

STRESZCZENIE

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THE INFLUENCE OF ARTIFICIAL RESINS
ON WATER RESISTANCE OF GYPSUM MATERIALS

The thesis presents the results of laboratory research concerning the influence of combined silicon and epoxy resin supplements on hydrophobic and water resistance features of gypsum materials. For comparative reasons, the first stage concerns the influence of singular modifying preparations. It has been proved that both silicon and epoxy resins introduced to gypsum compositions separately have advantageous influence on hydrophobic and water resistance features of modified gypsum materials. However, they do not protect these materials against destructive water effects. The second stage of the research concerned introducing two preparations that have different modifying characteristics simultaneously. The results prove that this research direction is justified and it allows to obtain gypsum materials with increased hydrophobic and water resistance features, which can be used in higher humidity places.

KEYWORDS: gypsum material, hydrophobia, water resistance

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CURRENT ISSUES OF CIVIL AND ENVIRONMENTAL ENGINEERING, IN SINGAPORE AND AUSTRALIA

In recent time, while time is running very fast, there have been lots of constructions, are being built in everywhere. Especially, Changi Airport Terminal 3, opened its doors in the beginning of 2008. It is not a huge structure to house huge spaces, but also it is an environmental issue of today. Singapore Flyer, the sister of London Eye with a height of 135m., from a height of 165m. says welcome to the new arrivals to Singapore from Changi. In Little India, the La Salle Art School, shines also during the night time while going to Esplanade, but never reachable on time. There are several high rises residential in Singapore, Little India, besides the official skyscrapers in city center.

In Australia, Surfers Paradise is full with skyscrapers as residential for summer times. The airport in Brisbane welcomes to the passengers from Singapore, and makes them go to Sydney. The city pattern of Sydney is a real copy of London, with Hyde Park, and street names around. First stop is at Sydney Opera House, surely. Its architectural and structural solution, coming from a period 1957 and 1973, is still unique in the world. From inside of the Sydney Opera House towards Harbour Bridge during night time, gives enough idea what the Harbour Bridge looks like. Towards Darling Harbour, along the streets, a lot of skyscrapers take place as offices. Around Darling Harbour, the new environmental development, named King Street Wharf, announces about lots of addresses for eating during the day, defining the new name of enjoyment in Sydney. The convention center in Darling Harbour is ready for every exhibition. And the shopping center, nearby the convention center and the sea museum at the next side of the wooden bridge for monorail connection serve for the happiness of the people in Sydney. The New South Wales Museum, just across the Royal Botanical Gardens, is a great chance to meet with talented Australian artists and their products under a huge construction.

In the paper, the flow about the current issues of civil and environmental engineering in Singapore and Australia will be defined with their architectural and structural explanations.

KEYWORDS: Singapore Changi Airport Terminal 3, Singapore Flyer, London Eye, La Salle Art School in Singapore, Esplanade, Surfers Paradise, Brisbane Airport, Sydney Airport, Sydney Opera House, Hyde Park in Sydney, Harbour Bridge, Darling Harbour, King Street Development in Darling Harbour, the New South Wales Museum

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INFLUENCE OF CONCRETE ADMIXTURES ON LOWERING THE CONCRETE MIX FREEZING POINT

The paper presents the 'anti-freezing' action of admixtures in the light of their influence on lowering the freezing point of fresh concrete. There have been presented the results of freezing point tests for selected admixtures to concrete mix in commercial concentrations, reduced to the concentrations applicable in dosing to a regular con-

crete mix, as well as the results of tests of the concrete mix with the use of the said admixtures. The results of the tests should be helpful in understanding which admixtures better support the protection of concrete that sets in low temperature conditions, and in particular – why the application of admixtures does not enable the abandoning of other protective activities at the early stage of concrete setting in minus temperatures.

KEYWORDS: concrete, concrete admixtures, freezing point, concrete casting in winter, concrete curing

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RESEARCH OF REINFORCED-CONCRETE BEAMS DEFORMATIONS, RENEWED AFTER THE INFLUENCE OF AGGRESSIVE ENVIRONMENT

The article presents the experimental and theoretical research of reinforced-concrete beams deformations, damaged in the conditions of simultaneous influence of aggressive environment and loading with their further renewal. The peculiarity of this research is that during influence of aggressive environment reinforced-concrete beams were tested both under the action of loading and without it. The influence of aggressive environment and renewal took place in the conditions of the operating loading on the reinforced-concrete beams. Such a combination of influences allows to define the optimal method of research of the renewal process in reinforced-concrete structures and the influence of loading, at which the strengthening takes place on the efficiency of renewal and deformations of experimental samples. The experimental and theoretical values of deformations of reinforced-concrete beams which were renewed without loading and under the operating loading are obtained. Their comparison is carried out with the purpose of determining the optimal method of research of such structures.

KEYWORDS: reinforced-concrete, corrosion, renewal, simultaneous influence, stress-strain state, deformations.

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SEVERAL DEFINITIONS OF ZERO-ENERGY BUILDINGS DEPENDING ON CALCULATION PROCEDURE AND BOUNDARY CONDITIONS

Depending on the country, geographic situation, weather conditions, measuring, there are different definitions of zero-emission or zero-energy buildings. First there must be decided if the building is on the grid or not. Afterwards, guided by the calculation, the on-the-grid buildings can be divided in four groups: net zero site energy use, net zero source energy use, net-zero energy cost, net zero energy emissions. With every definition, you have some specific systems, also depending on different boundary conditions. Every building needs to have his own monitoring system so they can see if they are a zero-energy building or not. Belgium and Poland are the two countries which we compared. They are not so similar on the used systems for renewable energy. Mostly, it depends on what the government advice, what they're giving their support to. Still, in the end, the user makes the choice.

KEYWORDS: zero-energy, building, definition, monitoring

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EVALUATION OF REINFORCEMENT BONDING IN FOAM CONCRETE

The presented study is devoted to experimental research of the reinforcing bar and foam concrete bonding phenomenon and the estimation of its durability. It is set that the reason of early destruction of the reinforced foam concrete beam structures is the inefficient reinforcing bar and foam concrete bonding. The authors present a method of calculation of bonding stresses on the edge of bar contact with the array of foam concrete, which are

defined from the condition of the accepted rectangular distribution diagram of stresses on the length of anchoring. Two types of diagrams are made for usage within the offered engineering method of calculation of bonding strength of both smooth and ribbed reinforcement with foam concrete of different density. The way of improvement in safety of the reinforced foam concrete constructions is specified through the use of anchors.

KEYWORDS: foam concrete constructions, reinforcement bonding, bonding strength, anchoring.

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MODIFICATION OF EPOXY MORTARS BY A PET HYDROLYSATE

This paper describes a method of obtaining as well as selected properties of epoxy mortars. The addition of poly (ethylene terephthalate) hydrolysate (PET) as a modifier of epoxy resins (EP) resulted in an improvement in selected properties of the mortars in comparison with the properties of mortars based on unmodified resins. The application of PET waste materials in the modification of polymeric binders in mortars is also advantageous for economical and ecological reasons.

KEYWORDS: polymer mortars, epoxy resins, recycling, PET hydrolysate, chemical modification

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PROBABILISTIC MODELING OF TIMBER MEMBERS

Safety assessments of structures built in the past require taking into consideration many different parameters. These parameters are mostly random and describe materials characteristics, actions and history of actions. The load bearing capacity of timber structures decreases with time. It depends on the type of load and timber. Strength reduction effects, referred to as creep-rupture effects, due to long term loading at high stress ratio levels are known for many materials. Timber materials are highly affected by this reduction in strength with duration of load. Characteristic values of load duration and load duration factors will be calibrated by means of using probabilistic methods. Three damage accumulation models will be considered, that is Gerhards model, Barret & Foschi's and Foschi & Yao's model. The reliability will be estimated by means of using representative short- and long-term limit states. Time variant reliability aspects will be taken into account using a simple representative limit state with time variant strength and simulation of whole life time load processes. Non-destructive laboratory tests of timber strength will be applied to update the level of safety. The Bayes theory and methodology will be applied to calculate the aposteriori level of timber members parameters and safety.

KEYWORDS: timber structures, creep rupture effects, safety factors, reliability.

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ANALYSIS OF BONDED CONNECTION FOR HYBRID STEEL-GLASS BEAM

In the last few years, due to the intensive progress and research in the field of glass structures, mechanical properties of glass have been distinctively improved and possibilities of use glass for a load carrying elements are now advanced. Different types of hybrid constructions, consisting of glass and other material, are analyzed or even newly developed focusing on an optimal structural interaction between both materials. The new hybrid steel-glass beam consists of steel flanges, glass web and bonded connection between them. A key aspect of this development is the selection of the suitable adhesive. Different types of adhesive with a different mechanical and deformation properties were chosen for the instant small-scale tests. Clear idea of the behavior of the adhesive layer and knowledge of the shear and tension strength of whole connection, are the first steps, needed to be done to successful modeling and investigation of the whole hybrid steel-glass beam under increasing load.

KEYWORDS: hybrid, steel-glass beam, glued connection, adhesive, material properties, analytical model, FE modelling

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COAL FLY ASH PROCESSING FOR ITS UTILIZATION IN BUILDING MATERIALS PREPARING

The fly ash from coal combustion processes is a waste very attractive for recycling in the building materials preparing. Presently, a small portion of coal burning products is being utilized for this purpose in Slovakia. Aimed at a wider recycling and exploitation of coal fly ash as siliceous and aluminous substance in the building materials production, the pre-treatment of fly ashes is designed for their quality improvement. This paper presents the results of mechanical and chemical activation of coal fly ash regarding the utilization in concrete and cements production. The investigation of physico-mechanical properties of concrete specimens based on mechanically and/or chemically activated coal fly ash as a partial cement replacement (25 wt. %) after 28- and 90 days of hardening showed that the addition of the coal fly ash activated under optimal conditions improves the compressive strength of these composites in comparison to concrete with non treated coal fly ash.

KEYWORDS: coal fly ash, utilization, mechanical and chemical activation, concrete

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PHOTOVOLTAIC SYSTEMS IN SLOVAKIA

The current energetic crisis, which affect Europe and Slovakia, evoked amount of serious questions concerning the dependence on fossil fuels and the possibility of their replacement by alternative energy sources in the future. One from the potential alternative source is solar energy and its immediate conversion to electricity by using photovoltaic cells.

Nowadays, Slovakia finds its position at the end of various tables pointing to the installed capacity of photovoltaic panels in the European Union.

Article describes a brief overview of photovoltaic development in the world and suggests potential uses in the future. Article is directly related with building up a center of excellence for renewable energy sources and related progressive indoor technology, which is involved with Faculty of Civil Engineering, Technical University of Košice. One from the several objectives resolving in this project is the transformation of solar energy into electrical energy through photovoltaic cells. Part of the thesis is intended to compare legislative and economical conditions in Slovakia and abroad.

KEYWORDS: photovoltaic cells, energy, solar, building.

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THE PROPERTIES OF CEMENT CONCRETES MODIFIED WITH SUPERPLASTICIZERS

The properties of grouts, mortars and concrete mixtures with four different superplasticizers have been investigated. We determined the plasticizing and setting time of cement, the plasticizing and shrinkage of mortars, the consistency change of concrete mixtures as a function of time using the slump and flow tests, and the compressive strength and water absorption of cement concrete. The investigations carried out show the significant impact of superplasticizers on the plasticizing of cement grouts and on the shortening of their setting time. The shrinkage of mortars depends on the type of superplasticizer. Furthermore, the consistency change as a function of time depends on the type of superplasticizer and indicates the possibilities of lengthening the time of workability maintenance of mixtures with those superplasticizers. The linear relationship was found between the values of the slump loss and the slump flow as a function of time. The superplasticizers used significantly lower the water absorption of concrete and increase the quality of those concretes by 1-2 classes as compared with the concrete without admixture. The investigations into cement concrete with superplasticizer indicate the possibilities of regulation of concrete mixtures consistency and selecting the adequate mean of transportation and placing, as well as some cement savings.

KEYWORDS: superplasticizer, paste mortar, concrete mixture, slump loss, flow test, concrete

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OPTIMIZATION OF NATURAL ILLUMINATION AND THE SAVINGS OF ENERGY OF EDUCATIONAL ROOMS CONCERNING RECONSTRUCTION OF NATIONAL UNIVERSITY „LVIV POLYTECHNIC” BUILDINGS

A problem of windows reconstruction, that necessary to do with observance of operating normative requirements became actual. Low level of resistance of air permeability is conducted to significant periodic and non-uniform receipt in a premise cold and warm air during a year. However, high level of natural illumination without engineering means of regulation creates light discomfort in the rooms.

There is possible to reach optimization of conditions of natural illumination and the saving of energy in educational rooms due to rational reduction of windows size.

KEYWORDS: illumination, temperature, microclimatic aspect, thermal resistance, comfort

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APPLICATION OF ALTERNATIVE FUELS FOR CEMENT PRODUCTION

In this publication a possibility of thermal utilization of alternative fuels in cement industry is presented. The replacement of natural fuels with secondary materials in the process of organized waste recycling is the most significant step in this direction. One should emphasize the concept of "organized recycling", i.e. executed consciously and above all with the earliest possible segregation of initial secondary materials. Such segregation must not only lead to separate of different materials, but should also be applied to secondary materials for the production of alternative fuels. Only then it will be efficient as regards both environmental protection and economics. The goal of lowering production costs is one of two main factors stimulating activities aimed at replacing the natural fuel used in the cement production process with alternative fuels obtained from combustible wastes. The second factor is environmental protection, for instead of undergoing potentially hazardous storage; wastes can be duly treated and rendered harmless in a useful way, with the total consumption of their energy. Cement kilns, in which combustion processes reach temperatures up to 2000°C, are one of the several industrial installations ensuring the effective and environmentally friendly combustion of alternative fuels.

KEYWORDS: alternative fuel, combustible wastes, thermal utilization, cement kiln

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THE DURABILITY PREDICTION OF DETERIORATING REINFORCED CONCRETE MEMBERS

The features of durability prediction and concepts of time-dependent reliability analysis of deteriorating reinforced concrete structures subjected to extreme gravity and lateral actions as rectangular pulse renewal processes are discussed. New methodological approaches to a time-dependent survival probability analysis and durability prediction of reinforced concrete members are considered. The safety margin of particular members is modeled as a random finite sequence. The effect of coincident recurrent extreme actions on their survival probabilities is analyzed. The instantaneous and long-term survival probabilities of particular and structural members of deteriorating structures are considered. It is recommended to calculate these probabilities by the unsophisticated analytical method of transformed conditional probabilities. The technical service life as a quantitative durability parameter of deteriorating structural members is studied.

KEYWORDS: survival probability, probabilistic durability, technical service life.

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OPTIMIZATION OF PROPERTIES OF CLAY SOLUTIONS ON THE BASIS OF THE UKRAINIAN BENTONITES

The article is devoted to the development of Ukrainian bentonites use technology at no-dig lying of engineering communications by a horizontal-directed boring method, via special solutions upgrading and laying technology designing. As a result of implementation of experimental research experimentally-statistical models are got. These models characterize influence of the varied factors on the technological rates of the special solutions on the basis of the Ukrainian bentonites: density of clay solutions, filtration-loss quality, and thickness of clay filter cake, viscosity, and yield point. The analysis of technological properties of such solutions modified by chemical additions is carried out. On results of experimental research the choice of optimum compositions of the special solutions on the basis of the Ukrainian bentonites is carried out. A mathematical modeling was used for this purpose.

KEYWORDS: Ukrainian bentonites, horizontal directional drilling, optimization.

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EFFECTIVENESS OF COMPLEX MODIFICATORS IN CONCRETE

The paper is devoted to obtain high performance concrete with complex modifiers and investigation of its exploitative properties. It was shown, that improved characteristic of concrete are achieved by optimal granulometric composition of fine, coarse aggregates and complex modifiers plastifying and accelerating on the basis of sulphonafthalinphormaldegides, polycarboxylates and highly soluble electrolytes, such as sodium tiosulfate and rodanide. The optimal compositions of complex modifiers due synergic action of their ingredients allowed to obtain concrete with improved properties durability and provided efficiency in monolithic building.

KEYWORDS: concretes, complex modifier, polycarboxylate, high strength, flowability, durability

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DRY BUILDING MIXTURES ON THE BASIS OF GYPSUM-FREE PORTLAND CEMENT

In this publication theoretical principles for obtaining gypsum-free Portland cement (GFPC) modified by organic-mineral additives were investigated. Gypsum-free Portland cement was improved by rational selection of the chemical additives which act as hardening accelerators, plasticizers and setting retarders. The hydration and structure formation processes as well as building-technical properties and running ability were established. The influence of alkaline metals carbonates as hardening accelerators on pH of a liquid phase, hydration degree in the alkaline systems as well as features of plasticizers action in constitution complex chemical additives were investigated. The possibility of speed regulation of GFPC early structure formation by introduction setting retarders which are replacing the effects of gypsum was determined. There were investigated the characteristics of the phase structure and microstructure of the artificial cement stone on the basis of gypsum-free Portland cement modified by the complex chemical additives and fine-dyspersated lime stone. Early structure formation is characterized by hydroaluminate hardening type with formation of metastable carbonate replaced by AF_{τ} -phase followed by structurally active hexagonal AF_m -phase $C_4A \cdot CO_2 \cdot 11H_2O$.

KEYWORDS: gypsum-free Portland cement, dry building mixtures, organic-mineral additives, rapid-hardening.

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MAIN GOAL - HOW TO ACHIEVE A ZERO-ENERGY BUILDING

A net zero building energy or zero energy building (ZEB) is an overall term applied to a residential or commercial building with zero net energy consumption and/or zero carbon emissions annually. It has greatly reduced energy needs so that the remaining energy need can be supplied with renewable technologies on- or off-site, depending on the definition. In this paper is a short sketch of the energy-use of buildings present followed by why zero energy building is a solution to the energy problem with advantages and potential disadvantages. It's divided in two bigger parts: reducing the energy needed, and generating energy from renewable resources. The later gives a short list of possible techniques to generate energy. In chapter four are some guidelines to select materials to construct the building. The focus there is on sustainable materials.

KEYWORDS: zero-energy, building, method, energy efficiency

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BUILDING ENVIRONMENTAL ASSESSMENT - SITE SELECTION AND PROJECT MANAGEMENT

Building environmental assessment is a specific process oriented to systematic, comprehensive and integrated evaluation of building performance. These processes lead to design, construction and operation of buildings with respect to criteria of sustainable development. Building environmental assessment is not only tool of control, but also tool of sustainable building design. The building environmental assessment systems deal with site selection criteria, the efficient use of energy and water resources during building operations, waste management during construction and operations, indoor environmental quality, demands for transportation services, and the selection of environmentally preferable materials. The Slovak building environmental assessment system was processed. The fields and indicators are proposed on the base of available experiences database analysis from environmental performance of buildings. The field site selection and project management will be introduced in the paper. Also the proposal and verify of this field will be presented for selected office building.

KEYWORDS: site selection, project management, building environmental assessment

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METHODS FOR THE DETERMINATION OF THE MODULUS OF ELASTICITY OF COMPOSITE MATERIALS USED IN A PAVEMENT STRUCTURE

Road building materials are exposed to forces caused by traffic load, climatic influences, but above all to air temperature changes and moisture. These effects manifest themselves in the cyclic changes in a pavement structure and its sub-grade. Force effects induce complicated stress and strain condition in individual pavement layers. The strain of various materials caused by the same load is different and depends on their deformation characteristics. The deformation characteristics of road building materials are important inputs in the project and design of a road pavement structure. More demanding requirements on materials as well as ecological considerations regarding the utilization of materials in construction, and other issues, require more research and the creation of new materials with outstanding and more suitable physical properties than those offered by the current materials. One of the major research results is the discovery of modern materials called composites. The geometrical and physical structure of the composite material influences its overall characteristics. The analytical modelling of the particle components of composites, the so-called quasi-homogenous and quasi-isotropic models of compact materials, enables to assume and define these characteristics.

KEYWORDS: road building materials, composite materials, pavement, modulus of deformation

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CONFORMITY CONTROL OF CONCRETE STRENGTH BASED ON THE RISK ASSESSMENT

In the conformity control of concrete, different criteria are in use. The current design codes are based on the semi-probabilistic design format. This supposes that a sufficient degree of control exists to assure that a distribution of concrete strength is in accordance with the assumption on which the design procedure is based. In the paper the following aspects of conformity control of concrete strength are covered:

- general concept and types of conformity criteria,
- hazard and risk in conformity control,
- risk-based conformity criteria,
- concept of risk balance between producer and client.

KEYWORDS: conformity control, concrete strength, OC-curves, risk assessment.

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CARE OF THE TECHNICAL STATE AND SAFETY LEVEL OF A BUILDING OBJECT EXEMPLIFIED BY A MULTI - STOREY APARTMENT BUILDING IN RZESZÓW

The article presents the problems of maintaining the usability of the structures erected in the late 80s and early 90s using OWT-75 large panel technology. Its example is a ten- storey department building in one of the housing estates of the Rzeszów Building Cooperative. For a few years the building has been checked by the authors. During that time many defects have successively been found. Their extent and origin have been described, proper remedies suggested and then applied. They ensured a good technical state of the building and enhanced the residents' feeling of safety.

KEYWORDS: large panel building, technical state, repairing, strengthening, safety level, durability
