

Abstracts Vol. 8 No. 1

Anna BERNATOWICZ

The high-tech, computer-based analysis of the fracture mechanics parameters

The use of the parameters of fracture mechanics presents a new way of designing in civil engineering. Traditional laboratory research provides lots of important information connected to cracks and tension – concentration in loaded elements. On the other hand, tests are very time - consuming. Initial calculations by means of computer programmes allow to decrease amount of laboratory tests only to extreme minimum. The paper contains the overview of the most common computer programmes used for the analysis of parameters of fracture mechanics . Moreover, the own model of Brazilian test in computer programme called Robot Structural Analysis was created. The model verification was made in Abaqus CAE. Concrete discs with straight or inclined crack in the middle, which simulates simple – or mixed – tension conditions in concrete element, were used as the subject of the study.

Błażej GAZE, Michał KAMIŃSKI, Agnieszka BIERNACIK, Arkadiusz DYJAKON

Analysis of economic and environmental solutions of heating systems of single-family building in the perspective of legislative changes

In Poland on 1 January 2017 a new legal regulation relating to the technical conditions for new buildings has begun to be obligatory. The paper aim is to analyze buildings designed according to old and new regulations. The study examined examples of three variants of solution of the heating system, domestic hot water and a source of electricity for a typical single-family home. The economic and environmental effects of presented solutions were compared. A simple payback period was determined for each solutions. The advantages and disadvantages of each solution were discussed.

Robert GRYGO, Marta KOSIOR–KAZBERUK

Reinforcing concrete structures with non-metallic composite frp bars

The paper presents the sorts, properties and designing methods for structures with FRP bars. The methods to determine the guaranteed tensile strength and guaranteed modulus of elasticity according to the guidelines for non-metallic reinforcement ACI 440.1R and CSA-S807 were presented, based on the analysis of strength parameters test results of GFRP bars and BFRP bars. As an example, the procedure of calculating the flexural capacity of structure reinforced with FRP bars according to ACI 440.1R was discussed. The results of the mechanical properties tests of GFRP bars and BFRP bars were used for calculation.

Agata JABŁOŃSKA-TRYPUC, Elżbieta WOŁEJKO, Urszula WYDRO, Andrzej BUTAREWICZ

The application of the human cell culture in the studies of pesticides impact on the human organism

In order to provide the food supply for an increasing human population products protecting plants against viral diseases, bacterial, fungal, pests and preparations stimulating their growth and development, known as pesticides, are commonly used. The aim of the paper is to show the way of their actions and the impact they have on the human body at the cellular level. Currently, in vitro cultures of human cell lines are a common model for research in this field. Properly chosen for the experiment cell lines allow for the study of the absorption of various chemicals, including pesticides through the epithelium of the digestive system, respiratory system and skin. They also enable the study of the effects of pesticides on the basic parameters of oxidative stress and the functioning of the endocrine system at the molecular level.

Katarzyna KALINOWSKA-WICHROWSKA

Applying recycling cement binder as an example of CO₂ reduction

The article shows of the scale of present cement production and its influence on carbon dioxide emission in the world and in Poland. In the era of sustainable development policy and EU directives, rightly reducing greenhouse gas emissions (including CO₂), a solution has been proposed that can to some extent contribute to reducing cement consumption by using a properly prepared recycled binder as its replacement. Some own research results were presented on the possibility of using waste concrete material in the form of properly processed cement as partial cement substitute in cement composites. Since large amount of contamination in the industrial secondary binder that could interfere with the homogeneity of the results, it was decided to obtain recycled binder under laboratory conditions. Mineral secondary material was obtained in a multi-stage shredding process prepared for this purpose laboratory samples made of cement paste. The prepared material was analysed for pozzolanic activity. The obtained results show that under the conditions of treatment the recycler binder, the binder can be used successfully as a substitute for cement in cement composites, thus reducing the amount of cement needed and reaching the production process (burning clinker) – reducing CO₂ emissions.

Dorota Anna KRAWCZYK, Antonio RODERO SERRANO, Katarzyna GŁADYSZEWSKA-FIEDORUK

The technical infrastructure details in the old towns in Spain

Historic urban cities in most European countries are a very important evidence of the past life style. The cultural heritage of the last generations should be available to as much people as it is possible to give them information about the national history, art and culture. Nowadays people expectation for indoor climate and technical equipment are much higher than several years ago. It makes buildings' owners to modernize them, but in a case of the historical parts of towns it could be difficult from a technical point of view or the result would reduce the architectural quality of the object. The paper shows the selected examples of technical improvements done in Spain.

Joanna STACHNIEWICZ, Marta KOSIOR-KAZBERUK, Julita KRASSOWSKA

Shear capacity of fibre reinforced concrete beams

The influence of dispersed reinforcement on the shear capacity of reinforced concrete elements was analysed. Three types of steel fibres with different geometries and shapes were selected for the test. The residual flexural strength of concrete with fibres was determined based on the procedure of *fib* Model Code 2010. The residual strength was used in the calculation of the theoretical shear capacity according to two calculation procedures: *fib* Model Code 2010 and RILEM TC 162-TDF. It was found that the property characteristics of steel fibres, such as geometry, as well as the method of surface forming and endings that determine the adhesion of the fibres to the cement matrix, have an influence on the shear capacity of bending element. Applied computational procedures give slightly different results of the shear capacity evaluation calculated using both methods.