scan is obtained using the Google Tango platform on the Lenovo Phab 2 pro device. In the future, along with the development of the platform, it will be replaced by the widely available ARCore, although it is also possible to use other tools, including the Occipital kit. At the moment, the paper is focused on the report on the implementation of VR and AR techniques for design support and the description of case studies of the design processes. The work does not describe specific technical solutions, but creates a holistic image aimed at illustration of the new perspective for interior design. In conclusion, the paper claims that the presented methods support the design process and create a new, more intuitive perspective on the perception of the project. It can also be useful in the didactic curriculum, while Design3R can immediately show the spatial effects of the project decisions. The perspective of the project's development is the interface for the architectural design based on BIM systems.

Session Title:

Mathematical and Statistical Methods

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NUMERICAL SIMULATION OF HEAT AND MASS TRANSFER IN AIR FLOW IN URBAN ENVIRONMENT

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ABSTRACT

Numerical study of the heat and mass transfer in the urban environment is an actual task of modern science. Knowledge of the interaction of the atmospheric turbulent flow and local flow structures formed due to the presence of buildings, structures and their complexes allows us to solve more efficiently ecological and urban planning problems such as forecasting the air pollution state, management of urban heat island effects, etc. It is a well-known fact, that heat and mass transfer processes in urban environment depend on many factors such as town-planning features and topology of streets, the presence of multiscale structures, green spaces, water bodies, anthropogenic heat sources (industry, HVAC systems), etc. In addition, the microclimate of cities is specified by the mesoscale turbulent air flow, atmospheric boundary layer characteristics, landscape features, thermal stratification conditions and the air composition. In this paper, the authors focus on some aspects of numerical modeling of turbulence flow in the vicinity of buildings and their complexes taking into account natural heat convection effects. Numerical simulation was carried out on the basis of the 3D Navier-Stokes equations for a compressible air supplemented by the energy equation and the k-ω SST viscosity model. The main modeling tool is the Fluent Software. At the first stage of study the stand-alone building with rectangular cross-section was chosen as a main test configuration. For this configuration, a series of calculations were performed with various thermal boundary conditions describing regimes of the neutral, stable, and unstable atmospheric stratification. Flow structures in the vicinity of the building were obtained for the different kinds of boundary layer thermal stratification. The influence of thermal effects on the air flow structure in the boundary layer was described. At the second stage, a numerical study of the turbulent flow structure in the vicinity of complex of buildings describing a typical topology of city streets was carried out. The parameters of the turbulent and thermal wake behind the building complexes were estimated. The work was supported by Russian Foundation for Basic Research, grant 18-08-00755 A “Numerical simulation of heat and mass transfer processes in multicomponent flows, describing mechanisms for the emission dissemination from vehicles in the vicinity of urban roads”.

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STOCHASTIC MODELLING AND PREDICTION OF FATIGUE CRACK PROPAGATION BASED ON EXPERIMENTAL RESEARCH

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ABSTRACT

The present article deals with the numerical analysis of the propagation of an edge crack in a plate. The theoretical model of fatigue crack progression is based on linear fracture mechanics. Some of the methodological problems encountered during the stochastic application of results of experimental research in linear fracture mechanics are identified during solution. The calibration functions for short edge cracks are compared for various loads. The calibration function for pure bending, which is presented on an extended domain of relative crack length, is applied in numerical studies with random input variables. Statistical characteristics and types of probability density functions of input random variables are identified based on studies in literature. The initial crack length is considered with log-normal probability density function. Numerical studies, which identify stochastic dependencies between input random variables and fatigue resistance, were performed using stochastic models. Attention is focused on the domain of relative crack length, which defines the use of the calibration function. The results are obtained using the Latin Hypercube Sampling method. The second part of the article focuses on the sensitivity analysis of the fatigue resistance. The numerical study shows the dominant effects of initial crack size and quasi-constant stress range on the fatigue resistance. This conclusion is confirmed using screening methods and techniques based on measuring the correlation. Pearson correlation coefficients, Spearman rank-correlation coefficients and Kendall rank correlation coefficients were applied for the evaluation of sensitivity analysis. The obtained results show a surprising agreement between Pearson and Spearman correlation coefficients. The effects of non-linear stochastic dependencies and outliers on the results of sensitivity analysis obtained using correlation coefficients are discussed. The study shows the possibility of using several methodologies of performing numerical simulations covering both qualitative and quantitative sensitivity analysis using a one-sample base. In further research it is necessary to focus on other types of sensitivity analysis, which are better suited for the analysis of the influence of outliers on structural reliability.

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MATHEMATICAL MODELING AS THE BASIS OF THE INFORMATION SYSTEM FOR MONITORING THE AQUATIC ENVIRONMENT

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ABSTRACT

During the project preparation of the construction of the facility, an analysis of the environmental situation at the construction site and adjacent territories, including on water bodies, is carried out. Mathematical modelling of processes in water bodies for monitoring their condition has been performed. Water resources of the region are a complex system of interconnected water bodies that interact with each other and have different characteristics. Analysis of the features of the distribution of pollutants in the aquatic environment of the ecological landscape showed that mathematical modeling should be carried out in three main directions, taking into account the nature of the mass transfer of the substance: diffusion; diffusion-convective; predominantly convective. For each type of mass transfer a mathematical model is created: one-dimensional, two-dimensional or three-dimensional. Under conditions of one-dimensional diffusion, when mass transfer occurs in one predominant direction, two options are considered: 1) diffusion from a point source with a known limited amount of matter; 2) diffusion from a permanently operating source with a known rate of outflow of matter. Both these problems are described by the well-known diffusion equation, but their input and boundary conditions are essentially different. The problem of two-dimensional diffusion was solved for the case when contamination occurs on a certain, rather small part of the boundary of a wide reservoir from a source with constant density. The case of three-dimensional spherical diffusion is considered on the example of the solution of the actual problem, when the source of pollution of constant power is at the origin (in the depth of the reservoir). The problem of non-stationary convective diffusion was solved by the example of a flat reservoir with a weak water current, when the simulated region is a wide two-dimensional channel, on the small part of the boundary of which there is a source of a passive impurity. In this case, the known impurity transport equation was used. We used to systematize the potential ecological situation and built the appropriate mathematical models that allowed us to obtain quantitative algorithms for solving the problems of monitoring and developing the components of the information system for calculating the concentrations of pollutants in the water system in the region.

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MODELLING AND FORECASTING OF SO_2 CONCENTRATION IN ATMOSPHERIC AIR - A CASE STUDY OF THE CITY OF KRAKOW

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ABSTRACT

The paper presents a statistical analysis of SO_2 air concentration in Krakow for the period from 2007 to 2016. The source data were obtained from two measuring stations of the Provincial Environmental Protection Inspectorate in Krakow. SO_2 concentration data had daily average values. The average monthly values and quarterly averages were used for the analysis. The analysis started with the determination of the trend function and the time series of the moving average. Then indexes of monthly and quarterly changes were determined. Considering the whole period of ten years, a slight downward trend was noted, even though a somewhat rising trend was observed in the first five years. In Krakow, the level of sulphur dioxide pollution is approximately two to 2.5 times higher than in the least polluted area of the region the capital of which is Krakow. To create a mathematical model, the following two series were identified: cyclic variability and random variation. A multiplicative model composed of four components was obtained. This model interpolates the source data. The methodology of time series modelling was also applied to monthly and quarterly data. The wind directions prevailing in the city centre were also defined for the last four years. Statistical analysis and multiplicative models of SO_2 variability for these directions were made. For each of the seven selected wind directions, the basic concentration statistics were determined and all components of the multiplicative models were identified. No significant effect of the wind direction on SO_2 concentration in Krakow was observed. This allows for formulating a hypothesis of the dominating impact of the relatively uniformly distributed local sources of surface emission on the magnitude of air pollution by sulphur dioxide in a large urban agglomeration, which is confirmed by some selected scientific sources. The models presented were used to obtain quarterly and monthly forecasts for SO_2 concentrations in Krakow. The discussed methodology is universal and can be used in the study of variability and forecasting of concentrations of other air pollutants in other cities.

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THE ESTIMATION OF SINGLE-HOUSING AREAS DEVELOPMENT USING ARTIFICIAL NEURAL NETWORK

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ABSTRACT

The subject of the research is the analytical model of single-housing areas development covered with local spatial plans in the suburban zone of Poznań agglomeration outside the central city. The research is based on the regression analysis with selected techniques of artificial neural networks using SPSS 22 software environment. It is conducted on 61 local spatial plans, with a single-family housing area from 2 to 90 hectares with an average of 15 hectares. Since it was assumed to focus on the growth rate from 5 to 10 years from the implementation of the plan, the research samples come from 1993-2007. In the article, the basic dependent variable is named “degree of development” and it can be described as the quotient of the constructed houses to the number established by the local spatial plan in the specified time (from 5 to 10 years). While uncontrolled development of single-housing area in Poznań agglomeration leads to many spatial problems, including urban sprawl, the purpose of the study was to support the decision-making process with a reliable analytical model. The allocation of large areas for housing development without sufficient analysis often results in inefficient use of the area, public effort and very low building density which leads to urban sprawl. The obtained regression model can be used in the evaluation and forecasts in spatial planning. Moreover, the results of the research can help to demystify the impact of local factors and conditions on urban growth. The aim of the work is to establish and describe an effective model that allows to estimate development over a period of 5 to 10 years from the plan implementation. The paper also assumes the comprehensive description and evaluation of various tested regression models, especially in terms of goodness-of-fit. This assessment includes comparison of the multilayer perceptron and radial basis function network, time influence from the plan implementation and different sets of independent variables (distance from the city centre, neighbourhood of the forest, access to the lake, availability of specific public services, presence of heavy industry, noise, infrastructure, etc.). In conclusion, it can be stated that a relatively simple network, based only on a few variables, allows for an effective estimation of development in a given time. The model can support the decision-making process for the purposes of sustainable development. Moreover, the goodness-of-fit increases along with the time from the plan implementation.

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RECENT TRENDS IN OBSERVED RAINFALL AND TEMPERATURE IN MALATYA, TURKEY

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ABSTRACT

The aim of this study were to investigate the possible trends in Malatya that a large city in the Eastern Anatolia region of Turkey, for the period from 1960 to 2014 from. Malatya is in continental Mediterranean rainfall region. Air temperature and rainfall data for two meteorological observation stations were analysed on monthly and annual time scales using data collected from General Directorate of Meteorology (GDM). Nonlinear slopes were estimated and analysed to investigate the trends of ait temperature and rainfall in Malatya city using Mann-Kendall test, Spearman's Rho test and Sen's slope method. The run test (Swed and Eisenharth) test is used in determine the homogeneity of data series. One meteorological station showed homogeneity for air temperature data other station showed heterogeneous. The other station showed homogeneity for rainfall data, heterogeneous observed in the other station. The results for annual data showed that one station has positive trend for air temperature. There were no negative or positive statistically significant trends for annual rainfall data. The temperature data for summer months represented statistically decreasing trends in %95 confidence level. In March, the positive trend resulted in % 90 confidence level. The rainfall data in March represented increasing trend only in March. No rainfall trend observed for the other months. The tendency of the trends is analysed by the Sen's slope method. These results could be associated with regional climate change and climate of Malatya could change semi-arid to arid.

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MULTI-CRITERIA ASSESSMENT OF TECHNOLOGICAL AND MATERIAL SOLUTIONS IN PUBLIC UTILITY BUILDINGS- BIPLOTS

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ABSTRACT

The article presents a proposition for the use of multi-criteria analysis for the selection of an optimal thermal insulation solution in public utility buildings. The main aim was to find the best solution among the many described variants. For each building partition of a public building, three technological solutions were considered. In the optimization process, 7 criteria were adopted: ecology, economics, sound insulation, water vapor diffusion, flammability, thermal conductivity and durability, evaluating individual variants. The surveys among investors were carried out for the most objective and the widest appraisement of the task. The obtained results showed the importance of individual criteria (indicators). All criteria were priced on a point scale. The results were visualized and interpretations were made on the basis of received biplots. The proposed solution will be used to make the best choice at the stage of planning and designing public buildings.

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Session Title:

Integrated Coastal Zone Planning and Management

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LANDSCAPE AND CULTURAL ASPECTS OF THE COASTAL AREA OF WESTERN POMERANIA AS FACTORS OF DEVELOPMENT OF MARITIME AND NAUTICAL TOURISM: IDENTIFICATION AND DEFINITION OF CONDITIONS

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ABSTRACT

Maritime tourism in its numerous forms (rapidly developing in the world) has direct impacts on coastal formation and development. As such it has become one of the most important areas of investigation. Among the many varieties of maritime tourism, due to its increasing availability and popularity, nautical tourism, which has recently had a strong influence on the multifaceted Polish coast, deserves special attention. However, due to the natural formation of coasts they are not adapted for most forms of marine tourism. Western Pomerania is a region considered suitable for nautical tourism which is characterized by its unique nature. In addition to its peripheral location, the area is protected from intense urbanization, and at the same time has managed to avoid engaging into investments that could have radically caused the deterioration of the landscape and cultural values of the region. Properly planned activities for the development of maritime tourism can adequately stimulate the spatial expansion of individual municipalities, often changing their existing character and a leading function. The aim of the article is to illustrate the determinants of the proper (past and future) development of coastal towns in the context of the expansion of maritime tourism (especially nautical), with particular emphasis on landscape and cultural aspects, on the example of a selected locality in the Western Pomerania region. As part of the research, the marine tourism potential in the Western Pomerania region, its landscape and cultural aspects concerning maritime tourism development, as well as the analysis of historical and spatial conditions for the location and concentration of nautical tourism activity in the Dziwnów area were identified. This seaside resort, which was selected as part of the research, is characterized by above-average potential of aquatic development and its local, maritime tradition. On the basis of the analyses carried out on the spatial structure of Dziwnów it was found that the village is a model example of tourism synergy of inland and in marine water area. The research included interpretative and historical studies, and the inventory of urban, architectural and landscape elements – essential for the development of nautical tourism, as well as the municipal strategy and field observations. Apart from the aspects related to the nature for the development of nautical tourism, the cultural values of the village, its local traditions and continuity of development of the tourist-oriented function also play a crucial role. The origins of the village date back to the transformation of the original fishing village into a summer resort, then a seaside resort, a post-war spa town – the Kamień Pomorski satellite, into a modern base of organized tourism.

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2-D COASTAL HYDRODYNAMIC MODEL TO EVALUATE THE PERFORMANCE OF THE ABU DHABI SHORE PROTECTION SYSTEM

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ABSTRACT

The main shoreline of the Abu Dhabi City Main Island is facing the Arabian (Persian) Gulf from the north-west side and is exposed to continuous current wave action. Therefore, a shore protection system was developed on this side from the Main Island. The shore protection system consists of onshore and offshore breakwaters, huge volumes of damped sand, and an artificial island known as the Lulu Island. In this study, the performance of the current shore protection system of Abu Dhabi City Main Island was evaluated using the Costal Graphical Wave (CGWAVE) 2D-hydrodynamic model. The model can simulate the characteristics of the waves when they approach the breakwaters or the shoreline. Our study has shown that the breakwaters manage to dissipate most of the wave energy before the waves reach the Lulu Island, whereas this island protects the Abu Dhabi City shoreline by creating an elongated sea area between the island and the shoreline that is devoid of any wave action. The constructed shore protection system was also efficient in controlling beach erosion and flooding by damping the wave energy.

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TRANSFORMATIONS IN THE WIDER INDUSTRIAL COASTAL REGION OF SAINT GEORGE, WESTERN OF PIRAEUS PORT IN ATHENS

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ABSTRACT

The industrialization of Greece began in the cities -ports, and not in the countryside, based on the sea exploitation, since the main means of transportation was the ship, which strengthened the working class and imposed until 1922, the creation of industrial settlements areas near Athens and Piraeus. Moreover, in the late 19th century, the coastal area west of Piraeus, is one of the most important landmarks in the wider industrial zone of the port, where a large number of investors invade the area. The siting of large industrial and port facilities on the coast began in 1898 with Vasiliadis Shipyard, as well as, the Fertilizers (1904) and Hercules cements (1911) factories. The industrial character of the coastal zone of Saint George in Piraeus is significantly strengthened by the installation of Saint George's power plant in Keratsini, a colossal project for Greek data. On the other hand, the surrounding area of Saint George was inhabited by the workforce of around industrial units, as illustrated by the "houses" that built the Fertilizers factory to house the workers and their families. Moreover, the industrious character of the neighbourhood strengthened the massive settlement of refugees in Greece in 1922. Towards the end of the 20th century, in the 1980s, the factories that constituted the heavy industry in the areas west of the port of Piraeus gradually began to close due to the reactions of the residents to the pollution which caused, but also to the general need of the wider Athens area, to get rid of polluting factories. Since1979, discussions have started on the redevelopment of the industrial zone due to the relocation of industries from Attica. This coastal region, which in the past was a major industrial area, is currently inactive industrially and as a result, most industrial buildings have been demolished and have significant environmental degradation problems. Now, this area is provided as a strategic intervention area for the qualitative upgrading of western Piraeus as well as for the municipality of Keratsini - Drapetsona, with the guarantee of high quality environment and infrastructure, main functions, as well as a recreational ride to the sea front. In the frame of the redevelopment of the degraded area, many studies were carried out by various architectural offices, where the area was considered to be suitable for a maritime centre, with the creation of offices, residences, entertainment and cultural centers, commercial shops, hotels, etc. The formerly industrial coastal zone in the west of Piraeus is abolished, changes character and mainly is urbanized. Consequently, the reconstruction of the "Drapetsona-Keratsini" harbor-industrial zone needs special consideration for its future development needs. In addition to upgrading the urban fabric with green areas, it will be combined with cultural, tourist and sports activities with the creation of hotels, conference centres and sports facilities, as well as the development of public transport, so as to gain immediate accessibility but not to be burdened with a nuisance of the house area.

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THE ROLE OF INTEGRATION OF ARCHITECTURE AND LANDSCAPE IN SHAPING CONTEMPORARY URBAN SPACES

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ABSTRACT

The public spaces of many cities and towns face numerous problems, manifested by the broadly understood disintegration of both social and spatial aspects (e.g. vanishing neighbourhood bonds and communities, the anonymity of the individual within the city space, and the commercialization or neglect of public spaces). The search for methods for the broadly understood integration in space proves necessary, and even the precondition for harmonious development and the effective functioning of a community. Integration of architecture and landscape can be understood and interpreted spatially in different ways. It is pursued not only through references to organic shapes, but also through the use of the site context in order to blend the architecture with its surroundings, to make references to historical and cultural motifs, the use of which allows people to create spaces that are functionally and narratively coherent, to “domesticate" the space by introducing the idea of *agrarian urbanism*, urban gardening and agriculture into the urbanised space, combining ecological solutions with art, allowing the passing time for a slow but permanent blurring of differences between cultural and natural elements, as well as using symbolism and philosophy. The purpose of this article is: a. to show the possibility of interpreting the integration of architecture and landscape and to introduce its new definition based on literature studies and analysis of selected architectural projects; b. to analyse and evaluate two selected examples of development concepts in the context of the adopted original definition of the integration of architecture and landscape (as a synergy of spatial factors); c. to identify the universal factors (actions) whose synergistic function contributes to the integration of architecture and landscape. These objectives are pursued based on the bibliographical analysis (interpretative studies) and axiological studies (including studies of source materials and field observations) of the two selected development concepts. For the purposes of the studies original definition of integration of architecture and landscape as a mutual complementation and strengthening of elements acting in a synergy was formulated. Each case has been analysed for the manifestation of values relevant to the adopted definition. As a result, actions integrating the architecture and the landscape in these examples and the universal factors whose synergistic function contributes to the integration of architecture and landscape were identified.

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THE FAILURE ANALYSIS IN DESIGN OF THE HOUSING PROJECT IN ISTANBUL ACCORDING TO THE ARCHITECTURAL DESIGN 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. 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 competition project in Balikesir (Turkey) is evaluated and analyzed for the failures according to the Turkish codes and regulations. 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.

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URBAN DESIGN WORKSHOPS IN EDUCATION CURRICULUM: ADVANTAGES AND DISADVATANGES

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ABSTRACT

Urban design workshops have become a quality addition to the regular education curriculum in architecture, urban design and landscape architecture schools. In many of these institutions, short study courses – workshops - are introduced as an obligatory part of the design studio. However, the quality of urban design workshops varies. This study focuses on twenty-five years of experience in teaching through workshops. Workshops, which are very often an extracurricular activity, can be used as a tool for curricular renovation and flexibility as they complement the studio programme. The advantages of enforcing programs of urban design workshops in education is that the professional subject changes every year depending on the current events taking place in the surroundings and the profession, and is, in comparison to the compulsory curriculum, that dynamic component of studying that links students and practise. During the course of the workshop, the students have to focus their thoughts, work and results in a short period. This enables them to contemplate about current events, but also to assess both their individual capabilities and knowledge gained through regular studies and extending the intuitive and intellectual learning process. The main disadvantage of urban design workshops is that only accomplishment of all phases of a workshop guarantees the best results from every perspective. The first phase of the preparation of a workshop, when its themes and goals are set, puts a lot of responsibility on teachers, who organize the workshop. Usually regular work occupies teaching staff, so this phase presents a burden for their educational and other activities in the school. The second phase is the very core of the urban design workshop, when all planned activities come together. It is essential for the participants to share their experiences and work in a common living environment for a couple of days. Results of the workshop, i.e. transformation of their experiences into design, show in the third phase either thorough exhibition, presentations or publications. It is usually difficult to continue workshop activities after the very intensive work in the second phase. The third workshop phase needs a new recuperation of creative energy.

Specific Session:

Technology, organization and management in construction projects

Conveners: Assoc.Prof.Dr. Elżbieta Radziszewska Zielina

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INFLUENCE OF MULTICOMPONENT AND POZZOLANIC CEMENTS CONTAINING CALCAREOUS FLY ASH AND OTHER MINERAL ADMIXTURES ON PROPERTIES OF FRESH CEMENT MIXTURES

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ABSTRACT

The main goal of presented research was to examine usability from technological point of view of cements containing as non-clinker constituents mix of calcareous fly ash (W) and other mineral admixtures - siliceous (V) fly ash, granulated blast furnace slag (S) and limestone (LL). In the paper the results of tests concerning the influence of presence of these additives in multicomponent CEM II and pozzolanic CEM IV cements produced using different methods (by homogenization in blender of earlier prepared materials or by intergrinding of all the constituents) on rheological properties, air content, setting times and plastic shrinkage of mortars. Additionally, hydration heat of cements was determined. Moreover, compatibility of plasticizers with these cements was also studied. In a broader aspect, the research contributes to popularize possibility of use multicomponent and pozzolanic cements with calcareous fly ash (W) as one of components in concrete technology, what greatly benefits the environment protection. Cements containing mix of calcareous fly ash (W) and other mineral components - siliceous (V) fly ash, granulated blast furnace slag (S) and limestone (LL) are characterized by acceptable technological properties and can be used as a common cement in a wide application range. It is recommended to use cements produced by intergrinding of the constituents or blending with fly ash W processed by grinding. Mixes with CEM II / A-M (V-W), CEM II / B-M (V-W), CEM IV / B-M (V-W) and CEM II / B-M (S-W) are characterized by higher workability then mixes with CEM II/B-W and similar workability as mixes with CEM I. Using such cements with carefully selected ratio of fly ash W to fly ash V or to slag S can reduce or even eliminate the negative influence of fly ash W on the workability. Mixes with CEM II/B-M (LL-W) are characterized by a similar or worse workability and higher workability loss then mixes with CEM II/B-W and CEM I respectively. From the point of view of improving the conditions of designing the workability, the use of cements containing calcareous fly ash W and ground limestone LL it is not optimal.

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INFLUENCE THE TYPE OF CEMENT ON THE SCC FORMWORK PRESSURE DURING AND AFTER CASTING

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ABSTRACT

Formworks for SCC are usually designed under the assumption of full hydrostatic pressure. Nevertheless, current research is attempting to explain the mechanism of this phenomenon as observed pressure usually is at the lower lever than expected. This causes formworks for SCC are usually overdesigned. It was noticed the rheological properties of fresh concrete might be a key to predict the SCC formwork pressure. Therefore, knowing the influence of fresh concrete properties on formwork pressure will enable to design formworks more efficiently. This paper presents the influence of type of cement on formwork pressure caused by SCC. Mixes were design under the assumption of equal dispersion ratio. Three types of cement were investigated: portland, blastfurnace and composite cement with a different w/c ratio (0.30, 0.40) and in presence of carboxyl ethers superplasticizer. Formwork pressure was determined on the element imitating a column with dimensions of 0.20x0.20m and a height of 1.20 m with casting speed of 7 m/h. Results show the formwork pressure was registered at the lower than hydrostatic level. Rheological properties had an influence on formwork pressure. It was noticed the different cement types had an influence on rheological properties. Lateral pressure reduction over time was observed with the intensity depending on the cement.

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DEVELOPMENT AND OPTIMIZATION OF HIGH EARLY STRENGTH CONCRETE MIX DESIGN

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ABSTRACT

The basic requirement in the production of precast concrete products is the possibility of their fast demoulding and subsequent transport, what requires high early strength of precast concrete. Until recently, high early strength was obtained by thermal methods of concrete curing, what significantly increased the production costs. Currently, due to the use of modern cements and admixtures for concrete, it is possible to eliminate the thermal treatment of concrete in the production of most prefabricated elements. However, obtaining the early strength after 16 hours at the level of 40 MPa allowing for quick demoulding of prestressed concrete elements and production of the elements in a 24-hour cycle is still problematic. The aim of the research presented in the paper was to obtain concrete intended for the production of prestressed concrete girders with early strength exceeding 40 MPa after 16 hours and optimization of its composition, mainly concerning the minimization of the amount of cement. For this purpose, research was carried out into the influence of the amount and type of cement as well as the w/c ratio on early concrete strength and other selected properties of concrete mix and concrete, including hardening temperature and 7 and 28 days strength. A typical concrete used in one of the prefabrication plants was adopted as the reference concrete, however it did not allow to achieve the assumed high early strength. Based on the obtained test results, it was found that by properly choosing of type and amount of cement and w/c ratio it is possible to obtain concrete with compressive strength much greater than 40 MPa after 16 hours. Data was obtained on optimization of the composition of concrete by the minimization of the amount of cement while obtaining the early strength of 40 MPa. It has been shown that by appropriately assuming the w/c ratio and the amount of sand, the amount of cement in the concrete can be noticeably reduced without significantly affecting the assumed early strength. In addition, the effect of the w/c ratio as well as type of cement and its quantity on the heat of hardening of concrete was determined, which is important due to the conditions of making prefabricated elements. In general terms, the results of conducted research contribute to obtaining significant economic and ecological effects (by minimizing the cement consumption).

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SUPPORTING SLAB FORMWORK SELECTION WITH DIFFERENT TYPES OF CLASSIFIER ENSEMBLES

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ABSTRACT

Formwork is the largest single cost item in cast-in place reinforced concrete structure. A properly selected formwork system, in particular slab formwork, affects pace of concrete works and therefore has an influence on the efficiency of the building performance as a whole. When the formwork items are leased to perform building works, choosing the right system gains in importance. This is why the problem of formwork selection has been discussed widely since early 90's until now by various researchers all over the world. The present paper introduces different classifier ensembles as a tool that can be applied to solve formwork selection problem and presents the mathematical model of the decision problem. In literature, boosted classifiers were already used to solve formwork selection problem by Korean researchers. However, boosting (AdaBoost) algorithm is not the only one that can be applied in the subject matter. In this paper different classifier ensembles are investigated. The comparison includes both different aggregation methods (eg. boosting, bagging, forests) and different types of classifier that is being aggregated. In order to compare ensembles' accuracy, the data collected on the national construction sites are used. The paper ends with remarks and indications that should improve the proposed solutions.

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SCHEDULE QUALITY ASSESSMENT BY UTILIZATION OF WORKING RESOURCES

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ABSTRACT

Schedule optimization is closely associated with the utilization of resources. Basing on Adamiecki's Law of Harmony, it is proposed that the schedule quality should be assessed by the effects of resources' downtime. According to authors' approach, scheduling consists in allocation of resources' work. All available resources generate total availability of work. Schedule quality assessment should be made by evaluating under-allocated work. It is a difference between total work available and work that is actually allocated as a result of the analysed schedule. Therefore, under-allocated work stands for resources' underutilization. Under-allocated work should be cost-evaluated over time with regard to particular resources or whole groups of resources (i.e. particular contractor's resources – if construction is performed by several contractors). The goal of the schedule optimization is to minimize cost of under-allocated work, especially in short-term planning horizon. The proposed method of harmonization assessment can be used in order to assess and compare any schedules, even those planned by independent schedulers for the same scope of works.

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DRIVERS AND ANTICIPATED OUTCOMES OF SOLAR PHOTOVOLTAIC PROJECTS – THE CONSTRUCTION PRACTITIONERS' PERSPECTIVES

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ABSTRACT

Despite Australia receives high levels of solar radiation annually, contributions to energy production from solar sources are significantly low across the country. Whist there is no lack of studies reviewing the initiatives of solar photovoltaic (PV) projects in Australia; few have been conducted in an approach that target construction industry's view and their professionals' perspectives on the solar PV projects. With the growing consensus that climate change is a threat facing today's society, this study aims to identify the relevant drivers and outcomes of solar PV projects for today's construction industry professionals and subsequently prioritise these phenomenon in terms of their importance and anticipation. Therefore, this study approached construction industry professionals to solicit their views regarding drivers and outcomes of solar PV implementation through an online questionnaire survey. The data received from the survey was subsequently analysed through an entropy ranking approach, facilitating prioritisation and ranking of both the drivers and outcomes. The findings reveal that construction professionals prioritise lowering the cost of solar PV technology as the most effective driver to result in their increased PV uptake, and resultantly anticipate greater solar PV efficiency and energy storage as the most important outcome. The findings of this study are insightful as they deconstruct barriers that may prevent construction professionals from implementing solar PV projects. Future study in this field is suggested to focus on ways in which lowered costs of solar PV technology can be achieved and technology efficiency levels increased.

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PREVENTIVE SERVICES OF RESIDENTIAL BUILDINGS ACCORDING TO THE PARETO PRINCIPLE

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ABSTRACT

The problem of ensuring an adequate level of the technical condition of a building occurs over the entire period it is in service. In solving problems connected with developing a prediction of changes in performance characteristics of a residential building, it is suggested that algorithms of determining changes in the reliability of technical devices be used. The process of changes in the technical condition of technical equipment can be managed by making decisions regarding repairs or replacing components. The prognosis of unfavorable processes will make it possible to determine the time frame in which the technical condition of a building will be unsatisfactory in the future, and thus necessitate repair works. Applying optimal prophylactic replacements requires a knowledge of the time span that the components of the building can be expected to work properly. To model situations in survival analysis, the Rayleigh distribution for the random variable of time was accepted. In the article, the model of the life span curve for a residential building has been presented, where the Pareto principle was applied as the strategy for undertaking renovation works. Modeling various scenarios of use helps to choose the optimal planning of renovation works on a building. The characteristics of various strategies influence the shape of the life cycle curve of the building. Applying the Pareto principle is an example of a strategy of renovation works on residential buildings. Applying the Raleigh distribution to predict reliability is possible thanks to the analysis of a set of data including the values of the degrees of wear of actual residential buildings.

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SCHEDULING REPETITIVE CONSTRUCTION PROCESSES WITH USE THE LEARNING-FORGETTING THEORY

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ABSTRACT

One of the main factors having a decisive impact on the completion date of a construction project and its total cost is the duration of individual processes. Projects such as the construction of multi-storey residential and public buildings, line facilities, highways, networks of external installations or pipelines are conducted with time-location methods of work organization. It is possible to notice the cyclical nature of building processes in projects; whose characteristic parameter is length or height. In such cases, works are entrusted to specialized organizational units (crews, teams) that conduct repeated operations on identical or similar sections, called units. With each repetition of the operations, workers acquire more and more practical experience which has a positive effect on their work efficiency and leads to a reduction in the time and cost of a construction project. The learning theory bring on a mathematical description of the interdependence between the repetitions number of the same task and work efficiency. Taking into account the learning effect allows for a more accurate estimation of the individual construction processes duration, which may provide an advantage at the stage of submitting bids in tenders. The aim of research is to prepare the implementation plan of repetitive construction processes conducted in a multi-storey residential building. The schedule will take into account the impact of the learning and forgetting effect for the duration of construction works and the interruptions in crews work on the example of finishing works. Due to the lack of commercial software for preparing construction schedules taking into account the learning and forgetting impact, a spreadsheet was developed in MS Excel to set the start and end dates and time buffers of construction processes.

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RISK ANALYSIS FOR HIGH PRESSURE GAS PIPELINE CONSTRUCTION SCHEDULE

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ABSTRACT

In article authors focus on preparation of construction works schedule for high pressure gas pipeline in urbanized area and implementation of risk analysis in estimation of realistic completion date. In the first step the pipeline was divided into couple of sections with different construction methods. During evaluation open cut methods, HDD and microtunneling methods were verified and for every approach specific types of risk were identified. Since number of potential risks was significant authors decided to apply the method for ranking the risks and introducing most important potential complications in the construction schedule. After risk identification authors prepared set of impact categories, varying for negligible few days delays to disastrous three months or more delays. Moreover, for potential risks a list of probabilities was elaborated to described risk is plausible to happen several times during project execution or is rather likely to occur every couple of similar projects. Combination of sets of possible impacts and sets of probabilities resulted in a project specific risk matrix. Risk matrix was the first tool used for ranking of all risks, especially when regions of intolerable risks and risks requiring mitigation plan were drawn in the matrix. Based on professional literature and their own experience for every potential risk authors estimated the risk level. Knowing this in the next step all risk was sorted according to decreasing value of risk level and for risks within intolerable area or within area requiring emergency back-up plan. Authors verified if those plausible risks indeed require a schedule reserve or some other solution may be applied. If schedule reserve was a reasonable solution the relevant additional construction time was estimated, having in mind the schedule impact level of reviewed risk. In the end construction schedule was prepared, which includes the risk analysis for all construction methods.

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MODELING OF EFFICIENCY EVALUATION OF TRADITIONAL PROJECT DELIVERY METHODS AND INTEGRATED PROJECT DELIVERY (IPD)

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ABSTRACT

The classic triad "owner-architect-general contractor" are the main participants of traditional projects. They make contracts that regulate the rights and obligations of the parties and establish procedures for solving the entire range of issues during the operation of contractual relations. However, modern projects, especially large ones, require a wide range of participants. Taking into account the large number of project participants, it becomes very important to optimize the cooperation between them. The problems with communication leads to the division of the construction process to the stages, the significant number of changes and non-operating costs, and as a result to the increased project duration and increased costs. The research analyzes the core, characteristics and principles of the Integrated Project Delivery (IPD) and establishes the connection between it and the traditional project delivery methods. The IPD accumulates some of their special features and becomes the next stage in the evolution of the construction industry. One of the main characteristics of the Integrated Project Delivery is an early involvement of key participants, based on the following principles: early involvement, early goal definition, intensified planning, and organization and leadership. The aim of the research is to compare the effectiveness of the traditional project delivery methods and the Integrated Project Delivery by the criterion of the total cost for project modification. Methods of mathematical modeling were used to compare the effectiveness of the various project delivery methods. Thus, such curves and functions of dependence were modeled: between the increase in the cost of the project modifications and the period of their delivery; between the intensity of changes made to the project and the time when traditional project delivery methods are used; between the intensity of project modifications and the time on application of the Integrated Project Delivery. By means of the integral calculus (Simpson's rule) it was determined the total cost of the project modifications, which is a function of the method of project delivery and the cost of making the appropriate changes. The result of the calculations proves that the use of the integrated project delivery model reduces the total cost of making changes by 33%.

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TWO-OBJECTIVE OPTIMIZATION FOR OPTIMAL DESIGN OF THE MULTI-LAYERED PERMEABLE REACTIVE BARRIERS

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ABSTRACT

The design, construction and management of engineering project tend to be large scale, indivisible, and long-term facilities, with investments taking place in waves. This investment process due to constant further development have become a critical issue in the world management of civil engineering as regards sectors of the national and private economy. These kind of investments cannot be limited to solving just the mechanical problem. They should be designed within considering their life cycle, all costs in the project and construction stage, as well as which will obtain during the lifetime of the investment. Due to the increasing environmental contamination especially soil and ground-water, the need of restoration these degraded lands for construction investment has emerged. Nowadays, the remediation technologies are more often focused on using passive engineering constructions installed in the ground, for example permeable reactive barriers (PRB) that allowed for land use during decontamination processes. As with any investment, information about the costs of remediation technologies is as significant in determining their final commercial success as are efficiencies data. Technology investors need to have consistent cost information to conclude whether the technology will be economic. In the case of PRB technologies, the installation is a major investment costs, where one of the biggest drivers are material costs. The most important parameters for PRB cost and design are dimensions (thickness, length and high should be enough to treat the entire width of contaminates and to prevent their migration). The most important challenge is to determined the optimal thickness of a PRB, which provide a residence time appropriate for reducing the concentration of contaminants. In engineering investment that involve designing, systems and decision making, optimization is crucial in creation the best design subjects the whatever constraints. In this paper the two-objective optimization method for multi-layered PRB design is considered. The proposed method is characterized by following special features: elimination of a time-consuming simulation model; application a universal, simple Excel spreadsheet-based optimisation model that calculate minimum cost PRB using solver; and the using of real input variability based on literature and laboratory tests. In the view of the minimize cost of the reactive materials and maximize the resident time of contamination, the required thicknesses of PRB layers: activated carbon, zeolite and zero valent iron were calculated.

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SUSTAINABILITY IN CONSTRUCTION PROCESSES - REQUIREMENTS, CRITERIA, EVALUATION CONCEPT

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ABSTRACT

The application of the principles of sustainable construction in practice is covered by research and legislative works, the effect of which are standards and other documents helping designers and investors in the assessment of construction products and buildings in their life cycle. The research, presented in the literature, focus primarily on the study of environmental impacts, in particular in the phase of manufacturing building products. However, there are no in-depth studies on the assessment of construction processes. This paper focuses on the analysis and evaluation of construction processes, in view of the requirements of sustainable development. The proposed methodology allows a systematic analysis of each of the three pillars of sustainable construction, i.e. the environmental, economic and social aspects, based on quantitative assessment indicators. Due to a limited scientific recognition in the area of social aspect assessment, it was subjected to a particularly thorough analysis and a procedure was developed to allow the study of the impact of construction works on the neighbourhood (surroundings). Noise, emissions of substances as well as vibrations and shocks were considered as the representative indicators characterizing the social aspect of the effects of construction on the environment. This approach is justified by the high harmfulness of these factors to health in the work environment. Depending on the nature of the impacts, their values were determined based on the noise level (noise), the concentration of respirable dusts (emissions of substances) as well as peak particle velocity and vibration levels (vibrations and shocks), it is recommended to represent in the assessment by multiplicity of standards or reference levels. The proposed method of analysis of building processes may be applied to the planning of construction works with the least adverse impact on the environment.

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CLASSIFICATION OF URBAN REGENERATION PARTICIPANTS AS A BASIS FOR IDENTIFICATION OF CONSTRUCTION INVESTMENT'S RISK SOURCES

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ABSTRACT

In each process of risk identification, it is extremely important to determine the sources of its occurrence. Urban regeneration is a very complex undertaking, so in its context it is extremely important to determine the entities co-participating in the implementation and coordination as well as those participating passively. All of these entities constitute a wide range of project stakeholders, and therefore persons, groups of people and institutions that may have a positive or negative impact on the course and results of the project. On the basis of the conducted research it can be concluded that the majority of the existing urban regeneration problems are revealed by the lack of an in-depth analysis of sources and risk factors. For the above reasons, the subject of this study is classification of urban regeneration participants as a basis for identification of construction investment's risk sources. Based on four feasibility studies for comprehensive urban regeneration projects, and taking into consideration the guidelines of the urban regeneration act, a generalized structure of beneficiaries of the integrated urban regeneration project was developed together with a description of their scope of responsibility and participation. The article also summarizes the conditions for the selection of partners and contractors of investment tasks, indicating procedural deficiencies that require further replenishment. The research methodology is based on an in-depth analysis of the available documentation of four urban regeneration projects implemented in Gdańsk, which was confronted with the provisions of the Urban Regeneration Act. The course of research includes the following points: (1) Legal basis for the identification of urban regeneration's beneficiaries, (2) Development of a generalized structure of urban regeneration's project beneficiaries, (3) The extent of responsibilities and participation of urban regeneration's beneficiaries, (4) Conditions for selecting partners and contractors for investment projects. The conducted analysis allowed to clearly classify the participants of urban regeneration process, also indicating its direct and indirect beneficiaries. As a consequence, the elaboration defines the responsibility of participants in the investment process, and at the same time allows to divide the risk between individual entities implementing activities covered by the intervention area. The observations described in the article also concern shortcomings in the documentation including, among others, lack of the definition of the required experience of design units depending on the nature of the construction works being carried out.

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THE RISK OF DELAYS IN IMPLEMENTATION OF BUILDING INVESTMENT IN URBAN CONDITIONS IN THE ASPECT OF HISTORICAL BACKGROUND OF ITS LOCATION

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ABSTRACT

The implementation of a construction investment in urban conditions is extremely complex, and at the same time exposed to a high risk of a specific character. This is due, among other things, to special requirements regarding technology used, method of management and organization of works, as well as the investment location conditions. In case of construction investment located in the historic part of the city, the possible accumulation of many unfavorable factors, which in course of its implementation, may constitute a serious source of delays and disruptions, should be taken into account at the preparation stage of the project. In practice, public construction investments are at the highest risk of delays, due to their considerable scope and high competition in declaring 'attractive' parameters by the contractors - evaluation and selection criteria of the most advantageous offer. Factors which in the contractors' opinion constitute the main source of time delays in construction investments conducted in urban conditions include: defects and deficiencies in the project documentation, investor's negligence at the project's preparation stage (eg insufficiently identified geotechnical conditions, lack of detailed archaeological survey of the area, the presence of unmapped utilities), necessity to suspend works and carry out additional research due to encountering archaeological sites, the necessity of using an unusual site establishment, lack of space for storing building materials and excavated spoil, no possibility of working on three shifts. The aim of the article is to present the main factors that have a significant impact on the construction site located in the historic part of the city, i.e. they are the cause of risk in the course of works and, as a consequence, affect the time of investment implementation. On the selected example of the facility located in the historic part of Gdańsk Old Town, the authors indicate the reasons for construction investment duration time extension. The authors also analyze the scope of resulting time delays between planned and actual values. The aim of the analysis is to draw investors' attention to the need of taking into account time contingency already at the preparation stage of construction investment, which results from the specific and unique nature of this type of projects. The article is a continuation of the authors' analyzes on the risk of cost overruns in implementation of building investment in urban conditions the aspect of historical background of its location.

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THE RISK OF COST OVERRUNS IN IMPLEMENTATION OF BUILDING INVESTMENT IN URBAN CONDITIONS IN THE ASPECT OF HISTORICAL BACKGROUND OF ITS LOCATION

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ABSTRACT

The implementation of a construction investment in urban conditions is extremely complex, and at the same time exposed to a high risk of a specific character. This is due, among other things, to special requirements regarding technology used, method of management and organization of works, as well as the investment location conditions. In case of construction investment located in the historic part of the city, the possible accumulation of many unfavorable factors, which in course of its implementation, may constitute a serious source of cost overruns and disruptions, should be taken into account at the preparation stage of the project. In practice, public construction investments are at the highest risk of cost overruns, due to their considerable scope and high competition in declaring 'attractive' parameters by the contractors - evaluation and selection criteria of the most advantageous offer. Factors which in the contractors' opinion constitute the main source of cost overruns in construction investments conducted in urban conditions include: defects and deficiencies in the project documentation, investor's negligence at the project's preparation stage (eg insufficiently identified geotechnical conditions, lack of detailed archaeological survey of the area, the presence of unmapped utilities), necessity to suspend works and carry out additional research due to encountering archaeological sites, the necessity of using an unusual site establishment, lack of space for storing building materials and excavated spoil, no possibility of working on three shifts. The aim of the article is to present the main factors that have a significant impact on the construction site located in the historic part of the city, i.e. they are the cause of risk in the course of works and, as a consequence, affect the cost of construction project. On the selected example of the facility located in the historic part of Gdańsk Old Town, the authors indicate the reasons for construction investment cost increase. The authors also analyze the scope of resulting cost overruns between planned and actual values. The aim of the analysis is to draw investors' attention to the need of taking into account cost contingency already at the preparation stage of construction investment, which results from the specific and unique nature of this type of projects. The article is a continuation of the authors' analyzes on the risk of delays in implementation of building investment in urban conditions in the aspect of historical background of its location.

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QUALITATIVE AND QUANTITATIVE ASSESSMENT OF SCAFFOLDING USED IN POLISH CITIES: FOCUS ON SAFETY

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ABSTRACT

Scaffolding accompanies construction and maintenance works in most types of built facilities at any stage of their life cycle. Despite strict safety regulations and general awareness of risks related with work at height, these temporary structures of collective fall protection are associated with many accidents. In some cases, the scaffolding itself becomes the cause of the accident (due to e.g. faulty or missing elements, or bad structural design), in some – because users ignore, or are oblivious of, the risk (e.g. climbing elements not intended to be climbed, using incomplete scaffolding). The scale of the problem of unsafe scaffolding can be indirectly analyzed on the basis of individual accident reports and statistics. However, the total number, types, purposes, sizes, and condition of scaffoldings used in the practice of Polish construction sites has not been assessed do far. Assuming that each scaffolding is a potential place of accident, the authors intend to fill this gap by conducting regular observation of scaffoldings erected in selected Polish urban areas. This paper presents the methodology of data collection and compares scaffoldings observed in two big cities, Warsaw and Poznań. Observation of scaffoldings consists in combing selected areas with bi-monthly frequency. Each area is distinctive for its predominant type of development and encompasses about 2 square kilometers. All scaffoldings visible from publicly accessible locations are counted and described in terms of size and usage. Although this method misses scaffoldings out of sight of the assessor and, due to urban locations, focuses on building and not industrial or infrastructure projects, it gives a good idea of the qualities of scaffoldings in use, and enables estimating changes in the number of scaffoldings over the year. As comes from the analysis, frame scaffoldings are the most popular type used in Polish construction. Users commonly choose the narrowest option (less than 70 cm of usable width of the platform) and apply them to a variety of works, be it placing concrete, cladding walls with ETICS or even heavy stone elements, or providing access to roofs. Modular scaffoldings are second most popular, whereas the tube and fitting type is used in extremely rare cases. Small projects (individual housing, small scale repairs) frequently rely on combination of elements of systems scaffoldings and are often incomplete. Interestingly, “bad scaffoldings” do not appear only in remote suburbs. As for the changes of the number of scaffoldings over the year, the pattern is not as clear as could be expected in the case of a cold climate country. The findings indicate that occupational safety culture is still low. The research presented in the paper is an element of the research project “Model of risk assessment of structural failures, accidents and incidents related with construction scaffoldings” funded by Polish National Centre for Research and Development (NCBiR), grant no. PBS3/A2/19/2015. Its primary aim is to assess the scale for estimating scaffolding accident rates. Nevertheless, the results provide direct insight in the scaffolding market in Poland.

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STRATEGY FOR MARK-UP DEFINITION IN COMPETITIVE TENDERS FOR CONSTRUCTION WORK

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ABSTRACT

A competitive tender with the price as the only (or the main) criterion of contractor selection is one of the most common approaches to procurement in construction. On the one hand, it is expected to offer the greatest benefits of competition to the client; on the other hand, it forces numerous competitors to engage time and resources for bid preparation with a low chance to win the job. To stay in the market, the contractor needs to foresee the behaviour of the competitors (which implies knowing who they are and what prices are they likely to offer), and apply some strategy to increase his/her probability to win without compromising the profits. A number of mathematical models of competitive bidding process can be found in the literature, from the earliest basing on probability theory, to more recent that apply artificial neural networks or fuzzy set theory. The paper presents a probability-based method of estimating the optimal bid price (which means a price of maximum expected value of the contractor's profit) in lowest bid tenders that stems from Friedman's model (1956). The authors discuss the assumptions that make the model applicable to real-life situations of specialized construction contractors. A worked example based on case-study data is presented to illustrate the idea. To be used in practice, the proposed model has to be fed with up-to-date results of tenders (number of competitors, and their bid prices). The proposed strategy thus rests upon careful monitoring of the market and internal condition of the bidder.

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A SIMULATION MODEL FOR STOCK OF BUILDING MATERIALS DEVELOPED WITH CRYSTAL BALL SOFTWARE USE

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ABSTRACT

The article presents a simulation model of the inventory with two variables developed using the Crystal Ball software. This model is designed for the purpose of optimization of logistics processes related to the organization of supply and storage of construction materials used in the production process. The result of the model, we get information about what provision should be basic to the whole process took place without interference. Not always, however, it is possible to create initial stock of this size. Using the program Crystal Ball we can also obtain information, what is the probability to avoid downtime for different levels of initial reserves. The model is based on the classical model developed by Jaworski Professor of the Warsaw University of Technology. In the model two variables will be considered. The first variable is the amount of depreciation; in the classical model it is described discreetly. Based on historical data, determines the probability with which will be observed the consumption plan and the probability of default and excess of norm of consumption of this material. The second variable take into account the amount of planned delivery. In the same way as in the case of the size of the depreciation in the classical model this variable was described discreetly. As before, the author recommends a definition based on historical data probability of compliance with the required value of delivery probability and delivery more or less than planned. In the presented model we also consider the possibility of describing random variables using other than the discrete graphics and the empirical probabilities. This procedure allows for the approximation of modeling methods for people who do not have the appropriate set of historical data and would like to use it to minimize the risk of organizational problems. The article shows what results are achieved through the use of the software Crystal Ball, and how they can be used in the organization of the construction investment process.

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THE COMPARISON OF ANN CLASSIFIER TO THE NEURO-FUZZY SYSTEM FOR A COLLUSION DETECTION IN THE TENDER PROCEDURES IN THE ROAD CONSTRUCTION SECTOR

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ABSTRACT

As the contracts in the road construction sector in Poland are usually of extremely high value and financed from the state budget, the tender procedures should not allow for the non-concurrent behaviours of tender participants. Otherwise, the clients lose will be of high value too. The database comprising hundreds of bidding procedures in the road construction industry in Poland has been developed. It comprises the tenders' participants, the locations of the roads sections, bids' values, the winners, the types of roads. Every procedure has been evaluated and assigned to the set with a given level of collusion occurrence probability. The evaluation has required the analysis and the transformation of – described in the literature – collusive types of behaviours to the parameters of procedures that can be shown as numbers or ranks. Four criteria of a collusion threatened contracts have been chosen and applied for evaluation. Then, two methods of machine learning were applied. The first method was to train an artificial neural network (ANN) to classify the procedures to the aforementioned sets. The other method was to utilize artificial neural networks predictive capabilities enriched by the fuzzy sets theory. The multiple output from ANN was defined as membership function values. The use of the fuzzy sets theory – the process of defuzzification – helps to classify the tender procedures to the sets of different level of risk (of collusion appearance). The results achieved in these two separate processes are compared and discussed. The created tool can be applied for the future tender procedures as a pre-test of a collusion appearance.

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COMPUTER MODELLING OF PROCESSES OF CHANGING OVER TIME AND RENOVATION OF HISTORICAL BUILDINGS

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ABSTRACT

Building structures are continuously subjected to loads, environmental and climate influences. The effects of impacts are more and more clearly noticeable over time, and especially visible in the case of historical buildings. The effects of the interaction processes are changes in the strength parameters of the materials used and the degradation of structure structures as well as changes in parameters of the objects. Most of the historical objects are constructions made of stone, masonry and wood. A significant part of these objects, to a smaller or larger extent, requires renovations during the period of use. Repairs or strengthening processes are preceded by the identification of forces and stresses in structural elements. In renovation works, apart from traditional ones, modern methods and technologies of repairs are used. Material layers and adhesive joints of high strength are introduced. A feature of heterogeneous materials that is important in the analysis of phenomena under the influence of stress is the implementation and endurance work of connections, joining and layers. The paper presents a practical method of modelling and assessing the state of stresses in structures and degraded or strengthened elements using computer analyses. The developed model is based on the finite element method and significantly reduces the number of unknowns. The model can be used to identify the state of stresses and strains in the design of strengthening, repairs and renovations of the historical buildings.

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SELECTION OF CONSTRUCTON PRODUCTS SUPPLIERS ACCORDING TO THE CONDORCET CRITERION

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ABSTRACT

The continuous growth of competition on the construction market results in the fact that construction companies are forced to keep searching for solutions facilitating the building process and construction logistics. In the recent decades, one of the most fascinating ideas which enable a real improvement in the aspect of a company's competitiveness on the market is supply chain management. It has undergone a transformation from fragmented actions to integrated operations intending to optimize the flow of physical resources and information. The first step towards the application of the modern logistics tools is the selection and evaluation of entities involved in a cooperation within the supply chain framework. The selection of reliable partners to supply a construction site or a building company may reduce the operational costs, minimize inventory and improve timeliness as well as the quality of offered services. Any mistakes made in the process of supplier selection may lead to issues such as supply delays, difficulties in keeping contract deadlines and even complete failure of a project or bankruptcy of a construction company. An 18th century criterion for the selection of the most preferable candidate developed by Nicolas de Condorcet is commonly accepted owing to its fair rules of choice (anyone who defeats most of their competitors in a direct confrontation wins). Due to its democratic approach, most criteria decide as to the selection of the winner. Should the choice of a winner or establishing a Condorcet ranking from the perspective of the social choice theory prove impossible, the selected candidate ought to be as much similar to a winner in the Condorcet sense as possible. The theory was developed in order to facilitate the selection of the most suitable candidate in the election, however it may also find application in the selection of a supply chain element evaluated with the use of multiple criteria. There are a number of decision-making methods which fulfil the Condorcet criterion. They vary in their computational complexity and may provide different final order. The intention of this paper is to review the methods which may offer support while selecting the most preferable supplier of construction products.

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RISK MANAGEMENT IN CONSTRUCTION PROJECT: TAKING SUSTAINABILITY INTO ACCOUNT

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ABSTRACT

One pillar of the European Union's policy is the environmental policy, which indicates, among other things, a need for taking into account ecological conditions and effects in all types of economic activity. The construction industry is exposed to conflicts between processes and the natural environment. Taking into account the sustainable development in construction projects requires an inclusion of environmental problems in the scope of project risk management. Risk management in construction projects is considered as a very important process supporting the achievement of project goals in terms of time, cost, quality, safety and stainability issues. The aim of the article is to pay particular attention to the latter aspect. Project risk management is effective when it is implemented in a systematic manner throughout the life cycle of the construction project. The article indicates that the specific features of construction activity have a significant impact on shaping the nature of construction investment projects. Their executions are connected with deep and long-lasting interference in the natural environment, and they are burdensome for the environment, both in the construction phase, as well as during their maintenance and liquidation phase. It requires the consumption of significant amount of material resources and the involvement of a number of specialists and institutions making decisions in succeeding phases of the life cycle of erected structures. Therefore, these projects have many stakeholders - interested, to a different extent, in the particular stages of the project. The results of the survey carried out among construction entrepreneurs at the turn of 2015-2016 about the fuel and energy consumption in the logistics processes of construction projects are presented. This provides a basis for answering a research question about how seriously entrepreneurs treat sustainability problems. Risks related to sustainable development are indicated on the map of risks in the construction project. It is emphasized that construction works should be executed with the use of such energy-saving technical solutions that enable for minimising a use of natural resources in the construction and maintenance phases, and in the final stage will allow easy liquidation of the structure.

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APPLICATION OF THE WOOD-FRAMED WALLS AND DIAPHRAGMS TO PRODUCTION AND ASSEMBLING OF THE MODULAR MULTISTORY BUILDINGS

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ABSTRACT

One of the most developing in Europe and North America technology applied in construction of residential buildings is the light wood-framed technology. Paper describes design issue and assembly technology involved to the modular wood-framed multistory buildings. This kind of buildings are currently constructed up to four-story as a multifamily or varying universal buildings like school, kid-garden or offices. These structures are based on large panel or modular technology, where elements in the form of wall panels and floor diaphragms or 3D spatial modules are constructed in the industrial plants. Individual elements like wall, floor, roof diaphragms are constructed on specialized production lines and then completed and assembled to the form of 3D module. Usually dimensions of the module do not exceed 4850 mm in width, 3700 mm in height and up to 19500 mm in length. The fully finished modules are being dispatched to the site. Elements transported to the site are then assembled by crane directly from conveying vehicle. Considering modern stages of construction commenced in the prefabrication plants, process of construction decreases to 40% comparing to assembly time of traditional building on site. Within last decades required minimization of defects brought construction towards modular structures when almost 80% of connections are accomplished in factory where these elements are completely finished. Modular building structures guarantee the highest standard of construction and their element quality. Moreover, the aspects like ecology, energy saving, and man power cost reduction strongly decide on popularity of these technology. Process of prefabrication, wide assortment and variety of factory production does not require time consuming processes and complicated moulds or shuttering indispensable in precast RC structural elements. Considering the large elements dimensions, the modular structure must fulfil requirements which are not recognized in traditional construction. Usually in the static analysis and modeling of building structure the structural load bearing and shear walls are considered. In the wood-framed structure bearing and non-bearing walls are statically cooperating in transmission of lateral loading, and they decide and determine the spatial stiffness of entire building. Design models can be evaluated with adequate engineering precision or taking into account all elements composing structure. Usually in the first approach the beam elements in numerical analysis are considered, while in the second stage 2D or 3D FEM analysis is conducted. The paper describes 3D model composed of plane and beam elements. Significant factor influencing static work of building is variation in moisture content causes shrinkage or swelling of timber elements. Multi-floor wood-framed construction faces challenges related to wood shrinkage, a process in which the moisture content evaporates, causing changes in the physical properties of wood. Shrinkage in result of drying decreases the dimensions of the cross-section, what affects the structure deformations and displacements. Considering the effects of shrinkage, the total vertical deformation of the two story residential building could reach about 30mm. This cumulative shrinkage effects of multi-storey building can cause large expenses of interior and exterior finishes and it may also create buckling in sheathing. The appropriate example of evaluation of shrinkage effects is presented in the paper.

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ANALYSIS OF OBLIGATORILY USED PRICE SYSTEMS IN PUBLIC WORKS CONTRACTS PROCUREMENT

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ABSTRACT

The issue of public works and supply contracts in terms of bidding is closely related not only to the individual cost calculation of individual bidders, but also to the tools that can be used within the calculations. For the standardization of the technical and economic parameters, comprehensive price systems can be used, while the use of these price systems is obligatory in the legal environment of the Czech Republic. The aim of this paper is to analyze the price systems used in the Czech Republic and to compare them in relation to the costing of construction works and supplies. In particular, the subject of the paper is the comparison of specific construction works in the area of building engineering and water management structures.

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SCHEDULING CONSTRUCTION PROCESSES USING THE PROBABILISTIC TIME COUPLING METHOD

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ABSTRACT

Scheduling construction processes is an integral part of the Building Information Management BIM 7-D methodology. The paper presents modeling of construction project schedules using the Time Coupling Method (TCM) in a probabilistic approach. It is presented in EXCEL application with a description of the calculation scheme. The data for the calculations was obtained using the multivariate method of the WMMS statistical models. The correctness of the PTCM method was checked by comparison with the results obtained for the same data in the Risky Project Professional program. In this program the distributions of time probability functions as beta, normal and triangular were assumed. The MAPE error was calculated by comparing the results obtained from the PTCM calculation and assuming the probability distributions of times: normal, triangular and beta. As a result of the analysis, it was found that the PTCM method is the closest to the Risky Project Professional (RPP), taking into account the beta distribution of the probability of times. Mean absolute percentage error (MAPE) less than 1%, it can be assumed that the matching of these two calculation methods is excellent. The PTCM method is very simple and fast to use. The calculation sheet in the EXCEL program is structured in such a way that the user enters only the duration and standard deviation of the processes. In the MPC program, there is a need to assign the probability density distribution to each work task and to calculate the alpha and beta coefficients for the beta distribution. The PTCM (Probabilistic Time Coupling Method) is a novelty and has not been analyzed so far.

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THE EFFECTIVENESS OF APPLYING MARKETING TOOLS IN THE REAL ESTATE MANAGEMENT

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ABSTRACT

The aim of this paper is to evaluate the effectiveness of marketing tools used by real estate agents in Krakow. Based on the diagnostic survey and conducted questionnaire surveys, as well as the subject literature, a cross-sectional analysis of various marketing tools, the frequency of their application and the effectiveness of marketing activities was made. The collected empirical material and analyzed literature allowed to formulate the following conclusions: a. the most commonly used form of real estate promotion is online advertising and the use of classifieds websites, b. social media plays a big role and their importance will be constantly growing allowing for effective reaching of targeted groups of customers, c. modern methods of real estate visualization are not practiced by real estate offices in Krakow, despite the fact that certain benefits for entities implementing them are already recognized, d. the need to make high-quality photographic description of real estates in case of preparing marketing offers is noticed. The essence of real estate marketing in recent years has changed radically. Until recently, customers searching for real estate used to deal directly with a certain real estate agent, with the belief that this is the only way to contact the seller. Currently, the sellers and the buyers' connection is mainly possible via the Internet. Therefore, promotion through social media, an office website or ad websites is crucial and brings need to compete. A proper presentation of the physical properties of real estate turns out to be significant in such announcements. This should be done by professionally made high quality pictures, projections and a properly prepared description of the property. Unfortunately, among the analyzed cases, it turned out that the photos are of low quality, often not presenting all rooms of the offered real estate. The property descriptions are laconic, which reduces the attractiveness of the offer and video materials promoting the property are quite rare, not to mention the so-called virtual walks. The conducted research has shown that in the majority of analyzed real estate agents in Krakow a small number of marketing tools is used. The visible revolution in the development of modern communication technologies has led to consumers behaving differently than when using traditional marketing tools. In order to be successful in building a competitive advantage in the real estate market, modern marketing activities should be applied more widely to the community, offering an open communication that will attract the attention of the potential client. This should be served by applying of such tools as: virtual walks, showing three-dimensional projections, photos from the drone, virtual reality, open house or back home staging.

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COST ANALYSIS OF THE POSSIBILITY OF SECURING AN ENERGY-EFFICIENT BUILDING AGAINST HARMFUL EFFECTS OF VIBRATIONS ON PEOPLE

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ABSTRACT

The aim of this article is to check vibrational comfort in near zero energy building (NZEB) which is often neglected for this type of building but could be annoying for residents. Building chosen for analysis is experimental building of Malopolska Laboratory of Energy Efficient Building which fulfill requirements for NZEB. The main advantage of this building is that it was design specially for research purposes and it has fourteen zones independently controlled. These zones give opportunity to ensure thermal, humidity, luminosity comfort, but do not measure vibrational comfort. Building is located in the city center of Krakow and very close to Szlak street on which cars and vans move. In this article the vibrational measurements carried out on the top floor of the building are presented. Results indicate that vibrational comfort should be taken into account in NZEB. Second part of the article describes possibility to ensure vibrational comfort in such a building by floor specially design for these purposes. In the city centers vibro-acoustic floors could be the only solution when vibrational comfort during day or night is exceeded. Three different types of vibro-acoustic floor with different layers' configuration are described. Their advantages and disadvantages are also shown. In the end, cost analysis is made for different types of floor solutions and the most optimal solution is chosen. The selection is made not only by economic reasons but, above all, by functional premises. The floor solution chosen to be used in Malopolska Laboratory of Energy Efficient Building first of all should ensure the vibrational comfort during daytime because it is office building not residing in the night. The owners of the building will be offered an economic option that meets the requirements of vibrational comfort during the day and an exclusive option that will ensure that the vibration threshold of perception will be not exceeded.

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ENERGY AND COST ANALYSIS OF ADAPTING A NEW BUILDING TO THE STANDARD OF THE NZEB

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ABSTRACT

The idea of Sustainable Development means caring for the environment and the natural resources. Building and transport are the sectors with the highest energy consumption. Building is responsible for about 40% of total energy consumption. Thermal protection regulations for buildings are becoming more and more severe. The 2010/31 / EU Directive on the energy performance of the buildings imposes on the member states of the European Union the necessity to introduce a standard of buildings of almost a zero demand for energy (NZEB). The requirements for these buildings (NZEB) are determined for each member country of the European Union. In Poland, the requirements for buildings (NZEB) are included in the Technical Conditions. In the article, the authors present energy and cost analysis of adapting a building that meets current requirements to the requirements adopted for NZEB in Poland. The requirements for new buildings are formulated for the building envelopes and for the factor determining Primary Energy. In order to improve thermal protection of the envelopes, for example, the insulation thickness should be increased or windows of better coefficients should be used. To improve the PE coefficient, the amount of energy coming from Renewable Energy Sources should be increased. The improvement of thermal efficiency is associated with additional costs. The aim of the article is also to show that reducing the amount of energy necessary for heating a building is not enough to design a comfortable home. The authors pointed to the need of ensuring multi-criteria comfort in NZEB. Buildings of low energy demand are very tight and well insulated. Often, in such buildings a problem with solar energy excess appears and, consequently, the rooms are overheated. On the example of a residential building, the Authors show what costs should be covered to adapt the building to a standard that meets the requirements of the NZEB and a building comfortable for users. The analysis was carried out to improve thermal and vibrational comfort.

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COST ANALYSIS OF THE BUILDING'S ADJUSTMENT TO THE STANDARD OF THE NZEB BUILDING

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ABSTRACT

Requirements for energy-efficient buildings are given for each country belonging to the European Union. In Poland, the conditions for MZEB buildings are included in the Technical Conditions. For buildings subjected to thermo-modernization, the conditions are milder than for designed buildings. In the article, the authors presented an analysis of the costs of adapting buildings that meet the requirements of the current technical conditions to the technical conditions of buildings with "almost zero NZEB energy consumption". The requirements for the energy demand of NZEB buildings in Poland are very strict. The authors emphasized the need to ensure comfort in NZEB buildings. Additionally, on the example of a residential building, the Authors presented what costs are necessary to adapt the building to the standard that meets the requirements of the NZEB building and the comfort building will give users.

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PROPOSED INTERCONNECTING DATABASE FOR BIM MODELS AND CONSTRUCTION-ECONOMIC SYSTEMS IN THE CZECH REPUBLIC

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ABSTRACT

With the global emergence of Building Information Modelling (BIM), the Czech Republic needs to adapt the systems currently used for accessing projects to the new way of designing. Unfortunately, the main emphasis in the Czech Republic is still put on the first stage of the project, i.e. the creation of a 3D model. Converting a 3D model into a BIM model also requires information needed by other civil engineering fields. Consequently, it is necessary to determine which kinds of information must be supplied to BMI models and also how to input or import data from other software tools or systems. This article focuses on construction-economic systems, which comprise the cost estimation of buildings, modelling life-cycle costs, and administration in the operation phase of a building. The main problem encountered in the Czech Republic is the disparate nature of BIM databases, price databases, LCC databases and building administration databases. This article aims to propose a database of functional parts that could serve to connect the individual databases, or at least provide means to aggregate the individual databases in a proposed structure of functional units.

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SCHEDULING THE PRODUCTION OF PRECAST CONCRETE STRUCTURAL ELEMENTS USING THE SIMULATED ANNEALING METAHEURISTIC ALGORITHM

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ABSTRACT

The problem of optimal scheduling of construction production is particularly important in the case of production processes of concrete precast structural elements. The most important features characterizing this type of construction production are as follows: - the necessity to produce precast elements in factory conditions in order to make the production process independent of the weather conditions, - the repeatability of production processes of precast elements. In order to support the scheduling of production process of precast elements in a factory, the ERP (i.e. Enterprise Resource Planning) systems are usually used. The ERP systems, in many cases, do not take into account the specifics of production process of precast elements. In the literature the issues of scheduling of production process of precast elements are most often modeled using the concept of the so-called Line of Balance (LOB) (among others Leu and Hwang 2001) or using the flow shop models with taking into account the constraints, which are characteristic of this type of production process (among others Yang et al. 2016; Ko and Wang 2011; Anvari et al. 2016). The paper presents a model for scheduling of the production process of concrete precast structural elements. The model is based on the hybrid flow shop problem (HFS problem), in which it is possible to include more than one device/equipment or group of workers performing one type of production process. Increasing the number of available resources (equipments/devices or groups of workers) is an activity that enables for significant acceleration of the production process of precast elements. The model respects the constraints that are characteristic of the production processes of such elements. The decision variable form of the optimization model of discussed issue, which is different from that used until now, allows (in the case of obtaining suboptimal solutions) for a significant reduction in the duration of production process of series of precast elements (even by several dozen percent compared to the initial solution, which was adopted in the order of precast elements numbering for tasks with n=10 different precast elements). The issue of discrete optimization, presented in the paper, is NP-hard. Therefore, the authors proposed the original solution of an optimization task in the model using the simulated annealing metaheuristic algorithm (among others Ogbu and Smith 1990, Ishibuchi et al. 1995) for which it was created the dedicated software in the Mathematica system. Next, the paper presents the results of tests verifying the quality of provided solutions in relation to the reference algorithms for the size of optimization tasks occurring in the production process of concrete precast structural elements. The application of the presented scheduling model is illustrated by a practical calculation example showing the effectiveness of the used optimization algorithm. The presented scheduling model of production process has the possibility of further extension with some new parameters, constraints and objective functions which have not been used until now. The model can be successfully used to solve planning tasks of the production process in plants producing concrete precast structural elements in order to significantly shorten the duration of production process.

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A VARIANT CONCEPT OF ELEVATION OF A STEEL GRID TOWER

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ABSTRACT

The article presents the stages of analysis of an existing steel structure of a 35m-high lattice tower, located in a woodland. The assessment of the condition of the tower's structural elements and connections was made in the aspect of plans for its elevation, in order to install an observation camera warning against the danger of fire. The tower up to 30 m was made of five segments with a square section, with decreasing width from 4.86m to 2.05m. The last segment, 5m high, was made as a cuboid. Truss walls and horizontal truss membranes were used. Technical platforms were installed inside the shaft. Rolled sections of St3S steel with a yield point f_d = 215MPa were used as structural elements. The tower was erected on concrete spot footing. Static and strength analysis of the existing structure was carried out, taking into account the actual condition of materials and connections in the aspect of the planned modernization. The influence of wind gusts and the load from ice were taken into account. The user planned to install an observation camera on an additional mast with a height of 12m. Initially, the concept of an additional construction made of Ø60.3x4mm steel pipe set in a steel sleeve fastened to the bridge plates was adopted. The support tube was stabilized with four steel stay rope with diameter of 5mm, fixed to the corners of the platform at 35m. As a result of the conducted calculations, it was justified that the adopted concept is inappropriate due to the fact that the limit values of horizontal displacement of the end of the mast, also unacceptable due to excessive vibrations of the image from the observation camera, would have been exceeded. Therefore, another concept was developed, in which a 12m mast would be made with an aluminium lattice construction. In the horizontal section, the mast would have the shape of an equilateral triangle with a side length of 450mm (420mm in the axes). The mast branches would be made of RO35x2 round tubes, and the gratings would be made of rectangular, full profiles with a 20x10mm cross section. The mast would consist of three latticed segments with a length of 4.0m. The stays would be made of Ø5mm steel ropes. Mast with sliding support would be stabilized with lashings, mounted on three levels. In order to obtain a proper tilting of the lashings in relation to the vertical axis of the mast, it is planned to use additional, horizontal expansion elements made of square profiles RK80x5, located at the level of the highest platform. As a result of the calculations carried out, it was shown that a construction designed as presented would meet the conditions of limit states defined in the current standards of fire safety. The work was summarized by providing user guidelines for ensuring the durability of the modernized structure in the anticipated period of usage.

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STRUCTURAL AND TECHNOLOGICAL ASPECTS OF THE HISTORIC FLOORS REPLACEMENT

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ABSTRACT

The abstract presents structural and technological problems resulting from the use of historic floors in the process of planned renovation and modernization. In the three-story building, built at the end of the nineteenth century, there was significant damage caused by warfare. At the stage of post-war reconstruction, some structural elements were adapted to new functions. Structural walls, made of ceramic bricks, were suitable for further use, without the necessity of additional reinforcement. Damaged fragments of the floors have been reconstructed. Due to the elevation of the street level, the rebuilt ceiling above the ground floor has been weighted with a 60 cm layer of brick debris or crushed brick. In an additional layer, water-supply systems were located. In the following years, the building was superstructured by one floor. Structural walls made of ceramic bricks were covered with channel plates. After several decades of usage, the user decided to change the function of the rooms, which involved transferring additional loads to existing structural elements, i.e., floors, walls and masonry spot footing. As a result of the research, calculations and consultations with the preservationist, it was recommended to strengthen the existing channel floor. After additional tests involving the trial loading of floors, they were admitted to the modernization without the necessity of additional reinforcements. During demolition works aimed at replacing the elements of sanitary installations, significant damage to steel beams, which were the supporting structure of floors above the ground floor, were identified. As a result, all works were stopped and the concept of using existing floors was abandoned. On the debris layer, used as a formwork, a newly designed beam-and-slab floor was made, and then the stone vaults and the debris-keramzite filling were demolished and utilized. At the request of the preservationist, fragments of destroyed steel beams were left as a so-called "witness" of the history of the building. The authors of the abstract draw attention to the significant problem associated with the use of several hundred-year-old structural elements in the processes of modernization of objects. In the analysed case, conducting meticulous calculations and tests consisting of a trial loading of a degraded structure did not result in obtaining the results qualifying the structure for replacement. At the stage of construction works, the potential danger was identified. This leads to the conclusion that the process of modernization of historic buildings must be carried out under the constant supervision of construction designers and architects.

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IMPACT OF SEMI-RIGID JOINTS IN LIGHT-WOOD FRAMED STRUCTURES ON SERVICEABLE LIMIT STATE

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ABSTRACT

Timber structure especially light-wood framed structures depending on semi-rigid behaviour of its work have got lower spatial stiffness than theoretical model with full-fixed joints. Semi-rigid behaviour of the joints is a function of material and constructional flexibility (semi-rigidity). Joints deformation are the results of material properties of wood as well as internal force redistribution onto individual elements intersected in analysed joint. The force distribution between individual elements depends on the direction of the grains in analysed parts of the structure. Joints deformation as the result of its semi-rigid characteristics cause the reduction of the stiffness so the values of the displacements rise. Increase of the displacement allows possibility to exceed the limits imposed by the requirements of Serviceable Limit State. The exceeding of the safe values causes the structure loose it its function due to the safety and comfortable use. The paper will present main concepts connected with non-linear and semi-rigid behaviour of the joints as well the models and static schemes of joints work in the light-wood framed structures. The experimental researches were conducted in Bialystok University of Technology. The experiments were carried out on the specimen in micro-scale 1:3. The translational stiffness k and rotational stiffness κ were analysed. The researches were conducted for wall plate-to-stud joint as well floor joist-to-wall plate joint of the floor to wall connection. There were observed dependencies between the loads applied to the joint and the translational and rotational deformation of the connection. Selected results of these experimental tests presenting the behaviour of the analysed joints and exposing its semi-rigid manner of work. For single span beam with semi-rigid joints will be presented calculation formulas presenting the change of extrema values of the displacement in relationship to the translational and rotational stiffness of the support joints. The paper will be summarized by conclusions coming from the carried out analyses.

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OPTIMIZATION OF TRANSPORT CONNECTIONS FOR THE SUPPLY OF RAW MATERIALS AND SEMI-FINISHED PRODUCTS TO THE PRECAST CONCRETE PLANTS

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ABSTRACT

Over the last years, there is a growing interest in concrete prefabrication. Many of the currently operating concrete plants have implemented systems that increase the quality of manufactured products, have expanded highly automated production lines and have clearly reduced wastes and energy consumption. However, one of the problems often encountered in the construction industry is the inefficient organization of logistics processes. Proper planning of shipments of raw materials and semi-finished products consisting in the selection of their appropriate quantity and the place of delivery, corresponding to the needs of customers should contribute to lowering costs. Therefore, it is necessary to carry out the optimization, the aim of which is to minimize costs and delivery time, as well as to maximize the fulfilment of the degree of expected needs of concrete precast plants. This paper presents a model that allows transport connection optimization between gravel pits, cement factories, and precast concrete plants using linear programming.

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CIRCULAR ECONOMY MATURITY IN CONSTRUCTION COMPANIES

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ABSTRACT

An idea of sustainable development is spread in many aspects of human activity. Recently, there has been a growing interest in it among entrepreneurs of various industries. Investigations of researchers in the field of ecology issues led to a formulation of the Ecodesign Maturity Model (EcoM2) supporting production companies in their pursuit of providing more sustainable products and services. The Circular Economy (CE), on the other hand, appears as a concept of reducing the ecological footprint by finding new concepts of the flow of matter in manufacturing processes, assuming its closed loop. In the literature, comparisons of production systems compatible with the idea of CE to ecosystems occurring in the natural environment, also known as closed ecological systems, can be found. CE in a building sector may be considered at different levels. At first, we can treat objects as ones that can be reused as a whole without any extra processing, for example: construction elements, pallets and multi-use wrapping of building materials. The second level includes reused parts of the construction that need to be remanufactured. The last stage requires a process of recycling, e.g. after a demolition of buildings, building materials are shredded and reprocessed into new elements. The EcoM2 model is used as a basis for an implementation of the Circular Economy in the construction industry. It is justified by its specificity because the construction of buildings is always associated with interference in the natural environment. The aim of the article is to indicate the role of construction enterprises in implementing the CE concept in the sector at the level of both processes and products, treated as an outcome of their activity. The article refers to the functioning of construction companies, including CE in their business strategy. The CE problem in a construction company should be recognised within the entire organizational structure. The concept of Circular Economy Maturity (CEM) of the enterprise is defined. The assumptions of the CEM model for construction enterprises is also described. The basic features that should characterise a company that is mature in terms of the application of the CE concept are specified. It is worth to note that the CE maturity is represented by enterprises that have a natural ability to reform and improve an ecological quality of their products and services. Moreover, these organizations are able to have unified processes and procedures that are identified, and knowledge about ecology is effectively communicated to employees. All organizations that have a CE maturity should plan all activities using processes that are designed and then improved by follow-up studies.

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SELECTED PROBLEMS OF MULTI-CRITERIA ASSESSMENT OF CONSTRUCTION PROJECTS

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ABSTRACT

In the implementation of construction projects, it is often necessary to prepare variants of planned solutions. Due to the specificity of construction activities, a number of problems arise during comparative analyses. Commonly used methods of multi-criteria analysis do not always allow to achieve the expected effect. In this article will present problems related to the application of multi-criteria analysis in engineering practice. Fragments of analyses of construction investment variants carried out with different methods were presented, results were compared, advantages and disadvantages of applied methods were indicated. The comparison made it possible to indicate which of them best reflect the specifics of construction investments and this was included in the conclusions from the presented research.

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INFLUENCE OF THE CONTRACT FOR WORKS FOR RISK OF VARIATION ORDERS

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ABSTRACT

The Variation Orders are reasons of many disputes during the construction project duration and they usually cause increase of the originally estimated total project cost. There are several reasons that the managerial decisions about variations with respect to the original design and specifications have to be made during the project duration. Classification of VO's has been proposed, presenting the potential reasons causing the variations classified to a given group. Some clauses usually used in the contract for construction works influencing for risk of variations, have been discussed in the paper. The way, in each particular clauses and their real consequences do influence on risk of project variations, have been shown.

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ENERGY AND COST ANALYSIS OF WINDOWS IN LOW-ENERGY BUILDINGS: THE INFLUENCE OF WINDOWS ON THE COMFORT OF USE OF ROOMS

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ABSTRACT

According to the requirements of Polish standards, the required value of the heat transfer coefficient Umax of windows and transparent surfaces not openable at room temperature greater than or equal to 16 ° C from 2021 should amount to 0.9 [W / m2K] (WT2021) instead of 1.1 [W / (m2K)] (WT2017). The tightening of requirements is to be a measure to improve the energy efficiency of buildings, and the agreed Umax values result from the calculation of the cost-optimal level of minimum requirements for the energy performance of buildings and building elements. The aim of the changes is to increase the number of buildings with almost zero energy consumption in the country. An important role in the process of planned changes is played by their economic and technical validity. When analysing the maximum permissible values of heat transfer coefficients for woodwork in other EU countries, it should be noted that the values adopted in Poland are among the most stringent. The article analyses the energy performance on the example of a single-family building in the climate zone III in the case when only the heat transfer coefficients for windows change. From the analyzes carried out, the Authors will receive information whether the use of window and door joinery with the parameters required by WT2021 is economically justified. In addition, an analysis of the comfort of use of rooms was carried out, in which windows with parameters compliant with WT 2017 and WT2021 were used. Windows with different heat transfer coefficients U [W / (m2K)] have different transmittance rates of solar radiation g [-]. Windows with different parameters affect the delivery of various amounts of solar radiation to the rooms. It has a big influence on the temperature reached in the rooms and overheating the rooms. Overheating of rooms requires additional costs to provide adequate ventilation or air conditioning. The authors will determine which windows are the most beneficial in terms of ensuring thermal comfort for users. The authors will propose the possibility of limiting overheating of rooms by using shading elements.

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ENERGY ANALYSIS AND COST EFFICIENCY OF EXTERNAL PARTITIONS IN LOW ENERGY BUILDINGS

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ABSTRACT

Energy efficiency is a very important factor in the construction sector. Construction consumes about 40% of total energy consumption in the world. New buildings in Poland and other European countries are designed according to strict requirements. An important aspect is to ensure thermal protection of the external partitions. Building barriers to meet the requirements of thermal protection must obtain a heat transfer coefficient at the appropriate level, specified in the Technical Conditions. Calculation of heat transfer coefficients of external walls, however, do not assume dynamic influence of external and internal environment conditions. The dynamic influences of environments on both sides of the barrier affect the thermal resistance, and thus the energy consumption and heating costs. In the experimental building of the Małopolska Laboratorium Budownictwa Energetoszcznego, located on the campus of the Cracow University of Technology, experiments are carried out to describe the phenomena occurring in the partitions. The building has over 3000 sensors. A lot of temperature sensors are placed in the external walls. At the same time, measurements of temperature, humidity and solar radiation are recorded. These are data that will allow the analysis of phenomena occurring in the external wall under various weather conditions. Temperature sensors were placed in the construction layer, which was made of various materials (cellular concrete, block, brick). Subsequent sensors are arranged between the insulation layers, which are arranged in four layers of 5 cm. The last sensors were located on two sides of the ventilated slot. The gap is similar to external conditions. The experiment is to provide an answer to the extent to which wind, sun or rain affect the deterioration or improvement of the thermal resistance of the external wall. The results of the measurements will be compared with the analyzes carried out in the program for determining the heat flux density. The conclusions from the tests and analyzes will allow the possibility of more accurate estimation of heat losses, and thus design of partitions optimal in terms of energy and cost efficiency.

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REVITALIZATION OF TWENTIETH-CENTURY PREFABRICATED HOUSING ESTATES AS INTERDISCIPLINARY ISSUE

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ABSTRACT

The prefabricated construction of housing estates in Poland was very common in times of centrally planned investments. It is estimated that 60% of housing developments created in Polish cities between 1966 and 95 are large-panel buildings. Currently, about 10 million Poles live in these types of blocks (over ¼ of the country's population). Hence, large-panel housing estates are an important part of Polish housing resources, and the problems associated with them affect the everyday life of a large part of society. The number of problems is significant and diverse, it's related to many areas - including urban planning, architecture, social and technical issues. This paper attempts to describe those multi-dimensional issues, indicate the directions of changes and evaluate the revitalization potential of prefabricated housing estates. The article concentrates on interdisciplinary and comprehensive nature of the revitalization that can improve the quality of the residents' life. Authors attempt to enter the issue of large-scale housing estates into the functioning and possibilities offered by the new revitalization act (2015). The article based on research and analyzes of over 18 housing estates 110 buildings have been analyzed in terms of technical condition, construction and internal installations. Inspections of buildings were carried out in 2005-06 and 2016-17 with employees of the cooperative, and residents (interviews). Documentation of buildings was found and analyzed.

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THE EFFECTIVENESS OF APPLYING MARKETING TOOLS IN THE REAL ESTATE MANAGEMENT

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ABSTRACT

The aim of this paper is to evaluate the effectiveness of marketing tools used by real estate agents in Krakow. Based on the diagnostic survey and conducted questionnaire surveys, as well as the subject literature, a cross-sectional analysis of various marketing tools, the frequency of their application and the effectiveness of marketing activities was made. The collected empirical material and analyzed literature allowed to formulate the following conclusions: a. the most commonly used form of real estate promotion is online advertising and the use of classifieds websites, b. social media plays a big role and their importance will be constantly growing allowing for effective reaching of targeted groups of customers, c. modern methods of real estate visualization are not practiced by real estate offices in Krakow, despite the fact that certain benefits for entities implementing them are already recognized, d. the need to make high-quality photographic description of real estates in case of preparing marketing offers is noticed. The essence of real estate marketing in recent years has changed radically. Until recently, customers searching for real estate used to deal directly with a certain real estate agent, with the belief that this is the only way to contact the seller. Currently, the sellers and the buyers connection is mainly possible via the Internet. Therefore, promotion through social media, an office website or ad websites is crucial and brings need to compete. A proper presentation of the physical properties of real estate turns out to be significant in such announcements. This should be done by professionally made high quality pictures, projections and a properly prepared description of the property. Unfortunately, among the analyzed cases, it turned out that the photos are of low quality, often not presenting all rooms of the offered real estate. The property descriptions are laconic, which reduces the attractiveness of the offer and video materials promoting the property are quite rare, not to mention the so-called virtual walks. The conducted research has shown that in the majority of analyzed real estate agents in Krakow a small number of marketing tools is used. The visible revolution in the development of modern communication technologies has led to consumers behaving differently than when using traditional marketing tools. In order to be successful in building a competitive advantage in the real estate market, modern marketing activities should be applied more widely to the community, offering an open communication that will attract the attention of the potential client. This should be served by applying of such tools as: virtual walks, showing three-dimensional projections, photos from the drone, virtual reality, open house or back home staging.

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VARIANT PLANS OF DEVELOPMENT PROJECTS IN THE CONSTRUCTION SECTOR, INCLUSIVE OF ENVIRONMENTAL PROTECTION REQUIREMENTS

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ABSTRACT

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

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Specific Session:

Smart and sustainable building envelopes for energy

Convener: Prof.Dr. Ana-Maria Dabija

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LIVING ENVELOPES FOR BUILDINGS – A HISTORIC PARALLEL

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ABSTRACT

According to Daniel Libeskind “Architecture is not based on concrete and steel and the elements of the soil. It’s based on wonder.” A building is a sculpture at a territorial scale. Integrated in the environment it may bring added value to the landscape (as in the case of the Sydney Opera House that became not only the symbol of the city but also of Australia). In a dry definition a building is a plant: it shelters scheduled activities and interacts with the natural and built environment in a manner that allows comparisons with the medical world: building pathology, building skin, sick buildings etc. From the architects’ point of view, a building is about space. From the engineers’ point of view, it is about performances. From the users’ point of view, it is about well being, which is an immaterial notion. The building envelope has always been somewhere between aesthetics and materiality: a combination of fashion and tehnology. In the past decades it has been analysed according to the essential requirements and classified in types and cathegories. As the necessity of preserving the planets’ resources increases, the need to impose new requirements on the buildings increases as well as, according to modern researches, the most important energy consumers are the building and theis users. In this context, the building envelope gains some new responsibilities and roles: to save energy, to produce and (when appropriate) to harvest energy. Curent trends in architecture turn to perrennial principles of design that have always been considered in the traditional architecture or throughout history. Living envelope systems are in fashion, as the benefits of plants spin from providing food in urban farms to providing better air quality by decreasing heat island effects. However buildings designed with living envelopes are millenary solutions. The paper focuses on making a parallel between contemporary architectural approaches and historic approaches regarding the building envelope.

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AN INTELLIGENT APPROACH FOR IMPROVEMENT OF BIPV SYSTEMS PERFORMANCE

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ABSTRACT

Building-integrated photovoltaics (BIPV) represents an efficient energy generation method, by incorporating photovoltaic panels in the roof, windows or facades of buildings. BIPV systems show a great importance, both in terms of achieving zero-energy buildings and architectural, becoming more and more popular among architects and building engineers, being useful for the rehabilitation of existing buildings, as well as for the development of new buildings. An experimental BIPV system, developed and mounted on one of the buildings of the Polytechnic University of Bucharest (PUB), was tested. The obtained experimental data were compared to a BIPV model developed and simulated with the Energy Plus software, specialized in simulation of electricity production for buildings. It is known that the efficiency of a BIPV system may deteriorate rapidly when the photovoltaic (PV) panels are partly shaded by clouds or shadows of buildings and environment. The authors considered the intelligent MPPT (Maximum Power Point Tracking) approach in order to increase the efficiency of the BIPV system. The proposed BIPV system can deliver promising performance in complex urban conditions. The experimental BIPV model was compared to the Energy Plus simulated model, thus establishing the factors that cause discrepancies between the results of the two models: 1) in the case of the experimental model – the solar irradiation, temperature and incidence angle can significantly influence the efficiency of the BIPV system; 2) in the case of the Energy Plus simulated model – there are two major causes that determine the inaccuracy of the obtained results compared to the experimental ones. On one hand, the use of different methodologies for meteorological data interpolation through its own database, as well as calculation models for temperature and electrical parameters, is restricted by the software architecture. On the other hand, there are several factors regarding the behavior of BIPV systems under natural conditions such as aging, soiling, snow and shading, which are difficult to integrate into the software. Taking into account that the differences between the experimental and simulated results are relatively small, an acceptable agreement between results can be considered, thus allowing the implementation of the MPPT controller for the operational optimization of the analyzed BIPV system. By developing BIPV systems, it is possible to evolve buildings towards the Nearly Zero Energy Building (nZEB) concept. An important step in illustrating this approach is the development of building-integrated photovoltaic-thermal (BIPVT) systems. This particular BIPV type allows active heat recovery by lowering PV panel temperature, which leads in a significant improvement in the conversion efficiency of solar energy into electricity.

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DESIGNING THERMALLY EFFICIENT ROOF SYSTEMS

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ABSTRACT

The past decade has seen the world building committee strive to ensure the energy efficiency of our built environment. A building's roof is often the most effective envelope in conserving energy. The roof system, if designed properly, can mitigate energy loss or gain and allow the buildings mechanical systems to function properly for occupant comfort. Energy conservation is increasingly being viewed as an important performance objective for governmental, educational, commercial and industrial construction. Interest in the conserving of energy is high and is being actively discussed at all levels of the building industry: Governmental, Codes and Standards and Trade Organizations. As with many systems it is the details that are the difference between success and failure. This presentation will be based on the author's 35 years of roof system design and infield empirical experience and will review key design elements in the detailing of energy conserving roof systems. Best design and detail practices for roofing to achieve conservation will be delineated, in field examples reviewed and details provided.

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ENERGY HARVESTING BUILDING ENVELOPES: A QUALITATIVE EVALUATION OF CHALLENGES AND POTENTIALS

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ABSTRACT

Since the 1980s manifold building integrated technologies have been presented and improved, such as passive solar systems using thermal storage and climate buffers or intelligent materials, and increasingly active systems i.e. photovoltaics, thermo-solar collectors, bioreactors based on algea or moos, wind triggered kinematic systems. Among them, energy harvesting through the building envelope and building integrated systems and technologies have been intensively promoted and investigated in the last two decades, particularly since the European Commission has made Nearly Zero Energy Buildings an objective for future construction. Although demonstrations, prototypes and test buildings receive increasing international attention and disseminated digitally and rapidly, there are still only few building products that achieved to be distributed and applied in a cost-effective and architecturally integrated way. While we can find interesting and transdisciplinary approaches and results in fundamental research and in certain other industries, those technologies are lacking being integrated into the regular construction market on one side, and on the other side their applications by the larger design and architecture community can rarely be found due to its complexity in connectivity and integration. Through a categorisation of existing energy harvesting systems in building envelopes, this paper will define, evaluate and compare the main typologies, the primary energy types, the functions and forms of integration and interfaces, façade types and modularity and materials applied in the different building envelope systems. It will also investigate the transformations in different building categories. This paper wants to shed light on the challenges and obstacles in actual and future implementation in order to increase the international awareness and disposition in science and industry towards integrative approaches and collaboration to improve the existing guidelines and frameworks. The aim is an integrated qualitative evaluation of innovative product and processes to raise the potential for the future development of smart and sustainable building, cities and societies.

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Specific Session:

Urban planning and industrial symbiosis

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INDUSTRIAL SYMBIOSIS IN BROWNFIELDS IN KRANJ, SLOVENIA

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ABSTRACT

Kranj is the third biggest municipality in Slovenia, according to the number of inhabitants. It was a highly industrialised city before 1990s. Today it still has important producers in the electronic, rubber and other industries, but because of the change of economic system, globalisation and independence of Slovenia in 1991, many factories went bankrupt, leading to a high number of brownfield sites. Despite existing brownfields, many new developments in the recent 25 years were built on greenfield sites. Recent economic growth in Slovenia is mainly based on competitive export oriented industries. This often directly implies necessary expansion and consequently additional pressure for soil sealing. The paper focuses on potentials of Industrial symbiosis in the City of Kranj in brownfields regeneration, mainly by improving the attractiveness of (partly) abandoned former industrial sites. Eco-industrial parks and industrial symbiosis are important elements of new green (circular) economy. By reducing the need for raw materials, energy and water in industrial processes, yet by building them in greenfield areas, we neglect the importance of land and soil as very limited natural resources. In 2015 the City of Kranj adopted its Sustainable urban strategy 2030 and many of its objectives could be achieved by the concept of industrial symbiosis. Also, in 2017, a new inventory of brownfield sites was made, based on the standardised methodology for all of Slovenia. In total 13 larger brownfield sites were detected covering an area of 46,17 ha. Furthermore, more important than the total area of brownfields is the fact, that in the statistical region of Gorenjska, only 23% of the total area of brownfield sites were completely abandoned. This means that in the other 77%, there is still some activity going on and consequently there is a higher potential to establish industrial symbiosis inside these areas. The paper examines the potential role of the Municipality of Kranj and the role of the Regional development agency in managing the process to establish industrial symbiosis. The benefits of this process can be seen for both: the industries seeking new development sites and the municipality, which aims to reduce soil sealing through brownfields reactivation. The paper also shows, that setting up industrial symbiosis should include also brownfield and underused sites of the whole Functional urban area of the City of Kranj and that industrial symbiosis can be understood as a tool for integrated environmental management of the area.

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URBAN PLANNING AND INDUSTRIAL SYMBIOSIS IN SLOVENIA

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ABSTRACT

In recent years the concept of industrial symbiosis is recognized as one of the most efficient principals of circular economy with positive impact on the environment on one side and contributing to economic benefit on the other. The major role of spatial development is to guide and coordinate different interests in space and direct them in accordance with spatial development procedures and methods. Beside engineering, spatial development is also a political and governmental discipline where space represents the “arena” for arrangements of different activities and actions. Spatial development plans represent the legal instruments enabling the development and integration of industrial symbiosis alongside other contemporary trends in cities. In Slovenia, the potentials of industrial symbiosis are recognized only on the national level as a development axis. However, there is a lack of integration of the concept into spatial development strategies and plans. The concept is developed only on the level of waste management, which is based on the recycling of general waste of inhabitants and not based on the exchange of waste as raw material between different industries. The main aim of the paper is to develop a methodology for integrating industrial symbiosis into spatial development plans on the strategic level. Since the City of Ljubljana is one of the drivers of circular economy this paper will represent Ljubljana as a case study of the research. The methodology will be developed on research of the relationships between industrial symbiosis and spatial development plans and analysis of spatial development strategies and plans to find the potentials for integrating a new model of industrial symbiosis into the spatial planning system in Slovenia, which could enable the platform for the development of circular economy.

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SUSTAINABLE URBAN STRATEGY OF THE CITY OF LJUBLJANA: THE NEW CITY CENTRE IN STANEŽIČE

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ABSTRACT

The purpose of the research is to evaluate the competition solution for the new city centre in Stanežiče in accordance with the Sustainable Urban Strategy of the City of Ljubljana. The proposal focuses on the void created because of years of exploitation of the terrain, which has acquired the dimensions of an altered landscape. By preserving the valley, the project also preserves natural elements and does not attempt to modify or camouflage the transformed landscape, but rather seeks to emphasise that elements of a degraded urban area can be used in the solution ideology. The proposed modified urban landscape incorporates a well-thought-out harmonisation between the urban and the rural in order to provide a new and completely original image of the future of housing development. Due to the competition requirements that soft edges needed to be designed for the deep central part, the housing takes the form of terraced buildings, which descend to the bottom of the valley, and the green roofs of these buildings adjoin to the central part of the empty space along their edges. The design is also intended to protect the area from the impact of noise and all unwanted negative influences. Through cutaways joined by a city rail route, the projecting slopes of the eastern edge of the gravel pit are extended all the way to the edges of Celovška Cesta, creating an area for multi-story business premises underneath. This allows one to walk unhindered between the floor of the newly designed valley and the edge of Celovška Cesta. Another unique feature is the public open area along the city rail route, which lifts onto the business buildings' green roofs. Views of natural (Šmarna Gora, Kamnik Alps) and artificial (St James' Church in Stanežiče) dominant features are the main motif of the public space in the green valley of the new settlement. The solution premises wished to enable the quality of life in the city, strengthen development activities and ensure social justice. Planned infrastructure for sports, recreational and free time activities, as well as importance of the extensive green system confirm the alignment of the project premises with contemporary city sustainable policy.

Specific Session:

Modern religious architecture: tradition and innovation

Convener: Prof.Dr. Jerzy Uścinowicz

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SACRAL ASPECT OF BUGA AND IGA GARDEN EXHIBITIONS IN 1999-2017: SELECTED EXAMPLES

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ABSTRACT

Bundesgartenschau (abbrev. BUGA − Federal Garden Exhibition) and *Internationale Garten Ausstellung* (abbrev. IGA - International Garden Exhibition) are garden shows organized cyclically in Germany since 1951. Until German reunification they were held in different cities of Federal Republic of Germany. German garden exhibitions are unique festivals organized as open-air events. After the festival the area of garden exhibition is usually open to public as park. This 'philosophy' combines temporary fair functions with longterm actions for improving degraded areas and quality of life. Exhibitions' main goal is to present new plant species and innovative solutions for garden design. They are usually large-scale green areas with high intensity of development divided into different functions: typical leisure parks, theme exhibition gardens, cemeteries, allotments, playgrounds. They are accompanied by buildings enriching functional programme: exhibition pavilions, cafes and restaurants, open-air concert stages, new or adapted spatial dominants like viewing platforms or towers. Due to large area of exhibtion also many temporarytransportation facilities for visitors are implemented e.g. cableway, monorail, bus. The paper main objective is to recognize sacral aspect of different exhibition gardens and analyse its role in the park structure. The studied group consists of 13 exhibition areas created during 8 exhibitions: Magdeburg 1999, Potsdam 2001, Rostock 2003, Gera and Ronneburg 2007, Schwerin 2009, Hamburg 2013, Havelregion 2015 (exhibition areas in 5 different cities), Berlin 2017. The sacrum is present in garden exhibitions in various forms. They can be divided into following groups: a. large-scale green temples (functioning as permanent landmarks or spatial dominants), b. small architectural elements like chapels (functioning mostly as temporary landscape accents), c. theme gardens referring to different religions and cultures (as a small spatial element they do not have important role in the park structure), d. abandoned cemeteries as green areas, e. existing temples or chapels as a part of garden exhibition, f. other references to religious motives. The presence of different religious motives within the exhibition programme proves that sacral sphere is recognized as an important element of human life which is worth to be discussed by artists. It also proves that it is a vital part of urban landscape with strong social binding and culture preserving power.

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FACE OF THE FAÇADE: STUCCO RENDERINGS IN INTERWAR CRACOVIAN ARCHITECTURE

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ABSTRACT

The Modernist architecture of the interwar era speaks to us through the simple form, colour and texture of buildings' façades rather than through rich decoration. In this purity, each element had a specific meaning. Smooth walls of cuboids articulated with horizontal fenestration, occasionally enriched with a modest cornice introduced a sense of harmony, peace and organisation into the city skyline, no matter whether it was a streamlined building, or a residence in a garden. For these reasons, one of the most important features of Modernist architecture was the manner in which architectural surfaces were finished and as a result of their relative simplicity, stucco renderings gathered great popularity at the time. In the interwar period, Cracow experienced exceptional growth: the area of the city expanded from 6 km^2 to almost 47 km^2 by the beginning of WWII, with most of this development occuring during the Modernist era. It constitutes a valuable architectural resource which should be preserved and restored for its exceptional functional and artistic values. This paper will discuss one of the many issues which have not been widely recognised so far: stucco renderings, which were widely introduced in the discussed period and which constitute an important aspect of the character of Modernist architecture in Cracow. The text will cover a short discussion of the characteristics of this heritage resource, along with the associated techniques and technology of Modernist stucco, together with difficulties encountered during renovation work.

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FUNCTIONING AND PROTECTION OF TRADITIONAL XIX-CENTURY WOODEN ARCHITECTURE IN THE CAPITAL OF SOUTH-EASTERN POLAND

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ABSTRACT

The south-eastern region of Poland is a culturally interesting area, where there are relatively many harmonious rural landscapes, with the open landscape (fields, tree stands) and the residential buildings consistent with the historical character. Podkarpackie villages, despite their interrupted construction patterns associated with the Second World War and the Communist-era Poland, still retain the traditional character thanks to the wooden housing, sacral and public buildings present in their structure. The research undertaken by the author (since 2015) makes us realize that wooden objects also exist in the Podkarpacie cities are threatened by strong investment pressure and lack of fixed construction patterns. The presented research focuses on Rzeszów city, the capital of the Podkarpackie province. The primary aim of the research was to determine the characteristic features and ways of functioning of 19th-century relics of wooden secular buildings in Rzeszów. The scope of the study included the analysis of documents registering historic objects of the region, including wooden objects. Field studies documenting wooden architecture in Rzeszów, which was created in the 19th century, were documented in the form of pictures and drawings. The collected materials were analysed in terms of preserved, original building materials, formal solutions and details. The transformations concerning the studied objects and their landscape context have been identified. The implemented activities show a significant saturation of the spatial structure of Rzeszów with historic wooden architecture. XIX-century buildings determine historical rural arrangements in the landscape of the developing city and document the construction traditions of the region. Construction with simple forms, generally devoid of decorative elements and details, presents regional patterns resulting from the then economic, cultural and natural conditions. The studied collection of Rzeszów wooden houses preserved in its original location does not contain objects valuable from the perspective of the monument conservator. These objects have largely undergone transformations and modernizations disturbing their original form. The conducted research allows to determine the manner of functioning of these buildings in a completely new cultural and spatial context. The author of the article tries to answer the following questions: How do traditional rural houses from the 19th century function in the contemporary "capital of innovation"? Is it worth taking steps to protect and study these objects?

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TRADITION THROUGH INNOVATION - "RETURN TO THE FUTURE"

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ABSTRACT

The temple is a symbol-icon of 'Heavenly Jerusalem'. Because it is the habitat of homo religious in the period between the dawn of times and the end of days. And although the necessity to build temples will pass, today they are indispensable as places of meetings and as an image of Heavenly New Jerusalem. The whole art is aimed at creating this ideal image, a different, future and already changed world in a temple. It is mainly a temple, through the art of liturgy, architecture, icon, sculpture that shows us the world which is to come on the last day. Presenting the world in its theosis, in transformation into saved reality was and is the basic function of all types of art. This is how it used to be. Is this the case today? Is it a transmission of "living" Church Tradition and its aesthetic and religious experience of sacrum? The temple is a true symbol. Although it is constructed of worldly matter, it contains a strong spiritual factor. The relation between the material and the spiritual world is, however, different. They also have different manifestations in the synthesis of arts, depending on the time and place. Art itself is not static in this process as well. It changes continually together with man and the world, it evolves together with his industrial cognition. For didn't the perception of the world change after the Copernican Revolution or when Einstein announced his theory of relativity? The presence in the temple is not individual. They always carry particular meaning. Their existence is also not the result of 'force of habit'. Their evolution in history was not static, as mere presence, but rather dynamic, through continuous supplementation of their meaning. The same is true for all the other spaces, forms, planes and lines used in the temple's architecture. The same for colours, geometry and figures. The same is true for orders, which create the whole symbolic structure of the temple and make it a structural, harmonious 'whole'. Art is a constant movement between religion and aesthetics. At that moment it ceases to be a work of art, because it is elevated to the level of theological sphere. Its whole value is participation in the life of the 'Other'. If it is a living symbol, it becomes a sacrament. This paper presents selected examples of interaction between architecture, iconography and theology in contemporary sacred art of the last decade in Poland. It also shows the process of evolution of traditional spatial and functional structures and application of new iconography conventions in the Christian temples. It covers problems in art as well as new essential ideological aspects of symbolical and liturgical nature. The effects of design and creation work presented in this paper, serve as a basis to classify these objects as traditional. This assessment of the synthesis of art achieved here – being always the basis for creating the liturgical mystery play within the Christian Church – is left to the reader himself.

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BETWEEN EARLY-CHRISTIAN ARCHITECTURAL FORM AND POSTMINIAMLISM

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ABSTRACT

We are currently observing a growing interest in the early Christian writings of hermits, the great eulogists of Christ. In modern religious architecture the manifestation of this interest is a return to the simple forms of early Christian temples. The problem, however, is the quality of this architecture and how it is received by the public. New temples, minimalist in form, so eagerly promoted in architectural professional journals, which are mainly to the liking of critics and architects, are rejected by the faithful. Could the reason for this be the fact that emptiness is excessively exhibited in their interiors? Emptiness is a certain type of synonym for nothingness, and nothingness remains in contradiction with the main message of Christianity. Contrary to the almost unchanged canon of the orthodox temple, the architecture of Catholic churches sees strong protestant influence. In extreme cases this leads to a sort of elimination of decorative forms which have traditionally been present in Catholic churches. The postminimalism that appears in religious architecture refrains from completely contesting interior decoration. We are currently seeing a return to decorative forms, techniques like the fresco or the mosaic, which are treated architecturally, analogously to how they were treated in the beginnings of Christianity. Simplicity, however, should not be mistaken for simple-mindedness, which is why the demand for good Christian architecture and religious art is ceaselessly rising. The art of religious architecture, however, is based on the appropriateness of the architectural form in relation to the content that it expresses. The form of a church that is mistaken with the form of a discotheque should raise an eyebrow, especially that of its author, even when said author is a star of architecture.

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EARTHEN TEMPLES

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ABSTRACT

Religion and faith have accompanied man since the dawn of history. Over time, these two factors gave rise to the need to establish permanent places of worship, which could provide both shelter from the elements during increasingly elaborate rituals and express the important status of said rituals to the community that erected such edifices. Almost every religion has produced distinct forms of temples, each tailored to their specific liturgy and symbolism. The often imposing size of these structures meant that they required significant feats of structural engineering and architectural design to be built, often prompting the development of construction technologies. These technologies made use of locally available materials – one of them being earth, used in one form or another as a part of the different construction technologies which incorporate it. In addition to being a construction material, earth has held great significance in practically every religion and culture as a symbol of fertility, the material from which man has been shaped, the medium through which the gifts of a deity may be bestowed through a bountiful harvest and finally, as a resting place of the dead, be it through the burial of their remains or the scattering of their ashes. It is no wonder that temples are still being built out of this symbolic material, although in the majority of cases it is a matter of local building traditions rather than acting on the aforementioned spiritual connotations. The article describes both historical and contemporary temples constructed using various building technologies employing earth, focusing on how the material has affected their architecture, structure and visual expression.

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ETERNAL CITY - THE HERITAGE OF EUROPEAN CULTURE OR AN INNOVATIVE METROPOLIS

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ABSTRACT

Rome - a city to which every day hundreds of tourists come, a city in which you can stumble over a little piece of the history of our contemporary world at every step, can it be innovative? I think that everyone who stands in the streets of this city and seemingly ask a simple question may face a problem, the wall, the hills - in the end, there are so many hills around Rome. Anyone who has ever crossed the threshold of this city may feel overwhelmed by the excess of monuments, but it should look a little deeper, already moving a bit from the center, you can see developing cities in the city, I'm not talking only about the eur district, but also the crossing is already over. " porta del popolo "marks the very perceptible boundary between what is called a monument and innovation. Coming out from behind many doors - "porta" from the very center, you can certainly touch this innovative metropolis which can be an eternal city, and it is more and more going in this direction. The question that can be asked is whether a city of European culture will be able to cope with innovation in the broad sense of the word, how will tradition, culture be confronted with modernity, will it be possible to combine them?

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ARCHITECTURE OF THE MUSSOLINI PERIOD VERSUS THE SACRED

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ABSTRACT

The architecture of the Eternal City is perceived as a cascade of monuments from before two thousand years but also very important for the history of this city and what could become a series of monuments that were created during the reign of Mussolini. The art presented by totalitarian states was perceived as heavy, very overwhelming, monumental. Form was subordinated to ideology, there was no room for sacrum that can be seen in the historical center of the city. The "healthy canons of beauty" that Fascism represented did not go hand in hand with creative expression and something fleeting, intangible. The architecture of Mussolini's times has its advantages, and it's worth to take a closer look. If history did not change, Rome could be another city - fascists praising war and progress did not value monuments particularly highly, Benito Mussolini boldly marked the broad parades route, not caring about the old ones' buildings. However, noting the links between ancient objects and those created in the 1930s in the EUR district, one may wonder if Benito did not look for references to the "sacrum" EUR, a district built for the World Fair in 1942 where Rome was supposed to present itself to the world as the capital of a powerful modern state and needed turned out to be a new city center, located at a distance from the ancient buildings. One of the most characteristic buildings of the Mussolini era is Palazzo Della Civilta del Lavoro, also called the "square colosseum", the very fact of this name indicates the building's reference to ancient buildings and the inscription around the building - "The nation of poets, artists, heroes, saints, thinkers, scientists, sailors, travelers" shows the Dictator's slightly more fleeting gaze on architecture, it was to be a testimony and show the monumentality and grandeur of the ruler, but I think that there is no shortage of secret and volatility here.

Specific Session:

Innovation in metropolitan regions

Convener: Prof.Dr. Bogusław Podhalański

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GREEN INNOVATION IN URBAN SCALE: ACTIVATION OF SMALL CITIES THROUGH HORTICULTURAL EXHIBITIONS IN BERLIN/BRANDENBURG METROPOLITAN REGION

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ABSTRACT

Garden exhibitions in Germany are organising urban structures for almost 70 years. Their special formula is premised on choosing degraded areas in different cities. The open-air garden exhibition is open to public for 5-6 months. Then the area is turned into multifunctional leisure park with various sport and cultural facilities. The paper main objective is to analyse the impact of selected garden exhibitions on medium and small urban structures. Analyzed settlements Brandenburg an der Havel, Premnitz, Havelberg, Rathenow, Rhinow/Stölln are located in Brandenburg federal state within 100 km radius from the German capital - Berlin. With almost 4 million inhabitants it is a main city of Berlin/Brandenburg Metropolitan Region, inhabited by over 6 million people. The analyzed settlements are located in the Havel region on western extremities of the metropolitan region. They were hosts of first fully decentralized BUGA (abbrev. *Bundesgartenschau* - Federal Garden Exhibition) 2015 horticultural exhibition, held at the same time in five venues. Analyzed settlements have population varying from 70 thousand (Brandenburg) to 1,6 thousand (Rhinow/Stölln). They have subsequently different significance in territorial development. However, in the shadow of great European metropolis they are facing very similar socio-economical problems, reflecting urban structure. These settlements, subject to emigration, were gradually degrading. The BUGA 2015 horticultural exhibition was meant to give the new impulse for these settlements. The main objective of the exhibition was to create new positive image of these places by investments in degraded, but still important for local society, public spaces. In general, it was an event promoting the whole trail linking the cities in the Havel River Valley. Each stop, the city or village had different *genius loci* highlighted and reflected by both revitalized and new structures. Horticultural exhibitions are widely recognized media-events in Germany. Therefore, they function as a travel magnet. They also educate the society not only in terms of horticulture novelties and landscape architecture latest trends, but also in wider aspects like ecological and aesthetic awareness. In decentralized form of the cultural tourism trail, like in Havel River Valley it promotes the whole region. The tradition and spirit of the place become real in festival-related constructed environment. For municipality it is an honour to be a host city of the exhibition. Many local companies are usually involved in the whole process of preparations and promoted during the festival. All this builds and strengthens the cultural identity of the local society. Local society involvement is very important in terms of nurturing cultural distinctiveness, which is one of the main elements driving cultural tourism. Also increased tourist traffic promotes local businesses. The festival as an impulse, forces improvement of municipalities weaknesses e.g. collective transport and infrastructure, which enables further development of tourism and associated services.

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FROM TECHNOLOGY TO A LANDMARK - THERMAL WASTE PROCESSING PLANTS

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ABSTRACT

Rising pollution levels and the amount of generated municipal waste places new challenges before modern cities. These are challenges of a technological, economic, social, as well as a spatial and architectural character. These challenges, when architectural matters are concerned, are often strictly associated with technological conditions. New solutions in the field of technological installations can constitute limitations in design terms, or quite the contrary - they can be treated as guidelines in the case of the creation of a new form. The goal of this article is to provide an answer to two questions: In what manner (in the case of thermal municipal waste processing plants) is the shape of a structure determined by technological solutions? In addition, in what scope does the effect of mutual architectural and technological dependencies in the form of a building affect the immediate surroundings of such plants and - on a wider scale - the space of a city. A significant element of this article is also an attempt at determining whether currently designed new thermal municipal waste processing plants are being located in a manner that gives them the capacity to also play a considerable role in the crystallisation of the structure of a city or of suburban areas, including metropolitan ones. One country that has been faced with the challenge of building new thermal waste processing plants is Italy, due to the considerable problem of managing municipal waste and the associated environmental and social problems. The research performed by the author included an analysis of a selection of thermal waste processing plants located in Italy. Afterwards, as a part of a case study analysis, those structures that stood out against the analysed set either due to distinct architectural features or a higher capacity for spatial impact were presented. The case study presented by the author formed the basis for a discussion about the subject of architectural form and the significance of pro-environmental structures with a hybrid form of use within space. The conclusions drawn from the study can also be useful as models of implementing pro-environmental solutions in other countries that are currently facing an unsolved problem of stockpiling municipal waste.

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FROM A VISION TO A NECESSITY - FROM A NECESSITY TO A VISION: THERMAL WASTE PROCESSING PLANTS

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ABSTRACT

While searching for the answer to the manner of addressing the problem of waste that is produced in cities, we are on the one hand faced with the necessity of solving it in a fast and effective way, while on the other with searching for effective plans of long-term solutions in this regard. Any prospective answer to the question about the management of municipal waste most often applies not to the processing of waste itself, but efforts being made so that the amount of waste that cannot be subjected to so-called recycling will be as low as possible. The term "cradle to cradle", which is a current in which a used product becomes a material for the production of a new one, is one of the main ideas which are at the helm of modern, pro-environmental visions of broadly understood resource management. However, pro-environmental, futuristic ideas regarding waste management are faced with the necessity of being confronted with the current state. One of the more effective means that provide an answer to actual, modern needs is the construction of thermal waste processing plants. The goal of this article is to determine the answer to the question whether - and if so, then in what manner - a visionary approach in terms of environmentally friendly cities has any effect on modern efforts and the solving of problems associated with waste management in cities. Do modern efforts regarding the actual protection of the environment follow far-reaching visions, or are they only an immediate answer to urgent problems? Examples of built projects of thermal waste processing plants, which were built not as a part of far-reaching plans, but as the result of taking quick and urgent "here and now" action due to threats to human life and a high degree of pollution in a city, have been analysed in the article. The examples of efforts that have been presented will be compared with selected pro-environmental ideas. The analyses that have been carried out will make it possible to formulate conclusions which will be able to serve as reference material during research on both theoretical models of pro-environmental cities and on modern efforts regarding municipal waste management.

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INNOVATIVENESS OF THE TRADITION OF RELIGIOUS ARCHITECTURE

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ABSTRACT

The innovativeness of the tradition of religious architecture - it sounds quite contradictory if we are to consider the accepted definitions of tradition - a sort of permanence or canonicity, and innovation (from the Latin *innovatio* - renewal) - a process of the introduction of new values or qualities concerning goals or manners of their achievement in the development of some structure. Innovativeness is usually understood as a result of all manners of scientific, technical, technological and other rational actions, which lead to the implementation of change in human life. Tradition is less rational, based on national or group stereotypes, customs or individual principles. Innovativeness in culture, faith or creative activity occurs as a factor based on human ideas, its representations which go beyond the sphere of *ratio*. Innovativeness occurs primarily as a contradiction of something, for instance said tradition, or - on the basis of said tradition or the capacity of innovation to cooperate with tradition, developing tradition itself, causing its change, development, adaptation to something new, preserving tradition as a form, message or symbol. The tradition of religious architecture is based on the tradition of Liturgy, the principles of faith, revelation. Tradition is strongly justified by the permanence of the phenomenon of eternity, about which man cannot gain knowledge rationally. This is why to fight tradition is to fight eternity, which makes no sense. If eternity is beyond rational categories, then tradition is not exhaustible by these terms. This is why tradition manifests itself through ritual, epos, images. Such manners are characterised by something that is beyond rational, at the same time exerting a strong impact through their syncretism and synergism. The synergy of the images of religious architecture is also very suggestive, evoking a strong influence on the thoughts and imagination of man. Liturgy, the parish, its members, contemplation, meditation, rituals, the architect, artists, the common efforts of the participants of the construction of a temple - that is what is important to the synergy of religious architecture. The temple - is a place of the work of the Holy Spirit, which is not a person, but an action, which is why the temple can more easily be expressed through its activity, the Word, Wisdom, instead of the image and likeness. The perfection of the non-figurative depiction within religious architecture is its skeleton and the abstract shapes occur in the form of images of a symbolic language. A temple is simultaneously a static element, embodied in its structural elements - floor plans, spaces, the external and internal surfaces of walls and ceilings, icons and frescoes, in being filled with liturgical objects and services. Sensing, achieving the theology of man, the icon and the temple through the Divine image and likeness, as well as the work of the Holy Spirit all express a deep innovativeness of the tradition of religious architecture.

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DEVELOPMENT OF GREEN AREAS OF THE KRAKOW METROPOLITAN AREA AS A PLANNING PROBLEM

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ABSTRACT

Spatial planning is one of the most important instruments that can ensure balance between developed areas and open space. Planning regulations define standards of quality of space for people and the nature. Creating green infrastructure inside strongly urbanised centres and connecting it with external areas is a problem in urban planning in the scope of integration of local activities and the regional level of spatial policy. The objective of the paper is presentation, in the example of Krakow, of the problems that exist in the scope of creating a coherent system of green areas in the metropolitan scale, including the city and the surrounding communities against the background of the current planning determinants. The analyses of the effective planning documents at the community level. allowed to determine the main barriers that restrict continuity of vegetation systems. These include, most of all, assigning large areas in the neighbouring communities for development activities, mostly housing, located directly at the border of the city. This applies in particular to the communities located in the southern part of the analysed area. Studies in the scope of the current condition of development of community areas in many places indicate potential possibilities of maintaining green corridors or restricting intensity of development in the given area. However, lack of economic benefits for communities and their residents from maintaining agricultural areas highly affects the spatial policy of local authorities. An additional argument is attractiveness of the suburban zone for inhabitants of Krakow as a place of residence, increasing prices of suburban properties. Directions of development of the małopolskie voivodeship drafted up in the regional scale are general. They do not define specific rules for the system of connections of vegetation areas of varied intended use. The required statutory metropolitan study, developed as a consequence of the voivodeship plan for the voivodeship city and its functional area includes the components necessary for spatial, social, and economic coherence. These include areas precious in terms of natural valour and landscape that are covered by legal forms of protection resulting from the act on protection of the nature and supra-regional and regional ecological corridors. There are no conclusions as to the effect of legally protected open areas on the quality condition of the environment in the metropolitan centre. There are no clearly stated rules for layouts and size parameters of vegetation areas or methods of laying them out. Attractiveness of Krakow, bringing in new residents, investors and tourists, is levelled by very unfavourable indicators in the scope of the quality of the environment. One of the factors that can improve this situation is the development of the vegetation system in the metropolitan scale, combining various methods of use of its individual elements, ensuring better access to open areas and cleaner air for the inhabitants. This requires new methods of determining the green infrastructure and entering in planning documents. The proposal of its implementation open to broad consultations will give chances for the effective carrying out of the plan.

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HUMANITARIAN ARCHITECTURE – CHILIEAN AND POLISH PERSPECTIVE

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ABSTRACT

Poland and Chile are located on different continents, despite this remoteness to the geographical distance they have many common features like a complicated history and today similar level of economic development. Income per person in Chile and in Poland is similar around 900 Euro per month. Of course, apart from the similarities, there are also significant differences between these countries for examples, this concerns climate, population density and cultural history. In recent years, the concept of humanitarian architecture appeared in the public space due to the interest caused by the appointment in 2016 of the Chilean architect Alejandro Aravena, curator of the Venice Architecture Biennale. His message addressed to the curators of national pavilions was to define the problems facing their countries in the form of a "report from the front" and then an attempt to define actions to solve them through architecture. The nature of these issues could potentially vary widely, from food security to mass migration, from illiteracy to the polarization of social wealth. Thanks to this, the role of discussions about architecture has been reversed from studying its formal role in society towards the humanitarian role of architect in society. So, what does the term humanitarianism mean? According to the dictionary definition, humanitarianism is "an attitude characterized by respect for people and care for its good", so it is a very broad concept that can be attributed to many issues. The purpose of this article is to present this phenomenon based on the architectural experience of Chile and attempt to describe its occurrence in Poland, to answer the question: what is modern architecture today?

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CAN A METROPOLITAN REGION NOT BE INNOVATIVE?

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ABSTRACT

One of the qualities of metropolises is their innovativeness. However, when we ask about the qualities of an innovative metropolitan region, the matter becomes somewhat complicated. The tasks of a metropolitan region concentrate around matters of supporting the functioning of its main centre. However, we should not assume that this support is only meant to take place in the form of simple economic functions like workforce accessibility, the providing of food, drinking water or fuel. Technological and industrial subcentres play an important role in a metropolitan region, their operation being directed at goals that the main centre works towards, which shows that if this support is to be efficient, then it has to be adapted to specific needs in a greater manner, in addition to meeting the criteria of innovativeness. In turn, if the subcentres are directed towards competitiveness, then they must tend to the development of their own creativity, which must result in increasing the degree of innovativeness of the activity that takes place inside them in all four types of innovation: product, process, marketing and organisational. From among the most commonly cited indicators of innovativeness, the number of patents is brought up the most frequently. Among Polish research institutions, the highest number of patents are being filed by universities and pharmaceutical companies, while territorially the most innovative region is that of the Warsaw metropolis. Innovation in urban planning and architecture is most often based on striving towards sustainable development, the minimisation of labour associated with transport and improving the quality of life of society, in addition to the adaptation of the latest technological solutions in building construction and the promoting of energy efficiency and the generation of renewable energy.

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SECULARISED CITY: BETWEEN RELIGIOSITY AND SPIRITUALITY

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ABSTRACT

The article presents one of the most inalienable dimensions of man that is his need for spirituality, which itself demands its proper form, including an architectural one. As modern anthropology states, man is not only a material being, nor only a psychological one, but also has a spiritual dimension. Due to the increasingly weaker role of Christian Churches in Western Europe, there arises the question regarding in what manner and in what sense can a man of the post-modern period satisfy his spirituality? Various religious offerings often do not fully live up to their task. Their propositions are quite often marked by an excessive emotionality and sensibility. Despite all this, we are faced with the question about Church religiosity and Church spirituality in this situation. It is also a matter that is probably more institutional, one that is tied with rationality. Faith, after all, always requires reason.

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THE USE OF BIM TOOLS FOR ORGANIZATION OF THE CONSTRUCTION SITE IN THE ASPECT OF WORK SAFETY

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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. In this paper the selected issues relating to the health and safety on the construction site are presented and widely discussed. The new design concept is recommended by the Authors including the identification of all potentially possible threats to health and safety at work through the use of the 3D modelling in the planning stage of the building project. This modern approach to the analysis may be used both to identify the basic hazards that may occur on site and to create the appropriate security systems protecting against these threats. The numerical tools that can be applied for this purpose as well as the available ways of presenting the proposed solutions are indicated and described in detail.

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EVOLUTION OF THE METROPOLITAN AREA OF SHENZHEN: ANALYSIS FROM THEORY TO SELECTED EXAMPLES

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Abstract. A continuously expanding megacity, the city of Shenzhen is situated on the eastern bank of the Pearl River delta, in the Southeast of China. After only 37 years of urban development, it is currently the fastest growing metropolitan area in the world. It is also a huge-scale experiment, in what is commonly referred to as a "plan-led urban form". Established in 1980, as a first Special Economic Zone (SEZ), and through the transformations of successive master plans, Shenzhen has now become one of the largest urban areas in China. Specifically, "The Master Plan of Shenzhen 1996-2010" and its subsequent revision, "The Comprehensive Plan of Shenzhen 2010-2020" reconfigured and accelerated city growth. Since 2010 the metropolitan area expanded northwards, including the previous non-SEZ territories. The plan was focused to conclusive structural evolution on border and periphery zones. The current structural master plan introduced a hierarchy of urban development on a municipal level, district level, and cluster level. Another important aspect was to regulate and control land use policy to avoid speculations on land price and building density inside emerging new districts and clusters. This article will try to describe, via particular examples, how concepts result in real site situations. It will analyse the process of detailing, from spatial development of multi-scale theoretical plans into architectural plans of study cases and finally built projects. Architectural features such as a specific building function or scale always reflect on pre-proposed theoretical guidelines of urban planning. Spatial hierarchy is imposed from macro-scale into micro-scale. Chosen insights are corresponding with recent periods of urban development and respond to infrastructural, economic and social needs of the time. The buildings are designed by European consultants, gmp International GmbH architects and engineers and they are implemented to Chinese frameworks. The analysis is based on comparison of theoretical surveys and observed in-field implementation. As a conclusion, the author tries critically to analyse the advantages and disadvantages of the fast and global growth of Shenzhen metropolitan area and transposition into architectural scale. What is making Shenzhen unique and innovative in city development?

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THEMATIC CITEIS: THE CITTASLOW CITY NETWORK IN POLAND

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ABSTRACT

Cities are currently facing a highly dynamic process of the transformation of their structures. This is associated with their growing population, which has maintained a positive growth trend for 50 years, with prognoses indicating that this tendency will not change in the coming decades. Cities have faced numerous challenges throughout the centuries of the crystallisation of their structures, challenges resulting from historical or economic conditions. The problems that affected cities in past centuries were a factor that stimulated the invention of new urban planning solutions that made it possible for their residents to have the most comfortable life possible, and, as a result, solving the social or economic problems that affected urban areas. These solutions had to be adapted to current conditions, along with the flow of time and economic development, and turned out to be factors leading to the emergence of entire spirals of new planning-related problems. New ideas associated with the development of urban structures, focusing on pro-environmental efforts and the minimisation of the negative impact of the process of urbanisation on the surrounding natural environment were being developed over the years. As a result, many new approaches to the matter of the planning of urban development have been devised, often described by slogans which highlighted their characteristics, which we can call “thematic” cities. One type of “thematic cities” is the slow city movement called Cittaslow, which originated in the Italian town of Grave de Chianti. The idea of the development of the towns which are members of the Cittaslow network is the individual use of their endogenic resources, with particular focus being placed on improving the comfort of living of their residents over the course of the adaptation to local needs and conditions. The Cittaslow network in Poland is a relatively new subject, one that has not been widely propagated. The article is meant to familiarise readers with this alternative method of urban development, as well as to characterise the existing Cittaslow network in Poland.

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ADVERTISEMENTS IN METROPOLITAN SPACE

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ABSTRACT

The article discusses how large-scale external advertisements, such billboards or LED screens, affect the spaces of metropolises through their impact on architecture. Marketing has always been an inseparable part of commerce, especially under the conditions of intense competition between entrepreneurs. Metropolises, which attract the best and brightest of the business world, have become the world's most competitive environment, where marketing strategies clash in their pursuit of the attention of prospective clients. It is not a coincidence that this activity leaves its mark on metropolitan spaces, be it through its influence on architecture or the activity that takes place in public spaces. The authors explore the many different forms in which various marketing strategies affect modern metropolises, as well as the tangibility of this influence. Other factors that were studied include the locations in which this influence is most strongly felt within metropolises themselves and where it is substantially weaker; the types of advertisements most likely to be encountered in such areas, as well as the degree of their intrusiveness on the urban and suburban landscape. The authors performed an analysis of the manner in which advertisements are placed in metropolitan public spaces, evaluating their impact on the architecture of individual buildings and the atmosphere of the analysed urban interiors. The authors came to the conclusion that external advertising is an inseparable part of metropolitan public spaces and that there are many forms of such advertising that, without an appropriate approach, can negatively affect the quality of public spaces, while others can improve it.

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THEATRE ARCHITECTURE AND URBAN CULTURE

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ABSTRACT

Social mission of theatre ceased to be limited only to theatre spectacles. Its integral elements are now becoming other events that are to gather, activise, concentrate inhabitants of the city. Aims of theatre as a social event based on the need of building community on direct, real contact of spectators with actors and spectators with themselves, pose new tasks for the architecture of theatres. Architecture could regain the power to create spaces adequate for theatre through realisation of the need of common space in the city. It is a quest for architectural solutions which may reflect the meaning of theatre, express contemporary ideas, or even create the meaning of theatre in our age, quite like it was once done by a box set in the illusionary theatre. Space surrounding a theatre is mostly a broadly accessible space of cultural character. These are squares, streets, parks. One may discern three basic models of shaping relations of theatre space and external public space in a theatrical place. In the first model a theatre site consists of public space surrounding a building which limits and separates the internal space of a theatre. In this very model a building fulfils the role of a symbol of culture in the surrounding urban space, it is an expression of externalising of the theatre separated from the world, it announces its existence. While in the first model an external public space may be considered a part of a theatrical place, in the second one the very building sets its limits. Theatrical site has a character of a hidden space, set apart from the external world, accessible for a chosen group only. In the third model of a theatrical place an external public space is incorporated into constructing a theatrical space or introduced into the space of theatre itself. Theatre buildings whose space may be intertwined with surrounding public spaces are called theatres of interference. In contemporary theatre architecture there are examples which are inscribed into the trend of building the relation of interference. These are structures introducing spatial and functional architectural solutions which give a chance to a special exchange of theatrical and social life. Their new relation could introduce a special value both for the art of theatre and a particular place for an urban community, as a theatre building may or even should be today.

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ETERNAL CITY - THE HERITAGE OF EUROPEAN CULTURE OR AN INNOVATIVE METROPOLIS

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ABSTRACT

Rome - a city to which every day hundreds of tourists come, a city in which you can stumble over a little piece of the history of our contemporary world at every step, can it be innovative? I think that everyone who stands in the streets of this city and seemingly ask a simple question may face a problem, the wall, the hills - in the end, there are so many hills around Rome. Anyone who has ever crossed the threshold of this city may feel overwhelmed by the excess of monuments, but it should look a little deeper, already moving a bit from the center, you can see developing cities in the city, I'm not talking only about the eur district, but also the crossing is already over. " porta del popolo "marks the very perceptible boundary between what is called a monument and innovation. Coming out from behind many doors - "porta" from the very center, you can certainly touch this innovative metropolis which can be an eternal city, and it is more and more going in this direction. The question that can be asked is whether a city of European culture will be able to cope with innovation in the broad sense of the word, how will tradition, culture be confronted with modernity, will it be possible to combine them?

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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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Specific Session:

Decision support systems in urban management

Convener: Dr. Jan Kazak

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DECISION SUPPORT SYSTEM IN PUBLIC TRANSPORT PLANNING FOR PROMOTING URBAN ADAPTATION TO CLIMATE CHANGE

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ABSTRACT

Current land use policy in developed countries result in many new constructions sites and urban development. Depending on the geodesign solutions, newly developed areas may influence their citizens to use private or public transport. Therefore, to design more resilient and eco-friendly neighbourhoods, it is important to incorporate public transport planning at the early stage of urban planning. In order to promote urban adaptation to climate change it is crucial to activate citizens to participate in decisions making process related to the common space and available facilities. Suitable for this purpose are the right tools for the presentation of various design solutions. This group of tools is called decision support systems. The aim of the research is verifying the suitability of the use of decision support system (CommunityViz) for public transport planning at the level for a master plan (local planning). The paper presents the possibility of using the CommunityViz system to create various scenarios of accessible public transport. Simulations were performed on the newly designed housing area in San Sebastian (Spain). The designed model for the neighbourhood was used during the workshop with citizens of San Sebastian, to incorporate their knowledge as local experts. Based on the master plan, three scenarios of bus stop locations were proposed. The dynamic model enabled to assess how many citizens may probably live in acceptable distance to bus stops, which may reflect the number of people for whom public transport may be an attractive solution for transportation needs. The results showed high usefulness of the analysed decision support system to solve the problem of public transport designing. Intuitive graphical presentation makes different variants clearly identified by all stakeholder groups.

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HOW TO SUPPORT BETTER DECISION MAKING FOR SUSTAINABLE DEVELOPMENT?

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ABSTRACT

Sustainable development paradigm refers to three basic pillars (social, environmental and economic) which strongly interact between themselves. Therefore, solving some problems needs actions in different fields, as well as solving one problem may influence different aspects of life. One of the multidimensional elements of global system is the unemployment issue and actions which are undertaken to reduce inequalities in that field. However, the open questions are: how effective those actions are?, which elements current mechanisms need an improvement? and which methods can help to overcome current problems and suggest better decision making in the future? The aim of the research is to determine whether EU funds for employment incentive actions were concentrated in those places where the unemployment rate was the highest and whether social inequalities were reduced. The case study was the evaluation of over 6000 employment incentive projects carried out in 2008-2015 in biggest EU Member State in the Central Europe – Poland. The study was carried out for NUTS-4 units. In order to assess the concentration of geospatial variables the hot spot analysis was used. The results show that the support was not concentrated in those part of the country where the unemployment rate was the highest. There is still a place to improve the implementation of national policies to obtain more satisfying effects in social inequalities mitigation. The proposed method of hot spot mapping is suggested by authors as an element of decision support system, which may have a positive impact on effectiveness of institutional actions to reach sustainable development goals.

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SPATIAL ABSORBENCY CONCEPT AS A DECISION SUPPORT SYSTEM FOR SUSTAINABLE LOCAL DEVELOPMENT

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ABSTRACT

The practise of last decades of land use planning system in Poland allowed local authorities to design new land uses freely, without proper analyses. It resulted in designing in total over 10 times more area for new housing purposes than is developed as housing nowadays. To prevent this situation, the amendment of the Act on planning and spatial development set, among others, the new obligation. Each municipality, before designing new land uses, needs to prepare an assessment of demand for each land use and the absorbency of existing real estate deign for that land use but still not used for that purpose. The demand analysis is defined by regulations in order to categories that have to be taken into account, while the absorbency evaluation is not. Therefore, each municipality include different factors, use another method and have a distinct accuracy of analysis. The purpose of this work is to present a concept of spatial absorbency calculations. The proposed method was tested in a pilot studies on a case of Jaworzyna Śląska (Poland) in order to verify the possibility of application of the framework in practise. The sources of this study were data from spatial planning documents, available public statistics and map services. Due to the lack of detailed regulations regarding the estimation of absorbency, the proposed method was based on the review of existing spatial policies developed under the new law as well as developed individually by authors. The results of the research are helpful in preventing excessive land use deigning. In addition, they provide information on the development opportunities of municipalities and their potential to invest. These calculations support the rating of not only usable area of the development, but also the number of potential new residents. The method is fully applicable in ArcGIS and CommunityViz software and may constitute the framework of decision support system for local authorities in sustainable local land use planning.

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SENSITIVITY OF POLISHSYSTEM OF MUNICIPAL REVENUE FROM REAL ESTATE MARKET TO CHANGES IN ECONOMIC SITUATION

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ABSTRACT

The paper discusses the local government revenue from the real estate market, focusing mainly on assessing the sensitivity of the income of municipalities from the real estate marketto changes in an economic situation. The study covered all communes (gminas) in Poland, excluding voivodeship cities (The analyses did not include voivodship capitals (16 cities) because they differed considerably from other gminas due to central character of their public functions) (2 462), including: 288 municipalities, 611 urban-rural communities and 1563 rural communities. The temporal scope of the analysis was a decade between 2005 and 2015. The analyses focused on the following three groups of revenue from a real estate market: recurrent property taxes (a property tax, an agricultural tax and a forestry tax); revenue from municipal assets (income from property sale, letting, leasing and from perpetual usufruct); taxes in respect of ownership right transfer (a civil-law action tax, an inheritance and gift tax). The main research hypothesis was made that the system of revenue from the real estate market in urban communities was more sensitive to changes in an economic situation than in urban-rural and rural communities. The analyzes were conducted for the country in general and in regional sections. The data came from the Local Data Bank of the Polish Central Statistical Office. The data analysis was conducted by means of statistical and econometric methods. The analysis results confirmed that in the decade of 2005-2015 there was a correlation between the gminas revenues from the real estate market and the economic situation.The obtained results only partially verify the research hypothesis that the system of revenue from the real estate market in urban communities was more sensitive to changes in an economic situation than in urban-rural and rural communities. Only in two groups of revenues from the real estate market: recurrent property taxes and revenue from municipal assets the computed Pearson correlation coefficients confirmed a strong (and stronger than in urban-rural and rural gminas) correspondence between gmina revenues per capita and GDP per capita in voivodships (the Pearson correlation coefficient in urban gminas was at 0.9645 in Group I and 0.6190 in Group II). The hypothesis was not proved to be true for Group III, i.e. taxes in respect of ownership right transfer, where the Pearson correlation coefficient in urban gminas was the lowest at 0.2904, which corroborates the absence of correlation between the revenue from from taxes in respect of ownership right transfer and the economic situation in the region.

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SPATIAL DIVERSIFICATION OF DEVELOPMENT OF THE AGRICULTURAL PROPERTY MARKET IN POLAND

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ABSTRACT

The paper discusses the development of the agricultural property market in Poland, focusing mainly on identifying the geographical differences in the development of agricultural property markets in voivodships. The study included 16 objects (voivodship agricultural property markets): Dolnośląskie, Kujawsko-Pomorskie, Lubelskie, Lubuskie, Łódzkie, Małopolskie, Mazowieckie, Opolskie, Podkarpackie, Podlaskie, Pomorskie, Śląskie, Świętokrzyskie, Warmińsko-Mazurskie, Wielkopolskie and Zachodniopomorskie. The temporal scope of the analysis was a decade between 2005 and 2015.The hypothesis that agricultural property markets in better developed voivodships grow faster than in the less developed ones was verified by evaluating the voivodship agricultural property markets over the period of observation, basing on five variables: number of transactions per 1000 inhabitants, mean value of a single transaction expressed in PLN, mean area of a sold property per 1000 inhabitants expressed in ha, price of 1 ha in PLN sold by the Agricultural Property Agency, price of 1 ha in PLN sold on a private market. Having obtained the values of the above variables, the voivodship agricultural property markets were rated from 1 (the strongest market) to 16 (the weakest) in five categories. In the next step, the rating results were summed up, thus forming a general listing of the voivodship agricultural property markets according to their level of development. Subsequently, the results were compared to the list of voivodships rated by their economic development on the basis of another variable, namely their average annual GDP per capita.The power of the correlation between the development of the voivodship agricultural property markets and the economic development level in voivodships was examined with the Spearman correlation coefficient. The exhaustive analyses were preceded by the characteristics of agricultural property markets in Polish voivodships. The data came from the Local Data Bank of the Polish Central Statistical Office and the Institute of Agricultural and Food Economics – National Research Institute. The data analysis was conducted by means of statistical and econometric methods. The analysis results confirmed that in the decade of 2005-2015 there was a correlation between the development of voivodeship agricultural property markets and the economic situation in voivodships. The agricultural property markets grow at the highest rate in the best economically developed voivodships: Wielkopolskie, Mazowieckie (in central Poland) and in Dolnośląskie. The least-developed agricultural property markets are in the voivodships in the south-east of Poland: Świętokrzyskie, Podkarpackie, Małopolskie, Lubelskiewhere the economic development is poor.

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HISTORICAL HERITAGE AND SPACE TRANSFORMATION

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ABSTRACT

In the article, the authors present the spatial changing in historical heritage and in regional architecture taking into consideration the life philosophy, return to the roots, and the identification of the inhabitants with their “little homeland” as well as with local enterprises. The research was conducted at two different tourist resorts — Karpacz and Zakopane, situated in the Sudeten and the Carpathian mountain ranges. The towns are characterized by different histories — national affiliation and ethnic structure of the population, respectively. Strong cultural tradition does not necessarily contribute to preserving regional patterns in architecture. The only warranty of proper spatial policy on culturally valuable areas is local policy. The operating local law should be strong, effective, and unequivocal. The only warranty of proper spatial policy for culturally valuable areas is the local plans.

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FINANCING HOUSING SUPPORT PROGRAMS IN POLAND IN THE LIGHT OF NATIONAL HOUSING RESOURCES

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ABSTRACT

The paper discusses the subject of subsidising residential development in Poland by the state, with respect to expenditures incurred on various programs that support the development of housing resources. The scope of the analysis includes specification of the size and type of national housing resources, the identification of housing support programs in Poland and their financing. In Poland, numerous programs supporting the construction or purchase of housing have been introduced since the political transformation that took place in the 1990s. They were usually replaced by new ones after several years of functioning, and the previous concepts were abandoned. This was quite often caused by excessive popularity and thus high financial encumbrances borne by the State Treasury. The problem is rather difficult, as private housing is dominant in Poland and citizens generally aim to purchase their own housing. This is rather typical for Polish mentality and tradition. All the proposals enjoyed great interest among Polish people. The government is currently working on another proposed program to support the purchase of apartments in small towns under the “Mieszkanie Plus” (“Home Plus”) program.

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MANAGEMENT SYSTEM OF URBAN LANDSCAPE IN POLAND ON THE EXAMPLE OF WROCLAW IN THE CONTEXT OF EUROPEAN LANDSCAPE CONVENTION IMPLEMENTATION

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ABSTRACT

This study analyze legal system of urban landscape management in Poland and its changes in last decade on the example of Wroclaw – city located in central part of Lower Silesia region in south-western Poland. The main objective of the study was to assess the current legal system of urban landscape management in Poland in terms of the implementation of the European Landscape Convention provisions. Before coming into force the act of 24 April 2015 amending certain laws in connection with the reinforcement of the tools for landscape protection (so-called “Landscape Act”) the basis of landscape management were spatial planning documents and guidelines from documents forming protection areas of nature or monument values. Study of the conditions and directions of spatial development, selected land development plans as well as guidelines for seven nature conservation areas and one cultural park were analyzed in terms of landscape management provisions. Changes of legal basis were also taken into account. After 11 years since ratifying European Landscape Convention in 2004 Polish authorities have finally noticed the necessity to implement its provisions to Polish law. Legal basis for urban landscape management has been drastically changed. Landscape Act introduces new tool for landscape management at regional level called landscape audit which will affect all new spatial planning documents of the city. It consists in characterization and assessment of all landscape types identified within the borders of each region in Poland. It is the basis for selection of priority landscapes, identification of threats and determination the way of spatial development of landscape units. Local authorities have also received new tool for shaping advertising policy. In the context of European Landscape Convention implementation it should be emphasized that before 2015 there was no document dedicated strictly for landscape management of Wroclaw because there was no legal basis for it. All the provisions were scattered in various kind of documents that’s why there was no coherent landscape management policy. It remains to be hoped that in the coming years, a coherent policy in this area will finally be developed and adopted thanks to the use of new landscape management tools.

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THE TRANSFORMATIONS OF TOURIST FUNCTIONS IN URBAN AREAS TERRITORIALLY LINKED WITH NATIONAL PARKS

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ABSTRACT

The article analyses and attempts to assess the transformations related to tourist functions in urban municipalities territorially linked with national parks in the years 2005-2016. The study covered eleven municipalities linked whit seven national parks (NP) - Stołowe Mountains NP, Karkonosze NP, Tatra NP, Warta Mouth NP, Wielkopolska NP, Wolin NP, Słowiński NP. 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.

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OUTDOOR ADVERTISING IN PUBLIC SPACE AND ITS LEGAL SYSTEM IN POLAND OVER THE CENTURIES

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ABSTRACT

We cannot imagine today's cities without signs, banners, billboards or other advertising devices. Outdoor advertisements are inherent and integral element of urban landscape. Advertising often impairs the value of cultural and natural heritage of the site and it affects the spatial order. On the other hand, advertisements indicate the location, promote a brand, mark, and image of the company, they are inherent and integral element of cities. Visual pollution is one of the issue in Poland now, but the issue of outdoor advertisements locating in space is not a new phenomenon. The problem, undoubtedly on a different scale, existed in the interwar period. Interwar Poland legislation system had provisions and restrictions imposed on advertisements owner. In present times, an attempt to solve above problems is the so-called “Act on Landscape Protection”, which introduces new tools for public space protection and allows to create an advertising code by municipalities. This article aims to assess the impact of advertising on the public space in the past and now. We compared Polish legal systems of locating advertisements in public space at interwar and present times. An expert approach was used in the impact assessment, while the whole study was based on the Leopold’s matrix method. The analysis shows that the overall impact of advertising restrictions in the city had a positive impact on the public space at interwar period and also might have a positive impact on the public space at present time. Reducing the number of large billboards and net advertising will positively affect at the public space aesthetics, also urban life quality and public space users’ perception.

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THE USE OF EUROPEAN FUNDS IN POLISH AND CZECH MUNICIPALITIES: A STUDY OF THE LOWER SILESIA VOIVODSHIP AND HRADEC KRALOVE REGION

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ABSTRACT

The main purpose of the paper is the spatial analysis of the use of EU funds in Polish and Czech municipalities. At the basis of this research task was the question whether the diversified structure of administrative units on both sides of the border affects the efficiency of consumption of EU funds by local communities. The average municipality in Poland has 15 thousand inhabitants, while in the Czech Republic the fragmentation of this level of local government is 10 times greater - the average commune has about 1.5 thousand inhabitants. The study covered a total of 621 communes from neighboring areas - Lower Silesia (173) and Hradec Kralove (448). They were focused on projects implemented directly by municipal offices, omitting other initiatives implemented in their area (e.g. by private enterprises). Data from databases on EU projects as well as from national statistics systems were used. In the first part of the research, communes' income from EU funds per capita was determined. As expected, the Polish municipalities had higher resources. Larger administrative units allow greater decentralization of EU project management. Then they were classified according to types and sizes of municipalities. An interesting statement is the disaffect of scale identified on the Polish side - smaller municipalities obtained relatively larger subsidies. This relationship was statistically significant. The use of funds on the Czech side was more balanced. Spatial analyzes allowed to indicate the places of concentration of the use of EU funds. In general, a positive correlation was between the amount of subsidies obtained and the distance from the state border. The border location affects the higher activity in the use of EU funds.

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MUNICIPAL HOUSING RESOURCE MANAGEMENT SYSTEM: ELEMENT OF POLISH CITY MANAGEMET STRATEGY OR HOUSING POLICY?

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ABSTRACT

Issues related to the housing problems are significant in every phase of economic growth. The functioning of this sector combines economic, legal, social and political elements, but this study focuses mainly on the economic and social ones which should influence the shape of the legal and economic system as a factor that supports the effectiveness of housing mechanisms. As example, the analysis of the demographic factors leads to the conclusion that the prognoses for the future need to take into account current demographic parameters, including the substitution of generations. A detailed analysis shows that the growth of this market is closely related to satisfying specific housing needs of the ageing society whose lifespan is getting increasingly longer. As it has also been shown, the social changes within the average Polish family, new patterns and lifestyles affect the younger generation's expectations and needs. The process is particularly important when the demographic slump or baby boom generations start entering the job market and, subsequently, influence the demand for apartments. The aim is to answer the question: do demographic processes connected with housing needs play a significant role in the city strategy? Or housing problems it's only local political problems? In paper Author discus about strategy and local housing policy. What is more, housing problems connected with local government policy has become a new research area. It has offered new opportunities to apply numerous statistical methods and instruments, econometric models as well as to test them in the course of quantitative and qualitative analyses of the housing problems and help in the management of the city.

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Specific Session:

Spatial changes of the city in the light of the idea of balancing development and restoring spatial order

Convener: Prof.Dr. Elżbieta Węcławowicz-Bilska

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URBAN SPRAWL IN THE CONTEXT OF CRACOW CITY LIMITS

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ABSTRACT

Urban sprawl is one of the biggest problems of the contemporary spatial planning. Since the 20th century there has been discussions amongst theoreticians and practitioners, devoted to delimitation of urban functional areas, agglomerations, or metropolises. The example of Cracow demonstrates that the attention of researchers should be also directed to the accuracy of city limits. A comparative analysis of the functional and spatial structure of Cracow and of its northern suburbs demonstrated that the rural areas examined exhibit a much higher degree of urbanity than – for example – a considerable part of Nowa Huta, which was incorporated to the city in 1951. Building permit decisions issued in Cracow in the period 2014-2016 regarding residential buildings illustrate uniform development, with the exclusion of the western wedge of green areas and the eastern industrial areas. Multi-family investments are located within the radius of ca. 6 km from the Main Market Square. One-family buildings are developed within the ring between the 6th and 10th km. This ring goes beyond the administrative limits of the city only towards the north (communes of Zielonki, Wielka Wieś, and Michałowice), which entails a question regarding the rationality of the city limits of today. Shortage of potable water hindered the development of northern outskirts of Cracow in the mid-20th century. The launch of a new water main in 1974 overcame this development obstacle. Over subsequent decades the priority of protection of soils of a high valuation class against land development grew weaker. After the economic transformation, due the development of local governments the policy relating to the areas discussed was directed towards liberal transformations of arable lands into para-urban structure. New residents live an urban lifestyle, taking advantage of the social infrastructure and services offered by the city. The absurd northern city limit, present there for nearly three decades now, has not interrupted the natural process of the city development, but it has prevented a rational spatial policy consistent with the idea of balancing development.

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THE MUSKAU BEND: MINING SPACE FROM DIFFERENT PERSPECTIVES

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ABSTRACT

The article analyses and assesses the phenomena and problems of the Muskau Bend – the Polish-German mining space, specific for natural and cultural conditions, and diversification in terms of the state of mining, as well as the directions of transformation and exploitation of elements resulting from the mining activity. The article is based on the author's field research carried out in 2013 and 2016, within the framework of the activity conducted at the Institute of City and Regional Design, at the Faculty of Architecture of the Cracow University of Technology. The way of thinking is conducted in three main directions: from the German, Polish and cross-border perspective, which serves to emphasise the distinctness of processes characteristic of the Muskau Bend areas located in Germany and Poland, but at the same time within the borders of the European Union. Such an approach to the subject provokes discussion about the present development and the future role of the Muskau Bend as a space connecting two neighbouring countries, where Poland and Germany function in a specific symbiosis, at the same time being markedly distinctive. The conclusions drawn can be useful both for the Muskau Bend itself, and for other mining and post-mining regions of a cross-border nature.

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"POST-MINING REALITY" IN WESTERN EUROPE: SELECTED COLLIERIES IN BELGIUM AND FRANCE FOLLOWING DISCONTINUATION OF COAL MINING

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ABSTRACT

There are numerous areas in Europe that were developing and functioning based on traditional industries, such as coal mining. These include among others: the Ruhr and Saar Coal Basins in Germany, Upper Silesia in Poland, Limburg in Holland or Nord-Pas-de-Calais in France. The spaces of industrial regions and cities, including those related to coal mining, have undergone a fundamental metamorphosis following the economic transformation which – in western Europe – started in the second half of the last century. A vast majority of collieries have been shut down and joined the group of former industrial facilities of great adaptation potential, commonly referred to as *brownfields*. The article contains a concise analysis of the condition of former mining facilities in two countries in Western Europe – Belgium and France, as well as a synthetic evaluation of the significance of these facilities for contemporary urban spaces. The discussion has been based on the Author's field research carried out in August 2017, focused on now defunct collieries that have been adapted to serve new public utility functions. The primary objective of the research was to diagnose the following problems related to the development of former mining facilities and grounds, with special focus on the complexes of shaft headframes and their accompanying dumps: a. the contemporary practical significance of adapted collieries; b. spatial and compositional role of former mining facilities; c. how the surviving collieries affect preservation of the identity of cities and regions historically related to coal mining. The above problems have been discussed on the basis of and illustrated with the examples of former Belgian collieries : "C-Mine" in Genk and "Bois du Cazier" in Marcinelle, as well as two collieries in France, in the Nord-Pas-de-Calais region: "Delloye" in Lewarde and "Dourges" in Oignies. The conclusions stemming from the conducted research and the article itself may prove useful in evaluation of the results of actions undertaken in relation to the shut-down collieries. They may also provide a good starting point for similar research in other mining regions in Europe, particularly in the areas where the process of the mining industry transformation is still in progress or has only just begun.

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THE GENESIS OF THE SYNERGY - PROBLEMS OF INNER CITIES

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ABSTRACT

By their very nature, cities are an extremely dynamic creation, therefore in their areas many different factors overlap and permeate. Perhaps soon we will have to get used to, multidimensional forms of land use. In this way, cities can gain new areas of expansion, as well as a new identity and identification. In all layer systems, the interaction of particular factors (elements) causes that each time we deal with a structure with synergistic features. The article discusses contemporary tendencies in the transformation of agglomeration areas, focusing on the issue and model of spatial synergy in different functional zones of the city centres.

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PLANNING PROBLEMS AND THE VALUE OF THE URBAN AND NATURAL LANDSCAPE IN THE SILESIAN AGGLOMERATION

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ABSTRACT

In the theoretical sphere, one of the prime principles of spatial and urban planning is its hierarchical organization from the national level, through the regional level, to the local level. In this way, the spatial planning system subjects the interests of the individual to the interests of the local community and the interests of the community in the interest of the region and the state. When assessing the existing spatial planning system in Poland, it should be noted that the only local plans are closely related to specific legislation, including environmental protection, cultural heritage, as well as more detailed regulations, such as technical conditions that should correspond to construction and building law. The aim of the article is to discuss in more detail the above problems on the example of the use of natural and cultural landscapes in the plans for the Upper Silesian Metropolitan Region.

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POCKET PARK: A NEW FORM OF GREEN PUBLIC SPACE IN CRACOW (POLAND)

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ABSTRACT

Public space, including green areas are particularly important for the quality of life in the city. The influence of greenery can be considered in regard to natural, social, and economic assets. Such spaces improve the city climate quality, they can create areas of social activity, and above all they serve as a space for leisure and recreation. The same natural environment brings benefits to the city, referred to as ecosystem services, which can be converted into monetary value. Therefore, protection of existing green spaces and their restoration is an important element of sustainable urban development. At the same time in large cities, in which dominates high-density housing development, the issue of ensuring proper availability of green spaces arises. In the recent years in Poland various activities are being undertaken to improve the value of an index showing the surface of public green spaces per one inhabitant of the city. The surface of green public spaces of recreational function in Cracow is 618,48 ha (based on “The direction of the green areas development and management in Cracow for 2017 - 2030” – project, p. 151), which in per capita corresponds to about 8 m2. In the last years, the city has been undertaking activities aiming at increasing the availability of public green spaces to the residents. For this purpose, the city initiated the realisation of an idea of creating small green spaces, called pocket parks, based on American and European solutions. The paper presents research on pocket parks as a new form of public green spaces in Cracow. The purpose of the research is to indicate rules regarding the method of development of small parks within selected American and Polish realisations, and to indicate optimal solutions for future implementation. The paper presents general principles of the idea of creating pocket parks. Two Cracow realisations of pocket parks are described: park in Zwierzyniec district, at the junction of Boleslaw Prus and Julian Falat Streets, and “Ogród Motyli” park, located at Dekerta Street in XIII Podgorze district. The above realisations are compared to the selected American pocket parks - Paley Park and John F. Collins Park. The analysis provides similarities and differences between the concept of pocket parks in Cracow and in the United States of America. As a result, the paper presents the benefits of creating small public green spaces in the context of the sustainable development of Cracow and the possibilities of applying solutions following the example of American cities.

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ROBLEMS OF SPACE SHAPING IN THE SURROUNDINGS OF FORMER MANORS AS PRESENTED ON SELECTED EXAMPLES IN CRACOW (POLAND)

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ABSTRACT

Inner city development structure of large cities is greatly diverse regarding form, functions, and historical and cultural values held. Dominance of high-density housing development and absence of non-developed areas of large surface results in the fact that in these regions the existing public and green spaces become particularly valuable. The considered areas require protection against further, chaotic development. In inner city development we may distinguish a particular type of buildings that represents valuable cultural, historical, and architectural values - a manor. Manors are associated with residential development, located among green areas. The development of cities resulted in the surroundings of manors located near city centres were subject to significant transformations. A question arises, how does the surrounding space impact on the value of these objects. The paper presents studies on the method of land development of areas surrounding old manor buildings in Krakow's city-centre development area in the context of shaping public spaces. The analyses stress the quality of surroundings in the vicinity of former manor developments. The purpose of studies is to indicate a method of shaping public spaces around former manors in Krakow and to recognize conflicts present within these areas. In result, the assessment of the impact of spaces on the perception of historic manors in the city space was conducted. The article shows examples of spaces surrounding three old, historic manors in Krakow, Łowczego manor in VII district Zwierzyniec, “Kossakówka” manor and park in I district the Old Town, and former manor at Jana Zamoyskiego Street in XIII district Podgórze. Areas surrounding the manors, in particular public spaces, such town squares, were subjected to functional, composition and aesthetic analysis. Based on conducted analyses, their strengths and weaknesses were established. The conclusions show issues regarding the areas neighbouring the selected historic manors in Krakow, while attempting to indicate possible actions that could improve the quality of these spaces.

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REINSTANATION THE SIGNIFICANCE OF CITY MAIN PUBLIC SPACE - REVITALIZATION OF THE MAIN SQUARE IN POŁANIEC

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ABSTRACT

The aim of the conducted research is to analyze the changes taking place in the public spaces of small towns of South-Eastern Poland and their impact on the residents' awareness and the sense of local identity. The analysis included the actual state "before" and "after" the revitalization carried out as well as the study of planning and strategic documents. The subject of the research was, among others Połaniec. The town in its history has been repeatedly destroyed among others as a result of war and natural disasters. Thanks to the residents who were always strongly connected with the town, Połaniec was rebuilt every time. The locality alternately gained and lost municipal rights, and finally, in 1980, become recognized as a town. The granting of city rights was closely related to the rapid development of Połaniec, caused by the construction of a power plant in nearby Zawada. In the seventies, eighties and nineties of the XX century, new large housing estates and service facilities were built in Połaniec. During this period, the most intense development of the city took place. Public spaces, like, "Promenade" at the shopping pavilion along Kościuszki Street and a “traffic town” have arised. The main square - the heart of the medieval Połaniec - in the 60s of the twentieth century was transformed into a communication node, thanks to which the town lost its main representative space. In addition, the service functions that so far have been focused within the market have been taken over by the pavilions built at Kosciuszko Street. Cultural events, since 1994 have been transferred to the concert shell. In 2008, the Połaniecka Gallery was opened, creating a potential representative space of the city. It was only within the framework of the Local Program for the Revitalization of the City and Municipality of Połaniec for the years 2007-2013 the funds were found for restoration the proper status of the main square. In 2009-2010, the reconstruction was carried out and the former - the representative character of the square (now Połaniecki Square) was recovered, at least partially. Raising the quality of the town's representative space resulted in an increase in the sense of local identity of the residents, which have an effect of, among others, renovation of the majority of the facade of the market buildings, which further contributed to the improvement of the quality of the town square. A successful revitalization process can take place only when it is conducted comprehensively. Restoring the rank of the Połaniec market, high awareness and a sense of responsibility for "their" town among the residents, resulted in a living, attractive space that became the showcase of Połaniec.

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UNDERGROUND PUBLIC SPACE: CRACOW'S TUNNELS OF FEAR?

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ABSTRACT

The importance of the quality of public spaces increases with the inhabitants' awareness. A well-designed place gives users a sense of security. A special type of urban space are underpasses, which, despite relatively high implementation costs, are quite often used especially in large cities. In recent years, Krakow underground passages have been called "fear tunnels". However, not all of them cause a sense of danger. The aim of the research was to determine the factors that make the underground passage becomes user-friendly and does not create a sense of uncertainty? Underground passages located in various parts of the city and performing various functions were analyzed. Underground public spaces have different shapes and dimensions. In the conducted research, it was analyzed whether the technical parameters of the underpass - such as width and height have an impact on the user's sense of security. It was checked how the spaces in which no services exist are perceived and whether these spaces are available to all users. The aim of the research was to determine the elements affecting the reception and use of this special type of urban space. The analysis was carried out for ten underground passages located in various parts of Krakow. Out of these ten, five spaces of the most diverse character were selected for the performance. Underground transitions with different saturation with service functions, different number of users, different degree of adaptation for people with mobility difficulties and various aesthetic level were analyzed. Areas with high saturation of service functions and located in places generating a large number of users were rated as the best. As the worst, despite the good technical condition and facilities for people with mobility problems, were rated spaces with a small number of services and about the proportions of a tunnel longer than sixty meters.

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RECREATIONAL AND TOURIST QUALITIES OF SUBMONTANE RESORTS WITHIN THE CRACOW METROPOLITAN AREA

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ABSTRACT

The metropolitan area is a zone where the process of focusing on and concentrating around the central city is discernible in all aspects of residents' lives and functioning of smaller towns. The population and businesses within the zone closest to the metropolitan centre are directly dependent on the main urban core, but as the distance grows, new internal links are created between satellite towns, yet they always remain with the impact zone of the agglomeration. Tourism and recreation are at the top of the list of available services, so the discussion on the future of small towns in the Cracow Metropolitan Area must focus on this branch of business activity. The concept of the metropolitan area has been present in our legislation for more than fifteen years now, and the area is determined and modified following the principle that it must be continuous and dense, the maximum distance from the centre of the metropolis to its outskirts must not exceed 50 km, i.e. on the average – the isochron of an hour's drive by car from the centre to the outer boundaries, and the principle of single affiliation, which says that one commune may be a part of only one metropolitan area. All the above principles apply to the Cracow Metropolitan Area, which is reflected inter alia in the change in land use forms and the increase of the land development density. Urban spaces which grow in the shadow of a metropolis copy and transfer patterns of functioning and living from a big city to small towns, which may – in consequence – lose their identity. Małopolskie Voivodeship, including the Cracow Metropolitan Area, 26% of which is made up by the Cracow agglomeration, is a region characterised by a complex ownership structure and varied land configuration, the latter adding to its tourist and recreational qualities. Towns of submontane character are situated in the southern part of the Cracow Metropolitan Area, in the poviats (counties) of Myślenice, Wadowice, Bochnia and Wieliczka. The most interesting submontane towns within the influence zone of the Cracow Metropolitan Area and – at the same time – the ones which best characterise the problem of spatial structure transformations resulting from tourist services are, among others, Lanckorona, Lipnica Murowana, Nowy Wiśnicz and Łapanów. Analysis of the existing conditions and spatial transformations, as well as the adopted vision of development of the above-mentioned towns, are the grounds on which we may determine the trends in the development of their spatial structure, changing to keep up with the tourist services sector. Development of tourism will contribute to preservation of the environmental assets, cultural heritage and identity, as well as to creation of new jobs. It will also give residents an opportunity to acquire an additional source of income.

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JOSEPHINE COLONIES – RELICS OF THE PAST IN THE CULTURAL SPACE OF BESKID SĄDECKI

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ABSTRACT

German settlers first arrived in the area of the Carpathians under the rule of Austrian emperor Joseph II Habsburg, who initiated the settlement campaign. Therefore, the colonization is known in Poland by the name derived from his name – Josephine colonization. It was a pre-planned settlement campaign carried out in the late 18th century, mostly in Galicia. The official objective of this campaign was to improve the quality and efficiency of the economy and agriculture in Galicia. Colonies in East and West Galicia differed from each other in growth dynamics. Colonies in Beskid Sądecki were characterised by a rather poor development rate and soon there was not even a trace left after many of the colonies. The Eastern Carpathians featured a distinctive increase in the number of population until the end of the 19th century, yet in the early 20th century, the population numbers dropped in this area as well. In principle, the colonization was to attract skilled craftsmen and professionals, but in practice the greatest majority of them were farmers, relatively poor and relying on the state aid. The settlement campaign did not fulfil the economic and political expectations, yet it left traces of the settlers' cultural heritage visible in the tradition and forms of development. Settlements of the colonists were located next to existing villages, with their own urban layout, frequently in the form of chain houses, or within the existing villages (in groups of at least 6 families) by lengthening or broadening the boundaries of the village. All the buildings were erected according to prescribed regulations, and their sizes depended on the amount of land allotted to a given colonist. Houses were built of brick and timber with the use of the timber framing method, and covered by straw or shingles. All the residential buildings were situated close to the road, and the house together with the stable were one unit. Timber or masonry developments of Josephine colonists, so much different from the developments of native inhabitants, will disappear from the Beskid landscape within the next ten years as a result of introducing new technologies in construction and the change in occupation of their owners. Developments in the colonies in Gołkowice Dolne and Stadła are now the only spatially clear remnants of German settlements of the 18th century that can be found in the Nowy Sącz countryside. Making an inventory of what is left of their spatial structures, combined with an analysis of ownership patterns in relation to the iconographic materials, would be an important contribution helping to shed some light upon the multi-cultural heritage of Beskid Sądecki. These works also have a chance to slow down, or at least to record, the process of degradation and immortalise the vanishing heritage of German settlers.

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TECHNO-POLIS: BEYOND TECHNOLOGY PARK

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ABSTRACT

Recent decades have been characterized by development of new fields of science and economy, including the sector of advanced technologies. Growth of knowledge-based economy is associated with new type of space. Technopoles, science and technology parks have been springing up in the cities all over the world. In urban terms, these are building complexes serving for functions of services, offices, laboratories and industry localized in landscape arranged areas. A long-term author's study of technology parks around the world oscillates around quality of their space, compositional principles and relations with their surroundings as well as the public areas facilities, city structure and spatial policy. Some technology parks are simple, intimate building complexes in greenery. Their significance for the city is not always visible. However, many examples indicate that the technology parks are more than a complex of buildings with office, laboratory and industrial functions. They have fort potential to change the city structure, by influencing social changes, increasing landscape greenery, node places and network connections. Author believes that emergence of technology parks has affected development of a new mode of city functioning, its form and space. Technology park complexes are morphologically distinctive from the surroundings by its new form and high-quality space. So author defines a new type of urban tissue – techno-polis through four mutually complementary aspects of the urban structure: function, space, form and community. The core of techno-polis fabric is providing the best working conditions for highly skilled, professional staff, working in research centres and high-tech companies and incidentally building network community, changing the city's structure and ensuring sustainable development. Techno-polis is a hybrid hub, which integrates the high technology industry with high-quality urban and architectural solutions. This attractive space with share of arranged greenery areas is a new eco-friendly quarter, where people can live and work in comfort.

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DEVELOPMENT OF WATERFRONTS IN SMALL AND MEDIUM-SIZED CITIES IN THE VIEW OF THE IDEA OF SUSTAINABLE DEVELOPMENT - SELECTED EXAMPLES

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ABSTRACT

The development of waterways is one of the key factors influencing the perception of the city by its residents and people visiting them. The unique value of these areas in the urban structure often results due to the short distance from the historic city center. An important factor is the layer of cultural values. For the sake of the rich traditions of many urban centers, it seems necessary to draw attention precisely on the aspects related to the connection of the waterfronts areas with historical tissue of the city. However, due to the continuous development of the cities, we have to deal also with the areas that have been invested today - often in recent years, and this process is still continuing. Often we faced with problems That have been created in recent years as a side effect incompetently policy planning. Legal documents such as the Water Law Act stipulate that "When designing, making and maintaining water facilities, the principle of sustainable development should be followed, in particular maintaining good water status and characteristic biocenoses, the need to preserve the existing relief and biological relations in the water environment and in wetlands ". Unfortunately, these records are often not taken into account during the transformation of watercourse channels - especially in urbanized areas. In fact, the priority is to get the maximum protection against flooding and to bear the lowest possible economic costs. So we can assume that the appearance and spatial order in the areas of waterfronts are primarily connected with the consistently implemented measures in line with the ideas of sustainable development, as well as thought-spatial policy pursued by the city authorities.

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RECIPE FOR A CITY

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ABSTRACT

Transformations of historic spaces in European cities have always been subject to certain principles and rules – different in different eras – regulating their structures. The results of expanding and transforming urban settlements in Poland suggest that, particularly in the last dozen or so years, a clearly discernible principle would be difficult to find in the image of Polish cities. Absence of a universally accepted urban planning doctrine is probably one of the reasons that there is no harmony, beauty or composition in currently created large cities in Poland. The problems have been discussed on the example of one of the major and most beautiful cities in Poland – Kraków. Its spatial structure is the result of many centuries' work, and it encompasses both historic urban schemes preserved in full and fragments of urban and rural settlements starting from the early Middle Ages. A rapid growth of the city area has been going on in several stages since the mid-20th century. Dynamic expansion, characterised by several stylistic trends valid in the late 20th and early 21st centuries, such as socialist realism, modernism and postmodernism, has totally changed the spatial form of the city. The city population has trebled during that time, and its area has grown almost seven times. The efforts aimed at rebuilding, expansion, modernisation and ordering the city that were undertaken after the political regime change in 1989 and following the changes in the Act on Spatial Development introduced in 1994 and 2003 and in the building code – in 1994, have failed to meet the city residents' expectations. Poland's accession into the European Union in 2004 brought on a certain acceleration in the process of modernisation, rebuilding and transformation of the city. It has been – and still is – provoking a succession of environmental, social and, first of all, spatial conflicts. The most serious problem is the air pollution in the city, resulting both from dust and chemical emissions, the limits of which are exceeded for seven months a year. Additional nuisance of the urban life in Kraków is related to the fact that there are approximately 300,000 commuters coming to the city on a daily basis and using up a considerable portion of the scarce municipal services. The contemporary growth of development in Kraków and its surroundings – at the time when sustainable growth and spatial order form a universally accepted paradigm – must be considered an unfulfilled promise. It seems that basing city growth in Poland on the self-regulating free market forces has been a mistake. The introduced legal and planning regulations were excessively liberal. This, combined with the fact that only a small percentage of urban areas have valid land use plans, makes the system defective and insufficient. Moreover, the frequently introduced changes and modifications of the system only further expose its inefficiency. The dominant position of investors, rather than urban planners, in creation of urban spaces, both in housing and services, does not promote harmonious growth or high quality public spaces.

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REVITALISATIONS IN POLISH HEALTH RESORTS VS. EUROPEAN MEASURES

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ABSTRACT

Nowadays there are 45 statutory health resorts, which means that the conditions and effectiveness of the treatment they offer is guaranteed by the state. Additionally, several dozen locations have natural medicinal resources, which are used to varying degrees. Many locations which served as health resorts in the interwar period, no longer fulfil this function. After the World War II all health resorts operating within the territory of the country were nationalised, but all of the ones that had been operating before obtained relevant statutes. Due to investments carried out in health resorts in time of socialism, many of such locations were subjected to excessive urbanisation, becoming bigger towns with the population of over ten thousand, in others the functions of leisure and tourism were being simultaneously developed, many of them assumed additional administrative functions, becoming seats of communes and counties. After regaining independence in 1989, long-term discussions were conducted devoted to the form and new legal solutions for health resort treatment. Simultaneously, a long-term discussion was launched on possible forms of privatisation of Polish health resorts. In principle, it consisted of three stages, and consequently heirs of former owners started to regain their properties only at the beginning of the 21st century. Owing to investments made in health resorts by different business entities in the years 1950-1989 and during the first years of privatisation, when single sanatoria or leisure facilities got sold, these returns actually referred to parts of treatment facilities or single buildings. Simultaneously, Polish health resorts started to be sold to different business entities and municipalised. Heirs of former owners, local authorities, as well as new users of health resort facilities conducted all sorts of adaptation, investment, and renovation works. They focused on the improvement of the quality of the facilities, devices, and space connected with health resort treatment, but they were also connected with the increase of the functional and aesthetic attractiveness of the entire town or village. Comparison of the effects of such measures in several health resorts in Poland with examples of similar actions undertaken in different periods in several health resorts in other European countries is the goal of this paper. It seems that representative examples of renovations of Polish health resorts returned to their heirs are Szczawnica and Solec Zdrój. Another group are spas located in the zone of big cities, such as Mateczny, regained by its owners, or Swoszowice in Cracow, which has been sold. This process looked different in case of health resort municipalisation, as in Rabka and Krynica. Among foreign examples, an interesting one is certainly the health resort in Vichy, restored in the 1960s and 1970s, and then again in the 1990s, Aix-en-Provence, and a small spa in the Vosges. Conclusions obtained as a result of these comparisons authorise us to state that: a. The most effective results of renovations and reconstructions of a health resort are obtained when their scope is comprehensive and based on the revitalisation of the entire complex, and even the entire town or village, b. The project is implemented consequently, c. Fragmentary activities connected with the renovation or modernisation of single buildings bring results which are not always satisfactory.

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FUNCTIONAL AND SPATIAL TRANSFORMATIONS OF LITTLE TOWNS IN MALOPOLSKA - SELECTED EXAMPLES

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ABSTRACT

Economic and social changes in Poland since the end of XX century had influenced significantly to the outlook and functioning of small towns. Towns of Malopolska Voivodeship in number of 61 are characterized by a significant diversity in size and level of development. Small towns which make up over 77% of the total number differ considerably both in the aspect of the ongoing demographic processes and the results of the contemporary economic transformation. The vast majority of cities in Malopolska in number 43 towns are quite small with population below 20 thousand inhabitants. The smallest towns barerly exceed 2 thousand people. There are approximately 30 thousand various business operating at present in all small towns of Malopolska Voivoeship. Their number varies from area to area depending on economic and social factors as well as on the geographic location transport accessibility. Social and spatial growth of small towns is affected by the globalization and metropolisation processes. The process of current transportation of the country economic system is reflected in spatial changes of the towns in the Malopolska. Prospect of development of small towns are differently due to changes of their economic functions and influenced by the geographic position, communal and technical infrastructure. Another parallel subject of consideration are revitalization activities undertaken within local revitalization programmes which are a basis for obtaining EU assistance funds allotted for this purpose. Author presents the planned spatial activities closed in revitalization programmes for the purpose of softening the conflicts in spatial sphere, improvement of living conditions and increasing of attractiveness for investors and tourists. Centres of small towns have symbolic significance for the sense of identity of their inhabitants. These are the areas where there are religions and historic buildings as well as public spaces promoting integration of residents such as market squares. In present social-economic conditions landmark squares in small towns due to preserved values despite of various degradations should be and can be remarkable and significant element of town attractiveness. Small towns have culture related assets and a special identity which may attract numerous tourists and investors on the condition that they have formulated a precise strategy of development high-lighting the elements most powerfully expressing their identity. The ways of development of small towns in their social-economic growth is related to diverse service functions and individual functional and aesthetic programme consistent with the towns specific character and its role in the region.

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THE SQUARE BETWEEN TWO SYNAGOGUES IN RZESZÓW (POLAND) – A PLACE WITH POTENTIAL?

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ABSTRACT

The aim of the article is to examine selected aspects of the potential of the square between two synagogues in Rzeszów. The study covers historical, spatial, functional and location features. Rzeszów is a large city in south-eastern Poland. It is the capital of the Podkarpackie Voivodship. The city has a historic centre, that in part is refurbished and pedestrianised, and, in part, its potential still waits to be unleashed. Between the historic market squares of the Old Town and the New Town, there is a sequence of smaller squares. One of the squares in that sequence is the subject of the study, described in the following paper. Characteristic feature of that square is its location between the former synagogues. It is located within an area entered into the Polish Register of Historic Monuments. The square is well-defined, to a large extent. It is located between two synagogues, tenement development, and a park. Compared to the areas of the historic market squares of the Old Town and the New Town, that square is smaller. The study seems interesting, as Rzeszów is a developing city and a metro area under construction. Interesting and attractive city centre may contribute to further development of the city. The present paper may be helpful in assessing the potential of the square between two synagogues in Rzeszów as an attractive place in the urban network of public spaces. The square seems to be an interesting place, worth using for expanding the boundaries of the attractive city centre.

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REVITALIZATION OF PUBLIC SPACES OF HEALTS RESORTS IN SOUTHER POLAND: BASED ON SELECTED EXAMPLES

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ABSTRACT

The aim of the article is to present new activities in located in the south Poland health resorts focused to improve the quality of the public spaces in these resorts. In Poland there are 45 spa resorts (mostly small towns and villages) half of them were developed in the southern part of Poland and many of them are interesting examples of the transformations of the urban public space. The revitalization of the public spatial areas of spa settlements carried out in recent year's means, first and foremost, activities aimed at increasing the attractiveness of these towns due to the strong competition on the spa and tourist market. Growing in connection with the creation of new spa or wellness centers or large complexes developed on the basis of thermal springs. Examples of localities with the dominant spa function were chosen to trace the current trends in the area of contemporary development of public spaces in the city, which are also healing spas of the spa. Spas such as: Rabka-Zdrój, Muszyna-Zdrój, Szczawnica-Zdrój, Iwonicz-Zdrój, Rymanów-Zdrój, located in the Carpathians area are very interesting and representative examples of changes in recent years in spa towns in Poland, after a period of stagnation caused by ownership transformations in health resorts associated with the privatization and the reprivatization of property nationalized after the Second World War. As well as long-term negligence in the period of system change in Poland after 1989. Activities undertaken in health resorts located in the south of Poland serve not only to improve the attractiveness of the town by improving the quality of public spaces. There are numerous activities to protect the cultural and natural heritage of the town, actions taken for the comfort of visitors and tourists, but also for the sake of residents as well as natural resources of mineral resources thanks to which the spa towns have been functioning for centuries.

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PLACES FOR GREEN AREAS IN THE SPACES OF THE MODERN CITY

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ABSTRACT

The aim of the work is to answer the question about the place for green areas in the spaces of the modern city. Presented considerations are based on field studies carried out by the author, supplemented by photographic documentation, and the analysis of available iconographic materials and literature. The research covered areas "reclaimed by nature" and included in the structure of selected European cities. Discovering (by planners) the potential inherent in these areas, both natural and cultural, brought a number of excellent spatial and functional solutions. We find examples of such solutions in the spaces of many European cities. These are, for example, parks created in the former railway areas of Berlin; in Madrid, the reconstruction of the city ring road, which allowed for the reclaiming of the areas on the Manzanares River and the creation of a several-kilometer long park on the waterfront. It became commonplace (especially in large cities) that space for for green areas is created on roofs and walls of buildings, and more and more often, in small undeveloped areas where Packet Parks are created. At the end of the 20th century, a phenomenon known as "urban gardening" emerged very clearly in the spaces of cities. As a result of socio-ecological initiatives in various parts of the urban structures, also social gardens are created. These vary in terms of size and are diversified in terms of the spatial and functional solutions applied. The analyzed natural spaces are places of rest, relaxation, but also educational and cultural events; they are included in the green structure of cities and they become their integral part. Clearly visible is also significant participation of local communities in creating these spaces and taking responsibility for their use. Presented examples indicate a clear change in thinking about the role of green areas in urban space and the benefits it can give to city dwellers. The positive social, ecological, spatial, functional and compositional effects obtained in these projects may be an inspiration to create non-standard solutions for transformations of other urban structures.

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RIVER AND RIVERSIDE AREAS – IN THE CONTEXT OF SHAPING THE URBAN SPACE. CASE STUDY

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ABSTRACT

Nowadays, the need of "return to the river" is universally recognized. The human need for contact with elements of the natural environment is particularly emphasized, in connection with our increasingly processed environment. In a number of publications in the field of architecture and urban planning, the role of these natural areas in shaping coherent, sustainable urban structures is also underlined. The aim of the article is to indicate the potential use of the corridor formed by the river and the areas constituting its neighborhood for shaping the urban space: in a functional, compositional and ecological sense. As an example, the Vistula River in Cracow was chosen. The research covered areas that are close to the river within the city's administrative boundaries. The Vistula Valley in Kraków creates a special space in which natural and cultural values intermingle. Over the centuries, both the spatial structure of the city and the layout of the water network - resulting from its natural transformations and the use of its elements for economic or defense purposes - have changed. The special cultural value of the Vistula river valley in Krakow is represented by the medieval urban layouts of the Old Town, Kazimierz, and Podgórze, as well as unique historical complexes and buildings. The historic buildings accompanying the river have significant compositional significance, being dominants or observational closures, building and deciding on the unique beauty of this Krakow salon. From the point of view of environmental values in the analyzed area, focus is drawn to the western and eastern zone of the Vistula valley. In the eastern part of the Vistula valley, particular attention should be paid to the occurrence of geothermal water deposits located in the region of Przylasek Rusiecki and Wyciąża in the vicinity of the Vistula river corridor. The analyzed area, due to its natural and cultural value, should play an important role in shaping the spatial structure of Krakow. As a linear area, it can become an important and attractive public space. Due to the extent of the area on which the research was carried out and the complexity of the research problems, some of the issues are only sketched in the article, signaling the values and significance of the studied area, and generally indicating the principles and possibilities of using these values to shape and improve the quality of urban space.

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CORRIDORS OF METROPOLITAN STRUCTURE DEVELOPMENT IDENTIFICATION AND PARAMETRIZATION ISSUES ON EXAMPLE OF KRAKOW

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ABSTRACT

The subject of the author's research is planning and urban aspects of modelling the spatial structure of cities being in the metropolitan development phase, with particular emphasis on the problems typical of their inner city. The research approach consists in an attempt to define the main elements forming the urban structure of this structure. It is assumed that these are node locations and development corridors, i.e. points and bands distinguished by accessibility by transport, diversity and intensity of land use, increased investment traffic and significance for the urban composition of the city. The purpose of research is to define the basis of spatial policy for particular types of development corridors and the corresponding nodal sites, also called urban centres. The article presents the assumptions of the method of identification, classification and parameterization of the potential of corridors for the development of the metropolitan structure. The criteria and factors of this method were derived from the following assumptions and experiences: a. there is a close relationship between spatial development policy and transport policy, where pedestrian and bicycle traffic is becoming a higher priority, b. metropolitan centres are shaped in places with the highest availability of collective transport, and these places form a network of public spaces of the contemporary city, c. the importance of ecological, architectural and urban quality factors increases, as well as the values that create the identity of particular spaces that build the metropolis, d. the main corridors of spatial development should integrate sensitive and strategic areas, including areas requiring revitalization and areas of intense and spontaneous transformations. Conclusions from the research based on the example of Krakow allowed for the refinement of factors assessing the potential of activation and integration of development corridors. Noteworthy is the relationship between the level of crystallization of internal and external links of the corridor and the ability to accumulate activation processes and generate strategic projects.

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INDUSTRIAL SPACES IN SMALL AND MEDIUM CITIES IN SOUTHERN POLAND – THE SELECTED EXAMPLES

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ABSTRACT

The industrial areas of small and medium size Polish cities, which were the elements of large industrial districts in the past, are the subject of the article. The effects of historical spatial conditions, the impact of industrial districts on these cities, as well as the consequences of transformations from the turn of the eighties and nineties of the last century are analysed. In the last twenty years, there have been profound changes in the industrial areas of urban spaces. Many of them did not raise after the period of systemic transformation and changes of the centrally planned economy to free market. The transformation of urban and suburban space has been and still is the effect of these changes, changing the purpose of the old industrial buildings and establishing the existence of new structures in open areas, such as “greed field”. In turn, this results in the reconstruction of the existing transport systems and road corridors, profound changes in the city’s infrastructure and affects human resources, directing new workforce to the routes. In addition to the transformation of the spatial structure of the city, a new standard of work space organisation has appeared: on the one hand, based on the old tape production system, and on the other, closed and isolated. The author presents a selected example of cities from the Bielsko Industrial District, which was established in the first half of the XIX century, and its area currently amounts to 2,6 thousand km². Currently, the machine, automotive, textile and metallurgical industries are mainly developing in this district. Furthermore, there are two subzones of two special economic zones in the BID: Katowice and Cracow. After years of stagnation, today the largest industrial areas are developing on the outskirts of the cities and villages, where industrial zones or economic activity zones are built. Such areas are located in Bielsko-Biała, Żywiec, Pszczyna, Czechowice-Dziedzice, Wilkowice, Rybarzowice, Skoczów, Cieszyn, Jasienica, Kęty and Andrychów. In small and medium-sized cities, the process of transformations and changes taking place under the influence of the development of industrial areas is particularly visible.

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POLISH HUB - CENTRAL AIRPORT IN POLAND, THE SOLIDARITY PORT

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ABSTRACT

The Central Communication Port, i.e. the Solidarity Port, is to be the investment that will be the best communicated place on the map of Poland in the project assumptions. The target location has been revealed in recent months. The new airport HUB and the railway junction will be built in the Baranów municipality, about 40 km west of Warsaw – soon the Polish government is to adopt the CPL concept. Within 10 years, a new airport, a railway station and a node for High Speed Railways and expressways connecting the new investment with road infrastructure in Poland are to be built. At the beginning, the concept predicts two runways, and ultimately there will be four. The total area planned for the investment is 3 thousand hectares. Initially, the capacity is planned at 45 million passengers per year. Current calculations are based on the 2010 data projection. A new analysis is currently being prepared, the completion of which is planned for mid-2018 to establish the final investment limits. Conceptual work is underway to resolve the main terminal for passenger check-ins. Two concepts are present in the discussions. The first one assumes the airport railway. It is used not only on expanding airports, but also on some of the most modern ones. This solution is more flexible and therefore cheaper, on the other hand, it extends the time of unproductive loss of passengers. On the other pole are terminals built in a concentric way, resembling a starfish. This solution is less flexible, more expensive, but more convenient for passengers. Current plans for the next two years include the preparation of comprehensive documentation, obtaining all environmental permits and approvals, as well as developing an architectural concept. The Central Communication Port will be designed on this basis. A new city is to be built around the CCP, it is to connect Warsaw and Lodz. The plans include construction of high-speed railways as well as metropolitan and agglomeration railways. Because the suggested travel time by fast railway is to last 15 minutes from Warsaw and 25 minutes from Lodz, it will not be the only Warsaw-CCP-Lodz connection. The airport HUB will be the best communicated place on the map of Poland, ideal for business meetings, fairs and company headquarters. The planned development of this area is beyond the scope of the typical Airport City and Aeropolis. This is a place where not only companies from the aviation industry and transport can develop.

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THE IMAGE OF CONTEMPORARY POLISH SEZ – SPATIAL ASPECTS ON THE SELECTED MEDIUM-SIZED CITIES

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ABSTRACT

The genesis of the article is an attempt to present a contemporary image of the Polish Special Economic Zones in the selected aspects. The topics presented in this publication are aimed at highlighting the complexity of interactions that are observed in the field of privileged areas, how special economic zones have influenced and continue to affect changes in the Polish economy, labour market, social processes and spatial transformation of the cities and regions. The interdisciplinary nature of the article is a multi-directional attempt to highlight issues related to the functioning of SEZ in Poland. As a result of the analysis of various studies, the publication presents both positive and negative aspects of these zones, an objective summary that covers almost a quarter of a century of the existence of SEZ on the territory of Poland. Currently, SEZ have become one of the symbols of the Polish systemic transformation. They are not at the centre of our attention and yet have a significant impact on the Polish manufacturing industry. SEZ is also another form of the structure and a change of the existing configuration of industrial areas in the cities. The strategic task of the special economic zones was to introduce modern production plants with new production technologies to the Polish reality of the early nineties of the last century, and to change the quality of work, increasing its efficiency. Contemporary urban and suburban space undergoes transformation, changing the purpose of old buildings and establishing new ones, enforcing reconstruction of the existing transport systems, and directing workforce to new routes. It is also a new standard of work space organization: on the one hand, it is based on an old type production system, and on the other, it is closed and isolated. On its site, there are completely different rules and laws, including both tax reliefs for investors and the suspension of employee rights. The author looks at the selected regions of the cities, in which they are located, like Mielec, Świdnica, Oława, Dzierżoniów, Polkowice, Niepołomice or Legnica. The analysis covers both the regional dimension as well as the geographical and human one, on the local scale, referring to the spatial and social conditions.

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PRESERVATION PRACTICE BETWEEN IDENTITY AND SOCIAL ISSUES: THE CASE OF GANYANTOU ETHNIC VILLAGE IN YONGZHOU-CHINA

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ABSTRACT

The village of Gayantou is located in the southern part of the Hunan Province in China. The village is located between Jingshui river and Xianshui river, not casually, Gayantou means “village positioned between two rivers”. The studied site, the Black Gate House, is one of the six ancient rural residential complexes of the village. It was built in 1638, during the Ming Dynasty (1368-1644), and belonged to the Zhou family. Still today, the inhabitants of rural villages such as the concerned site, are food self-sufficient as their main activity is based on rice production, a crucial activity not only for their diet, but also for the Chinese economy. Despite this, the preservation of rural ancient villages is threatened by the massive depopulation due to rural-urban migration, especially by the youngest groups within the communities. In the last decades the Hunan Province Administration has been facing the decline of the cities’ quality of life, being overcrowding-related issues among the most serious. As an attempt to solve this, the Administration in collaboration with Hunan University, is trying to encourage rural village residents to remain in the countryside by building new villages – with *appealing* urban standards – or in the best cases, by restoring the existing buildings – which is the only way to preserve identity and social sense of belonging. The site was subject of study during a high formation workshop held in August 2016 which was organized by the Architecture College of Hunan University and by the Polytechnic University of Milan. The main intent of the workshop was to show locals good practices of maintenance while training new generations of experts. The workshop was attended mainly by Chinese architecture students (among grads, master and PhD students), plus two exchange undergrad students from Princeton University (USA) and two graduate students from the Graduate School in Architectural and Landscape Heritage of the Polytechnic University of Milan. The aim of the research was also to investigate the site regarding its materials, its construction techniques and, above all, the problems and causes of its deterioration and its structural instability, resulting in a conservation and reuse draft project afterwards. The specificity of the survey was its limited use of technology, in order to give students a replicable methodology for any similar case study. The geometric, material and deterioration survey was in fact carried out on a simple and traditional way, with precise and scientifically correct techniques. Students were able to learn a fast and low-cost, yet correct methodology concerning direct data acquisition, an essential phase prior a conservation and reuse project proposal.

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