

STRESZCZENIA

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INFLUENCE OF SUDDEN COLUMN LOSS ON THE DYNAMIC RESPONSE OF A MULTISTOREY STEEL FRAME

Multistorey steel buildings are proved to be very susceptible to situations when one of their columns loses its capacity as a result of an accidental action. The above mentioned case concerning a steel framed building is the subject of investigation presented in the paper. Structural system of analyzed building was designed in accordance with ultimate and serviceability limit states in the persistent and transient design situations. Then its integrity in accidental design situation was assessed. According to EN 1991-1-7 [1], the strategy based on limiting the extent of localized failure was assumed. Firstly, the static analysis of the structure in Autodesk Robot Structural Analysis Professional software was performed. Then, the static and dynamic GMNA analyzes (materially and geometrically nonlinear) of the structure in Autodesk Simulation Mechanical were carried out. Calculations were made in reference to plane frame, which is the repeatable load bearing system of considered building. FEM models were made with the use of beam and shell elements. The results of performed analyzes were compared and discussed. Concluding remarks were drawn and directions of future research were outlined.

Keywords: robustness, dynamic analysis, accidental action, column loss, steel framed building, FEM

Przesłano do redakcji: 24.09.2017 r.

Przyjęto do druku: 28.12.2018 r.

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USING OF NEAR-CRITICAL FLOWS' THEORY IN PRACTICAL CALCULATIONS

The paper considers the problem of practical using of theory about near-critical flows. It describes the types of immovable and movable near-critical flow phenomena and cases of these phenomena formation during different hydrotechnical constructions operating. The paper gives generalized differential equation of free-surface profile of wavelike near-critical flows. The solution of mentioned generalized differential equation is given as well. The solution of generalized differential equation takes into account possible deviating from hydrostatic pressure in initial cross-section of considered flows. If the specificity of near-critical flows, especially wavelike free-surface profile and deviation of pressure distribution in initial section of considered flows, will

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not be taken into account, it can put to difference between designed and real hydraulic regimens. This factor can bring to miscalculation during designing, building and exploitation of hydrotechnical constructs. All that shows the issue urgency of near-critical flows characteristics determination and modelling for practical calculations. The equations for determination main depths (maximum and second conjugated) are given. Besides, the paper gives existence conditions of different types of near-critical flows. An objective of this work is to present the comparison between theoretical and experimental data of free-surface profile of cnoidal waves. The comparison shows good convergence of results.

Keywords: near-critical flows, non-hydrostatics, differential equations, laboratory researches

Przesłano do redakcji: 24.03.2017 r.

Przyjęto do druku: 28.09.2018 r.

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PROCUREMENTS OF MODERN METHODS OF CONSTRUCTION BASED ON WOOD

In the last years we have witnessed increasingly frequent interest in an individual way of living in family houses. This provides a more natural way of living and living freely in contrast to the impersonal and restrictive living in panel housing estates. On this change largely responded companies offering a variety of system construction and technological solutions. With traditional and proven construction materials, the company also new, modern and fully-fledged alternative housing. One of them is the modern prefabricated structural systems based on wood. Even despite undeniable advantages that are associated with wooden buildings, preventing their more widespread low level of knowledge and awareness on the part of consumers and investors, as well as strong ties to traditional brick technology. An important factor in deciding the most building owners in choosing the construction of wooden houses is a measure of coping and recovery advantages of individual design systems that will mainly be reflected in the costs, quality and speed of construction. For this reason, we have decided to carry out a survey aimed at examining the impact of the procurement method on existing wood buildings in the context of construction time and acquisition costs.

Keywords: modern methods of construction, wood, construction costs, construction time

Przesłano do redakcji: 24.09.2017 r.

Przyjęto do druku: 15.12.2018 r.

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TECHNICAL AND ARCHITECTURAL PROBLEMS IN REVITALISATION OF PREFABRICATED RESIDENTIAL COMPLEXES

The subject of this paper are the issues connected with revitalisation of prefabricated residential complexes built in industrial technology. The article focuses on modernisation of prefabricated residential complexes in terms of architectural and technical issues of the buildings. The reason for this is the fact that there is a systematic improvement in the quality of housing environment and attractiveness of housing areas and also the issue of revitalisation should be popularized. Popularizing this subject in Poland serves to refute false information that the exploitation of these residential estates is coming to an end. Current research confirmed with the technical expertise on possibilities of further use and an unflagging interest in old 'high-rise housing developments' may be an encouragement for revitalisation works. In this paper the attention is paid to technical issues of the housing developments connected with building defects, exploitation damage, diagnosis and modernisation of the buildings and also the architectural possibilities of new solutions within revitalization. Additionally, the paper presents the results of the survey

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carried out among the residents concerning the architectural aspects of Sadyba residential estate in Warsaw and diagnosis of some problematic issues.

Keywords: revitalization, modernization, thermomodernisation, prefabricated housing estate, technical issues, image

Przesłano do redakcji: 24.07.2018 r.

Przyjęto do druku: 28.12.2018 r.

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SYSTEM OF HEAT SUPPLY 'ad hoc' WITH SOLAR WALL

For the implementation of solar thermal installations it is necessary to optimize energy-efficient external enclosures due to the correct installation and design of these units at different orientations of external walls. Investigated the effectiveness of using solar energy in the conditions of shortage of energy in Ukraine. *Ad hoc* solar wall look at two modes of its operation. Given a variety of graphical, analytical expressions for understanding the operation of the proposed design. Given these changes of the heat carrier temperature solar wall income the amount of the specific instantaneous heat output through time. The article considers the possibility of using experimental models, solar wall under the influence of her unfavourable *ad hoc* factors. It is established that the proposed model is solar wall is quite effective and can be used in solar heating systems.

Keywords: solar wall, temperature, specific heat capacity, a coefficient of performance system

Przesłano do redakcji: 05.10.2017 r.

Przyjęto do druku: 28.12.2018 r.

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SUSTAINABILITY ASSESSMENT OF DESIGNED FAMILY HOUSE ALTERNATIVES WITH APPLICATION OF GREEN TECHNOLOGIES

The paper aimed at an assessment of environmental and energy impacts of designed family house using green technologies. Investigated buildings are located in Kosice region. The analysis investigates the role of applied green technologies in proposed variants of family house from embodied energy and equivalent emissions of CO₂ and SO₂ by using LCA assessment method

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within “cradle to gate” boundaries. The main contribution of the study is underlining that green technologies have significant part in the reduction of the environmental and energy impacts.

Keywords: green technology, green building, sustainability principles to building design, sustainability assessment of buildings

Przesłano do redakcji: 05.10.2017 r.

Przyjęto do druku: 28.12.2018 r.

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RISK ANALYSIS WITH AN APPLICATION TO LOCAL ROAD INFRASTRUCTURE

The paper presents the concept of the risk evaluation for road infrastructure exposed to natural hazards – floods and landslides. Floods and surface mass movements impose a serious threat to the contemporary activities and people’s lives in modern economy. The natural meteorological and hydrological phenomena are main causes of a landslide activation. Typically, heavy or prolonged rain is combined with the progressive flooding. In river valleys, an increased lateral erosion of rivers and rapid snow melting in early spring would also lead to flood events. In Poland, the Carpathian regions are mostly predisposed to the formation of landslides. This may be favoured by the nature of shapes associated with high and steeply sloping slopes of the valleys and flysch geological structure. The paper presents the general characteristics of precipitation in Poland and the concept of a risk assessment with risk matrix. The issue is illustrated by an exemplary detailed risk matrix for a selected section of the road infrastructure in Subcarpathian province.

Keywords: natural hazard, road, flood, landslide, risk matrix

Przesłano do redakcji: 24.11.2018 r.

Przyjęto do druku: 28.12.2018 r.

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ANALYSIS OF THE INFLUENCE OF SLIP IN BOLTED JOINTS ON GLOBAL STRUCTURAL DEFORMATIONS

Shear connections of bearing type are one of the most commonly used types of bolted connections. This type of connection effectively transfers the load, when there is no gap between the bolt and the connected elements, the elimination of slack is often associated with a slipping. Neglecting the slip in a non-preloaded connection is a design error, which in some cases might lead to structural damage. The study presents the ways of taking into account the slip in connection in the analysis of the structure. The authors discuss the analytical approach based on the Fontviolant formula and the numerical approach in which software supporting the design of building structures is used. The aim of the study is to determine the influence of slip in non-preloaded bolts on the deflection of truss structures. The basis for the conducted analyses was the damage to a conveyor that was subject to major deformations as a result of excessive slip in incorrectly designed bolted connections. Theoretical analyses were carried out for flat trusses and they were expanded to cover the most commonly used types of trusses. The paper discusses the difficulties, pointing, among others, to random parameters that affect the capacity of the connection. The obtained results confirm that it is necessary to take into account the slip and its significant influence on the value of structural deflection. They also provide a set of results that can be used as initial reference for the slip calculation. Especially, the influence of slip in non-preloaded overlap bolted connections on the global deformations of the structure.

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Keywords: slip of bolted connections, deflections of the structure, bar model, numerical analysis

Przesłano do redakcji: 24.10.2018 r.

Przyjęto do druku: 28.12.2018 r.

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CRISIS PHENOMENA IN “CITY-DISTRICT”

Crisis phenomena occur in the majority of settlement units regardless of location, size, social structure and other significant factors influencing the quality of life and correctness of urban processes. This paper is an attempt to present relations of social problems and urban layout and genesis of the spatial structure of the selected small town. Unit selected for analyses – Poniatowa town, characterizes with specific layout and time of founding – this is a town founded “in cruda radice” during the construction of structures of the Central Industrial Region (Polish: Centralny Okręg Przemysłowy, abbreviated COP) built on the basis of residential development for nearby industrial plants associated with military production.

Keywords: city-district, multi-family development, Poniatowa

Przesłano do redakcji: 24.11.2018 r.

Przyjęto do druku: 28.12.2018 r.

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APPLICATION OF AN INTERFACE DAMAGE MODEL TO STEEL REINFORCED CONCRETE: A STUDY OF THE SIZE EFFECT

Influence of the size of steel reinforcement of a concrete structure on crack initiation at the interface between the steel fibre and the concrete body of the structure is under consideration. Numerical analysis is provided using a quasi-static delamination model for interface rupture based on an energetic approach using a cohesive zone model for providing the interface stress-strain relation. The obtained results confirm expected dependence of the critical load which causes triggering of the interface crack on a structure dimension parameter.

Keywords: interface crack, damage evolution, quasi-static delamination, critical load, crack mode

Przesłano do redakcji: 24.03.2017 r.

Przyjęto do druku: 28.12.2018 r.

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CONCRETE NANOMODIFICATION WITH SELECTED NANOPARTICLES

The aim of the paper is to present the state of the art and technology in the field of concrete nanomodification. This new approach to the design and manufacture of materials by modifying their microstructure at the nanometric level is increasingly used also in the case of concrete. Owing to C-S-H phase changes concrete porosity and permeability can be reduced, which increases concrete durability. The improvement of concrete properties and the possibility of the manufacture of new building materials are the most important benefits of the impact of nanotechnology on construction. The paper describes the most commonly used nanoparticles in concrete technology, including nano-SiO₂, nano-TiO₂, nano-Fe₂O₃, Fe₃O₄.

Keywords: nanotechnology, nanomaterials, nanoconcrete, nanopowders, nanopowders

Przesłano do redakcji: 24.11.2018 r.

Przyjęto do druku: 28.12.2018 r.

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ANALYSIS OF THE RESULTS OF THE DESIGN PROCESS PERFORMED ON THE HISTORIC ARCHITECTURAL STRUCTURE BASED ON THE EXAMPLE OF THE EXTENSION OF HISTORICAL DIDACTIC COMPLEX IN RZESZÓW

The article analyses the issue of the extension of the historical architectural didactic complex in Poland. The conditions of the building before the design process was described and the adopted design solutions were analyzed. Design works allowed to arrange form of facades. The results of the work is an additional didactic and administrative space. The article analyses the results of cooperation between local delegation of Regional Office of Protection of Historical Monuments and the architect, which allowed to extend the possibilities of historical use of the object in combination with the newly design part.

Keywords: historical architectural complex, architectural expansion, design in historical architectural structure

Przesłano do redakcji: 15.12.2018 r.

Przyjęto do druku: 28.12.2018 r.

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THE POSSIBILITIES FOR IMPLEMENTING RAINWATER MANAGEMENT MEASURES IN TUKE CAMPUS

All of the buildings in TUKE campus are connected on water main as only one source of water. There is no building with alternative source of water for non-potable uses so that potable water is used for drinking purposes as well as all others activities (flushing toilets, cleaning...). Drainage solutions of the TUKE campus are in traditional way too. The buildings situated in TUKE campus have a classical drainage system for rainwater runoff consist from traditional direct channelling of surface water through networks of pipes to sewer system except two buildings - PK6 and PK5 which have a drainage system for rainwater runoff designed through the infiltration facilities – infiltration shafts. This paper describe a big potential savings of potable water by the use of rainwater in TUKE campus as well as the big potential for “green” drainage solution – infiltration in TUKE campus.

Keywords: drainage, infiltration, rainwater harvesting, savings

Przestano do redakcji: 10.11.2017 r.

Przyjęto do druku: 28.12.2018 r.

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