

STRESZCZENIA

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TRANSFORMATIONS BETWEEN THE HEIGHT REFERENCE FRAMES: Kronsztadt'60, PL-KRON86-NH, PL-EVRF2007-NH

The State Spatial Reference System in Poland currently includes two height reference frames: the first, PL-KRON86-NH, with the old name Kronsztadt'86, and the second, called PL-EVRF2007-NH, as a Polish implementation of the European Vertical Reference Frame (EVRF), named also NAP (Normal Amsterdams Peil). Kronsztadt'86 was supposed to replace the earlier reference system called Kronsztadt'60, but the intentions were not fully in line with reality. Kronsztadt'60 has been implemented in all geodetic and cartographic elaborations even before the computer era and will probably exist until the use of analogue maps or their duplicates in the form of raster maps. For practical purposes, transformation formulas have been developed between all three reference frames mentioned in the title of work. For this purpose, about 16,000 points of the base height network in the PL-EVRF2007-NH and PL-KRON86-NH were used and more than 7,000 points in the Kronsztadt'60. Transformational formulas were developed in two variants: in the form of polynomials approximated by the least squares method and in the form of an interpolative grid. Basic empirical relationships were implemented among others in the program TRANSPOL v. 2.06 [8], elaborated according to the assumptions of the Head Office of Geodesy and Cartography.

Keywords: height transformations, reference frames, Kronsztadt'60, Kronsztadt'86, Kronsztadt'2006, PL-KRON86-NH, PL-EVRF2007-NH

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PROPERTIES OF PORTLAND-COMPOSITE CEMENTS WITH ZEOLITE TUFF

Growing requirements for protection of the environment every year gradually increase production of cements with a high content of mineral additives and clinker cements should be considered as cements for special purposes. The strong development of a quaternary Portland cement composite system containing blast-furnace slag, zeolite tuff and limestone powder is presented. The composition and particle size distribution of the constituents are optimized by the incremental coefficient of the surface activity of the zeolite-containing Portland composite cements. Zeolite tuff and limestone powder of high specific surface area lead to the increase of the surface activity of the entire system and a corresponding improvement in the performance of the cement. It was shown that low-energy Portland-composite cements "green cements" obtained by separate grinding are characterized by higher early compressive strength. The optimization of Portland-composite cements was carried out and the relationship between the phase composition, microstructure and strength of the cement matrix were investigated. The main role of zeolite is to improve the properties of cement stone by reducing the quantity and size of hydrate calcium hydroxide with increasing of low alkali calcium hydrosilicates. It is shown that a synergistic combination of mineral additives of different groups with substantial

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reduction of high energy-consumption clinker component in the Portland-composite cements allows to improve rheological properties and provides of strength increase of binder.

Keywords: Portland-composite cement, zeolite tuff, particle size distribution, compressive strength, properties

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THE USE OF THERMIONIC EMISSION PHENOMENON AS SUPPORT FOR RENEWABLE ENERGY SOURCES

Energy converters using the phenomenon of thermionic emission to generate electricity and their applications related to renewable energy sources (RES) have been presented. Taking into account new technical solutions, hybrid systems combining thermionic energy converters (TEC) with other energy generators, e.g. with PV cells, the Stirling engine, improving the efficiency of the entire electric energy generating system, have been described. Leading technologies related to thermionic energy conversion and TEC hybrid systems powered by solar radiation have been shown in the tables. The dynamic development of TEC technology in recent years, in our opinion, will contribute to the wider interest of research communities to use the thermionic emission phenomenon to generate electricity.

Keywords: thermionic emission, renewable energy sources, thermionic energy converters, hybrid systems, electric energy

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WASTEWATER CONTROL SYSTEM AS AN ASPECT OF ENVIRONMENTAL ASSESSMENT OF INDUSTRIAL ENTERPRISE'S ACTIVITY

In order to reduce the influence of wastewater from enterprises on the environment extreme relevance is gained by improvement of the monitoring system at each stage of technological process. A new tool is calculation of the polluting substances concentration is suggested to be entered into the monitoring system on the basis of determination of material balance of technological process of production that will allow prediction of qualitative and quantitative composition of sewage for the selected period. The system can be used in any enterprise, but the example with all calculations is given for the Mykolaiv Branch of "SUN InBev Ukraine" which became the object of research. The scope of the study covered the process of wastewater formation of the enterprise. Realization of tasks demanded the use of general scientific methods: analysis, synthesis, systematization and generalization in the course of studying of the corresponding literature on the research subject; modelling, formalization, comparison – at drawing up the

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calculation scheme of concentration of the polluting substances in sewage; supervision - during studying the technological scheme of production; and also methods of mathematical data processing in MS Excel.

Keywords: wastewater, pollutants, material balance, environmental management

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PROPERTIES OF COMPOSITES INCORPORATING CELLULOSIC FIBERS

Nowadays, with the understanding of the importance of the green building concept, there is a constantly increasing demand for ecological construction materials. The application of raw materials from renewable sources such as wood, plants and waste to building materials preparing has gained a significant interest in this research area. With the consideration of environmental consciousness, natural fibers are biodegradable so as they can alleviate the problem of massive solid waste produced and relief the pressure of landfills, they are used for replacing other non-degradable materials for product development.

In this experimental work, wood pulp and recycled waste paper fibers in addition 0.2%, 0.3% and 0.5% were used. The fiber cement composites were subjected to a characterization of their composition including the assessment of a complex set of basic physical and mechanical properties after 7 and 28 days of hardening. Experimental results show that application of small amount of cellulosic fibers lead to a reduction of density up to 6% when compared with the reference composite. However, cement composites based on wood pulp showed better mechanical properties such as compressive and flexural strength in comparison with cement composites with recycled waste paper fibers.

Keywords: cellulosic fibers, building material, fiber cement composite, density, mechanical properties

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THE INFLUENCE OF HEAT SOURCE LOCATION ON SURFACE TEMPERATURE DISTRIBUTION OF THE INDOOR SIDE OF EXTERNAL WALLS IN AN UNINSULATED APARTMENT IN WARSAW DURING THE HEATING SEASON

This article presents the influence of the heat source location to surface temperature distribution of the indoor side of external walls in an uninsulated apartment in Warsaw during the heating period. The apartment is located in a multi-family residential building. This building has never been thermomodernized and therefore it is highly energy-consuming. In 2016, an air-to-air heat pump was installed in the apartment and replaced the existing heat source, a dual-function gas boiler. The device is used both for heating the apartment during the heating period and cooling it during the summer. Such system works particularly well in non-

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insulated objects, in which the partition's internal surface temperature changes dynamically as the outside temperature changes. This article describes the results of the thermovision test of the walls of this flat. The surface internal temperature distribution on the selected three walls was examined under different atmospheric conditions while maintaining similar internal conditions.

Keywords: air-to-air heat pump, uninsulated building, thermovision, alternative heating system, walls

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COMPARISON ANALYSIS OF THE THEORETICAL AND FORECASTED VALUES OF MINING TERRAIN CURVATURES WITH REFERENCE TO THEIR VALUES CAUSED BY MULTI-DEPOSIT EXPLOITATION CONDUCTED AT THE GREAT DEPTH

In this article were presented the results of comparison analysis of mining terrain curvatures values, which were caused by a multiple exploitation of hard coal in several coal beds numbered 338/2, 341 and 358/1. The curvatures values (observed on the measuring line) were compared with their theoretical values calculated on the base of subsidence forecasted by the use of the Białek's formula (with the values of its parameters determined from the survey results) and with the curvatures values modeled with this formula directly. On the base of this comparison, there was made an evaluation of effectiveness of made forecasts and conducted theoretical calculations. Taking into account the values of correlation coefficients and standard deviations between the 'measured' and theoretical, and forecasted graphs of curvatures, it was defined which graphs fit better to the real results of geodesic measurements. It should be marked that an exploitation of three coal beds was conducted by the longwall system with the roof rocks falling into the post-exploitation emptiness, at a great depth amounts from 600 m (the 338/2 coal bed) to 1,000 m (the 358/1 coal bed). The influences coming from the exploitation of these coal beds were observed within 10 years on 53 points of measuring line, which was located above the middle of the B-2 longwall in the 338/2 coal bed and parallel to the runs of excavations in this coal bed. The surveys of the points heights and distances between the measuring points were done in the three- and four-monthly cycles. Based on these measurements, the values of mining terrain curvatures were designated.

Keywords: multi-seams extraction; exploitation at the large depth; observed, theoretical and forecasted curvatures of mining terrain; J. Białek's formula

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ACIDS IN BITUMEN EMULSIONS

In the article there is proved the possibility of using ortho-phosphoric acid with special emulsifiers instead of hydrochloric acid – for the production of road cationic slow-setting bitumen emulsions. There is ascertained the difference between used for bitumen emulsions distilled binder (Nybit E85 bitumen), produced from heavy crude oil, and oxidized bitumens (grade 70/100 bitumen produced by JSC Mozyr Refinery and grade BND 60/90 bitumen of JSC UkrTatNafta), produced from light crude oil. The difference is analyzed between physical-mechanical indices of distilled and oxidized bitumens. Eight bitumen emulsion formulations were developed based on usage hydrochloric acid, three bitumens and three emulsifiers (Redicote E-11, Redicote 404 and Redicote E-4875), as well as four formulations based on usage of ortho-phosphoric acid, two bitumens and

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two emulsifiers (Redicote EM44 and Redicote C-320). There was investigated the influence of hydrochloric and ortho-phosphoric acids upon the physical-technical indices of road cationic slow-setting bitumen emulsions and the difference was ascertained between the indices of bitumen emulsions based on distilled and oxidized bitumens. Bitumen emulsion formulations were developed based on usage of ortho-phosphoric acid and special emulsifiers for the class of cationic slow-setting emulsions for slurry seal and microsurfacing mixtures.

Keywords: bitumen emulsion, hydrochloric and ortho-phosphoric acids, slurry seal and microsurfacing mixtures

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COMPARATIVE ANALYSIS OF SELECTED METHODS FOR SEATING OF MACHINES USING FOUNDATION BOLTED JOINTS

Finite element modelling of elements connected in foundation bolted joints applied in the case of seating of heavy machines or devices is presented. The study is focused on joints made with the use of three different types of chocks: a steel chock, a polymer chock and a polymer-steel chock. Stiffness characteristics of the joined elements for the adopted models of the foundation bolted joint at the assembly stage are described and compared. Conclusions of paramount importance to the engineering practice are created.

Keywords: seating of machines, foundation bolted joint, foundation chock, finite element method

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ANCHORAGE SYSTEMS IN FRP – STRENGTHENED REINFORCED CONCRETE

The main aim of this article was to present recently evolved methods of strengthening flexural reinforced concrete beams, as well as the concrete-anchorage system bond strength problems in composites that were either surface mounted or inserted in the pre-cut grooves in the concrete cover. The focus is on the beams strengthened with the carbon FRP (CFRP – carbon fiber reinforced polymer) composites to show the basic advantages and drawbacks associated with their installation and bond performance. Domestic and foreign experiments investigating the EBR and NSMR strengthening systems were discussed to show their efficacy, common failure modes and the factors initiating the debonding process. Debonding problems and solutions to those problems were illustrated using the example of a composite material attached to the outer surface of concrete in the shear zone of reinforced concrete beams. The article provides guidelines for checking the anchorage capacity for the existing longitudinal reinforcement with the simultaneous action of bending moment and shear force in the support zone of the reinforced concrete beam.

Keywords: reinforcing, strengthening, FRP, anchorage systems, failure modes

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MODERNIST PARTY HOUSE IN ZIELONA GÓRA. ARCHITECTURE TO BE DISCOVERED

According to the tendency that was observed at the turn of the 1940s and 1950s, each provincial town, including Zielona Góra, was to be expanded. At that time in every area of social life, including architecture, there was a fixed set of values and symbols. Urban planning and architecture were to be adapted to the propaganda needs of the new social-political formation. A decision was made to build an elegant building, the seat of the Provincial Committee of the Polish United Workers' Party. The Central Office for Architectural and Construction Projects was entrusted with the project. The team headed by Mikołaj Kokozow designed a building reflecting the tradition of interwar architecture that linked constructivism and so called quasi-classicist modernism. The building at 23 Bohaterów Westerplatte Street in Zielona Góra is an example of socialist realism, which was a dominant style in Polish architecture in the years 1949-1956. The former Party House was designed in quasi-classicist style, decorated with quasi-historical detail. The building has a permanent position in the cultural landscape of Zielona Góra, being part of post-war history and an important element of the continuity of the cultural heritage and history of the town.

Keywords: history of architecture, modernism, social realism, monument

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ANALYSIS OF SLOPE STABILITY USING CONVENTIONAL METHODS

The paper deals with the assessment of slope stability on the road II / 595 near the village Zlatno. The assessment of slope stability was made before and after the landslide caused by floods in 2010. For proposal for a comprehensive assessment and possible remedial action is necessary to know the geological conditions and choose the appropriate method to assess slope stability. The calculation of factor of safety was made using GEO 5 software. The critical factors of safety have been determined by Petterson, Bishop and Sarma Methods. We analyzed possibilities to using these methods for assessment of slope stability. The Sarma Method is more appropriate for this calculation.

Keywords: assessment of slope stability, landslide, factor of safety, road

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NUMERICAL VERIFICATION OF DAMAGE LOCALIZATION METHOD BASED ON MOVING MASS IN TRUSS STRUCTURES

The article presents examples of damage localization in numerical models of trusses based on changes in natural frequency. The changes were caused by an additional mass moving on the truss nodes. The results of the localization in several truss bars (top chord, bottom chord, diagonal bars, posts) are presented. The influence of damage size on the localization effectiveness is shown. The differential operator was used in the analyses.

Keywords: civil engineering, truss, damage, modal analysis

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