

## Summaries

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ANNA ASANI

**Lubuskie Section of the Oder — Technical Condition of Left Oder River Embankment at km 432,60–442,80** • Kwartalnik Górnictwo i Geoinżynieria • z. 2, 2011

This article presents the results of the technical condition study of the embankments located on the left bank of the Oder river, at 432.60÷442.80 km river section. It is a second class embankment, a length of 12.0 kilometres, which protects the following towns: Nowa Sól (Pleszów), Koserz, Modrzyca, Otyń and Bobrowniki together with adjacent areas of agricultural crops. The scope of works was consistent with the standards and included: fieldwork (stocktaking, probing with DPL probe and small-diameter drilling), laboratory tests (to determine the leading parameters of soil: soil type, bulk density, humidity, degree of plasticity, filtration factor, the organic content, etc.) and assessing the technical condition of the embankment as for its effective flood protection. The studies indicate that the embankment is generally in the medium condition, and primarily the repair of embankments should be carried out in the most vulnerable parts of the landslide, ie at km 0+200÷1+050 km 1+550, km 2+450 and km 5+330.

**Keywords:** *embankments, Lubuskie section of the Oder river, embankments condition*

ANDRZEJ BATOG, MACIEJ HAWRYSZ

**Geotechnical Designing of the Wind Turbines** • Kwartalnik Górnictwo i Geoinżynieria • z. 2, 2011

This paper presents the geotechnical designing method of the wind turbine located in the Pyrzyce Wind Farm. The guidelines for the application of the investigation results obtained from the cone penetration testing for designing of those constructions were presented. The CPT results were used both to determine of geotechnical parameters of soils as well as to the estimation of the subsoil bearing capacity and the value of the foundation settlements. The comparative calculations based on the Polish Standard were performed and the usability, economical advantage and the high safety margin in case of the wind turbine foundation designing were demonstrated.

**Keywords:** *cone penetration test, foundation, wind turbine*

JERZY BAUER, WOJCIECH PUŁA, MAREK WYJADŁOWSKI, MONIKA SCHLEISS

**Analysis of Displacements of Horizontally Loaded Pile Group Placed in Elastic Subsoil with Random Properties** • Kwartalnik Górnictwo i Geoinżynieria • z. 2, 2011

A probabilistic analysis of limit serviceability state of a pile groups is presented in the paper. Pile heads are interconnected and loaded by a horizontal force. Interaction of piles and subsoil is modelled by a set of springs using classical method called Kx generator. Applying the response surface method for

the displacement data calculated from the resulting static model, the reliability indices and sensitivity coefficients are computed for assumed variability of random Young's modulus and random thickness of upper soil layer.

**Keywords:** *limit serviceability state, response surface, reliability index*

LUKASZ BEDNAREK, JAKUB MAZUREK

**Evaluation of the Impact of Additives to the Aggregate 0–63 mm to Improve its Capacity Ratio Based on the Results of Own Research • Kwartalnik Górnictwo i Geoinżynieria • z. 2, 2011**

In the present study analyzed the effect of admixtures (fly ash, slag, and granulated lime) on the size of load ratio (CBR) of aggregate base, which was sandstone with granulation 0–63 mm. In addition, the fitness of the base material for its use on a foundation of roads. Based on primary blend of grain size was calculated size distribution of mixtures with dopant and found that improved markedly compared to the raw material. On the basis of the CBR rate was noted that used in this study had a positive dopant on the formation of CBR, causing even two and half fold increase in the value of this parameter. It also appeared that the material does not demonstrate a basic utility, as the material used for road foundation.

**Keywords:** *aggregate, foundation, load index CBR*

JAROSŁAW BRODNY

**The Effect of a Dynamic Load on a Friction Joint's Working Parameters • Kwartalnik Górnictwo i Geoinżynieria • z. 2, 2011**

The article presents the results of stand tests for friction joints under a dynamic load. The tests consisted of exerting an axial load (compression) on the friction joint on which a traverse was placed with a mass freely falling from a specific height. The dynamic characteristics of a friction joint's work were identified based on the tests carried out. The characteristics determine a variance in the value of the force transmitted by a friction joint during a dynamic load according to time. Variances in the value of axial forces in the clamps joints were also registered during the tests. The displacements of a friction joint's elements were recorded with a highspeed camera which also enabled to determine their speeds and accelerations. The tests results presented should be used in operating, designing and selecting a yield support for the conditions of a dynamic load hazard.

**Keywords:** *mining support, friction joint, dynamic load*

JAROSŁAW BRODNY

**The Effect of a Dynamic Load on the Working Characteristic of a Friction Joint with a Thrust Wedge Used in a Yielding Support • Kwartalnik Górnictwo i Geoinżynieria • z. 2, 2011**

A new design solution of a joint has been developed using an additional element such as a thrust wedge to improve the working characteristic of the friction used in yielding supports. The article presents the results of stand tests for the new joint design subject to a dynamic load. The source of dynamic loading was impact mass falling from a specific height. A working characteristic of a friction joint was determined (relationship between the force transmitted by the joint according to time), the characteristics of variations in the value of axial forces in the clamp joints and the

displacement of the selected friction joint components. The results obtained indicate that the use of a thrust wedge in the friction joint design improves its working parameters.

**Keywords:** *mining support, friction joint, friction wedge, dynamic load*

MIROŚLAWA BUKOWSKA, STANISŁAW ĆMIEL

**The Characteristic of Changes of Carboniferous Rocks Properties in Non-continuous Tectonic Zones in the Upper Silesian Coal Basin** • Kwartalnik Górnictwo i Geoinżynieria • z. 2, 2011

Within fault zones in the USCB there can be noticed changes of values of numerous physical, chemical and technological parameters of coals and rocks surrounding beds, even at great depths. Secondary changes of some properties of rocks of carboniferous formation of the Upper Carboniferous within non-continuous zones are results of various processes including epigenetic ones resulting from rocks weathering and thermal modifications. Zones of tectonic dislocations become the routes of migration of water and gases containing oxygen and nitrogen in infiltration zones that are favorable to weathering processes, what is the result of rock mass unblocking. The knowledge of rocks properties in dislocation zones is essential because of existence of natural hazards in rock mass that result from exploitation as well as considering difficulties in maintenance of mine workings within such zones. Changes of some physical and chemical properties of coal and barren rocks with approaching to fault surface have been characterized on the basis of kłodnicki and bytomski faults. The characterized properties are as follows: uniaxial compression strength of rocks surrounding the bed 507 in the Bobrek–Centrum mine and bed 416 in the Wujek mine as well as micro-hardness and degree of coal fracturing. There are shown changes of sandstones consisting among others in decrease of compression strength in the vicinity of faults. The decrease equals to several hundred per cent in the distance of several meters from the fault surface. In comparison to surrounding rocks changes of qualitative parameters of coal including its micro-hardness, degree of fracturing and volumetric density occur at smaller distance from the fault surface what is the result of coals properties — their structure and texture. The micro-hardness decreases essentially within the fault surface and the degree of fracturing of each grain increases several times. In the article it is noticed that the issue of rocks destruction in fault zones and influence on natural hazards in a rock mass in the aspect of designing and conducting of safe and rational exploitation is not included straight in the executive regulations of the Geological and mining law.

**Keywords:** *USCB, rocks, faults, properties of rocks*

JAN BUTRA, RAFAŁ DĘBKOWSKI, ZDZISŁAW IWULSKI, MARCIN SZPAK

**Analysis of Ore Exploitation Process and Future Plans in “G–7/5” Panel in Rudna Cooper Mine** • Kwartalnik Górnictwo i Geoinżynieria • z. 2, 2011

In the paper geological and mining technology conditions in “G–7/5” panel of Rudna Cooper Mine was described. The mining process started in 2002 is presented as well. The results of rock mass observations and measurements were characterized and seismic hazard in “G–7/5” panel was evaluated.

Ore body in “G–7/5” panel is located at a depth of 870 m in the downthrown side of “Biedrzychowa” fault. “G–7/5” panel is composed of three smaller excavation blocks. Hard geological and mining conditions in this panel, especially in block “A”, often result in mining direction changes e.g. toward old workings and yielding zones. At present in block “A” liquidation works are carried out. In block “B” face–entry drivage was started in August 2010.

Depending on activity level, during mining in that area between October 2009 and September 2010, three different periods can be distinguished. They correspond with the specific character of mining works and prevention methods against seismic activity hazard. Location of mining tremors indicate

that many of them occurred in faults lines running through the working area in “G-7/5” panel and on the block development edges. Due to tectonic dislocations in this area, mining in “G-7/5” panel was connected with relatively high level of bumps and roof falls hazard.

**Keywords:** *underground mining, observations and measurements methods, rating of rock mass stability*

MAREK CAŁA, JUSTYNA ADAMCZYK, MICHAŁ KOWALSKI

**Three-dimensional Stability Analysis of Municipal Waste Disposal Zoniówka II** • Kwartalnik Górnictwo i Geoinżynieria • z. 2, 2011

This paper shows the 3D slope stability analysis for municipal waste disposal Zoniówka II (quarters I and II) with numerical methods. The conditions of landslide were simulated for the quarter I. The theoretical situations were also analysed. It was assumed that retaining embankment was built from plastic or semi-solid consistency soil. The quarter I was also analysed assuming it's fully filled with wastes. The calculations results show, that main reason of landslide was improper soil material of retaining embankment. Further simulations proved that retaining embankment from plastic or semi-solid soil would approve waste disposal stability. The appropriate way of waste disposal is decreasing of moisture content of retaining embankment soil.

Stability analysis for quarter II showed considerable different results between 2D and 3D calculations. These differences are the effect of higher precision of 3D modelling what gives a better opportunity to precisely reproduce the slope geology. This also gives a good chance to study the slope failure indicators. The 3D stability analyses of waste disposal allow investigation the progress of failure surface, its shape and range and also the volume of landslide. The accurate 3D geology model shows the influence of properties change on the calculations results. 3D calculations are however more laborious and require more powerful computers.

**Keywords:** *slope stability analysis, numerical methods, shear strength reduction technique*

MAREK CAŁA, SEBASTIAN OLESIAK

**The Method of Estimating of Selected Strength Properties of Upper Miocene Clay in Carpathian Foredeep near Krakow with Weight Sounding Test (WST)** • Kwartalnik Górnictwo i Geoinżynieria • z. 2, 2011

This paper shows the results from of laboratory investigations performed for upper Miocene clay in Carpathian Foredeep. These results were compared with output from field tests carried out with WST probe. That was the base for construction of nomogram for estimating of strength properties of the soils resulting from field tests with WST probe.

**Keywords:** *geotechnical engineering, geotechnical site characterisation, geotechnical laboratory investigations*

MARIUSZ CHOLEWA, ROBERT JOB

**Punch Strength of Geosynthetic Sealing Screens** • Kwartalnik Górnictwo i Geoinżynieria • z. 2, 2011

The paper presents results of punch strength tests of protecting and sealing geosynthetics. Six types of geotextiles of different thickness and basis weight were chosen as protecting materials, two types of geomembrans of different thickness and one type of bentonit mat represented sealing materials. The tests were carried out separately for a set of the geotextiles and the geomembrans and for a set of the

geotextiles, geomembranes and the bentonit mat. The measurements were taken according to the standard: PN-EN 14574.

The results of the tests showed, that the punch strength of the set geomembrane + geotextile increases in proportion to the thickness of the materials and ranges from 0.73 to 2.62 kN in the dry test and from 0.76 to 2.88 kN while testing hydrated samples. Whereas the punch force of the set geotextile + geomembrane + bentonit mat ranges between 1.48 and 5.19 kN depending on the type of geomembrane and geotextile.

**Keywords:** *geomembranes, geotextiles, bentonite mats, strength*

MARIUSZ CHOLEWA, MARCIN LUPA

**Influence of Cyclical Insolation on a Static Puncture of Chosen Geosynthetics** • Kwartalnik Górnictwo i Geoinżynieria • z. 2, 2011

The paper presents results of tests of the static punch strength of chosen geosynthetics subjected to cycles of insolation amounting to 100 hours. Three geotextiles (GW-1: of knitted continuous filaments, GW-2: of welded continuous filaments and GW-3: of stitched continuous filaments), three geonets (GS-1: of the density of 16 openings per 1 cm<sup>2</sup>, GS-2: of the density of 1 opening per 1 cm<sup>2</sup>, GS-3: of the density of 1.0 openings per 1 cm<sup>2</sup>) and three geomembrans (GM-1: 0.3 mm thick, GM-2: 1.0 mm thick and GM-3 1.5 mm thick,) were used for the tests. The tests of punch shear were conducted in accordance with a method described in the standard PN-EN ISO 12236. For each of the nine materials, the results of tests of so called "fresh" and insulated samples were compared. It was shown that the influence of solar radiation received during 100 hours do not cause weakening geonets and geomembrans. It were only geotextiles that showed decreasing of strength value.

**Keywords:** *geomembranes, geotextiles, geonets, strength*

JERZY CIEŚLIK, JACEK JAKUBOWSKI, ANTONI TAJDUŚ

**The change of Axial Stiffness and the Development of Sandstone Samples Damage through the Conventional Triaxial Tests** • Kwartalnik Górnictwo i Geoinżynieria • z. 2, 2011

Results of laboratory investigations focusing on change of axial stiffness of sandstone samples made under a conventional triaxial compression test conditions has been presented in this paper. It was assumed, that fracture propagation and damage process of rock samples on representative volume element level follows continuum damage mechanics laws. Based on investigations and analysis of axial stiffness change of sandstone samples for applied confining pressures, a damage variable was determined and the condition for the initiation of damage process was proposed. The results of investigations show a phenomenon of two different failure processes.

**Keywords:** *conventional triaxial tests, axial stiffness change, damage process*

KAJETAN D'OBYRN

**Protection Possibilities of the Jakubowice Chamber in the Wieliczka Salt Mine** • Kwartalnik Górnictwo i Geoinżynieria • z. 2, 2011

The Jakubowice complex is a substantial group of chambers in the eastern part of the central field of the Wieliczka Salt Mine. Examination of the technical status, based on excavation chamber observations,

was confirmed by numerical geo-mechanical analysis. Both analyses proved that the most important issue for preservation of the post-exploitation chambers is geological structure of the surrounding deposits. Especially, the existence of waste rock layers, and also intensity of the chamber convergence process. Liquidation by filling of the chambers localized at the lowest level and preservation of the upper chambers, with historical value, shall prevent further degradation of this part of the salt mine. The important outcome of the undertaken analyses is providing evidence of the lack of direct hazards created by the chamber complex for the land surface.

**Keywords:** *salt mine, geological structure, technical condition of excavation chambers, geo-mechanical analysis, filling of the caverns, protection*

JAN DRZEWIECKI

**Influence of Fault Parameters on the Range of its Impact** • Kwartalnik Górnictwo i Geoinżynieria • z. 2, 2011

In this article the method of estimation of range and intensity of fault impact is presented. From the practically point of view when the fault throw is comparable with height of longwall support there is a typical underground mining situation. On the other hand when the fault throw is higher than longwall face it will make an unfavorable situation. In each case the immediate vicinity of the fault or fault zones is characterized by anomalous in relation to the natural/gravity pressure condition. The vicinity of fault is a factor for weakening the rock mass. On the other hand the vicinity of the fault is an area of energy and stress concentration. This concentration in the vicinity of the fault combined with the energy accumulated in the range of longwall mining will determine the possibility of dynamic phenomena in hard coal seam as well as in the roof rocks. The proposed method also takes into account three parameters of fault: the faults throw  $h$ , the dip angle of the fault plane  $\alpha$  and depth of hard coal seam  $H$ . The range of stress anomaly zones in the two walls of the fault is determined using a computer program developed by GIG called "SIGMA Z" for calculating the stress values using the formulas developed for calculating the values of the anomalous propagation velocity of longitudinal seismic wave in the analyzed area. Currently, this method is used in predicting stress distribution in the area of the mining activities.

**Keyword:** *rock mass, longwall mining, range of fault zone*

ZENON DUDA, KATARZYNA KRYZIA

**Malbork city fortified walls** • Kwartalnik Górnictwo i Geoinżynieria • z. 2, 2011

This paper describes characteristics of the ancient, medieval walls of town Malbork. This article includes description of fortified walls extending along the river Nogat, in the area from the castle to the bridge on the road to Gdansk and also fragments of fortifications in the west of densely built-up part of the town. There were presented results of research and exploratory work aimed at assessing the technical condition of fortified walls of Malbork and also there were discussed the program of conservation and repair work. There were described reasons for disastrous state of the fortification structure. There were characterized temporary protection of the fortifications construction, after which should be proceed a comprehensive repair and maintenance of the historic area of the existing town walls in Malbork. The whole article is characterized by photographic documentation and documentation of build — implementing along with implementing the drainage system. This article constitutes the first part, while the second one will concern fortified walls of Malbork Castle.

**Keywords:** *historic structure, technical condition of a building, temporary rehabilitation-restoration works, fortified walls*

**The Identification of Parameters of Elasto-Plastic Soil Models with Using Simultaneous Method**  
• Kwartalnik Górnictwo i Geoinżynieria • z. 2, 2011

The paper presents the concept of parameter specification of elasto-plastic soil models with using simultaneous method. This method uses nonlinear regression analysis of results of triaxial test (for chosen stress path) to obtainment all constants. Discuss of objective functions variants precedes the presentation of algorithm using combination of successive search method with Nelder-Mead's simplex technique. The stress path in triaxial test simulates step-iterative procedure, in which plasticity state is analyzed with using the Nayak-Zienkiewicz method. The presentation completes specific example of parameter identification of Nova-Wood model for results of standard shear path.

**Keywords:** *specification of parameters of soil models, elasto-plastic soil models, numerical simulation of triaxial test, stress path*

LIDIA FEDOROWICZ, JAN FEDOROWICZ, MARTA KADELA

**Problems of Adequate Interpretation of the Results for Analyses of the Structure-Subsoil Systems**  
• Kwartalnik Górnictwo i Geoinżynieria • z. 2, 2011

In this paper description of the structure-subsoil systems concern their numerical behaviour obtained in basic engineering models during progressive failure process:

- for the whole system structure-subsoil, or only
- for structure that co-operates with subsoil.

The above analyses present an attempt to provide an answer to the question — when the numerical calculation model (with the basic Coulomb-Mohr constitutive description) assure adequate evaluation of a hazard for:

- 1) loss of bearing capacity for the whole system structure-subsoil; with mode of failure,
- 2) progressive rigidity degradation of the road structure co-operating with subsoil; where the progressive failure, durability and load capacity are directly connected.

**Keywords:** *systems structure-subsoil, numerical modeling, durability of the structure, loss of bearing capacity*

LIDIA FEDOROWICZ, JAN FEDOROWICZ, MARTA KADELA

**Numerical Evaluation of the Bearing Capacity for the Strip Foundations** • Kwartalnik Górnictwo i Geoinżynieria • z. 2, 2011

In this paper one of the basic geotechnical problems, bearing capacity problem for shallow foundations have been numerically tested with the main focus to test an adequacy of the values for bearing capacity factors numerically obtained. The task belongs to problems considered in the professional literature [1] as an engineering task satisfying goodness of fit for the results numerically and conventionally obtained, while numerical analyses provide the wide opportunities for testing the real subsoil behaviour. Referring to the above the special attention to adequate numerical models was given; where the adequacy concerns constitutive model as well as geometry of the subsystem representing subsoil in the analyzed structure-subsoil systems. Here the basic Coulomb-Mohr constitutive model with associated and non-associated flow rule was used in tasks.

**Keywords:** *bearing capacity, numerical model, Coulomb-Mohr constitutive model, associated and non-associated flow rule*

**Computer Simulation of State of Stress Near Rock Mass Exploitation Area, with Consideration of Methane Flow** • Kwartalnik Górnictwo i Geoinżynieria • z. 2, 2011

Knowing the state of stress within rock mass near the exploitation area is a crucial element of planning mining works, especially in areas containing methane, which often happens in case of coal exploitation. One of the solutions to this problem is numerical modeling. This paper presents a method of estimating the changes of the state of stress around long wall exploitation area, based on MES numerical simulation. Mathematical model used here, treating coal as porous compressible medium, considers the presence of methane within rock mass and its flow caused by exploitation. It allows to observe both the changes of the state of stress and of methane porous pressure within rock mass. The results obtained were compared to the results of methane pressure tests available in literature.

**Keywords:** *numerical modeling, rock mass exploitation, state of stress, rock mass, methane*

**Application of One Parameter Classification for Splitting Rock Massif on Roof, Seam and Floor Rocks of “Rudna” Mine** • Kwartalnik Górnictwo i Geoinżynieria • z. 2, 2011

It was shown in the paper that differentiation of rock massif into roof, seam and floor rocks is statistically significant. Variance analysis and one parameter classification were utilized to carry out required computation. Six rock parameters from laboratory data were taken into account.

**Keywords:** *rock mass mechanics, investigations of the geomechanical rock properties, analysis of variance*

**Non-linear Soil Stiffness Characteristic ( $G_o$ ) — Methods of Determination, Examples of Application** • Kwartalnik Górnictwo i Geoinżynieria • z. 2, 2011

The results of research on non-linear stiffness characteristic of soil ( $G_o$ ) derived from complementary use of seismic wave velocity measurements (CSWS/SAWS and SDMT field methods, and BET laboratory method) and the old fashioned TRX, oedometer methods are presented. The results obtained from seismic dilatometer (SDMT) and surface seismic methods (CSWS, SAWS), performed on chosen test sites, have been presented as well. Non-linear stiffness characteristics in a wide range of strain for two soil are shown. Example of application is depicted based on back analysis and real structure displacement measurements.

**Keywords:** *non-linear characteristic of stiffness,  $G_o$  shear modulus, seismic dilatometer SDMT, surface seismic methods CSWS and SAWS*

**Early Stage Acoustic Wave Velocity of Concrete CFA Piles** • Kwartalnik Górnictwo i Geoinżynieria • z. 2, 2011

Regarding the issue of the pile quality (continuity and length) tests by means of non-destructive methods, it seems essential to estimate the velocity of the elastic wave in the concrete. For exam-



ple, considerable differences are observed in the measurement of the wave velocity before and after the pre-cast concrete piles are driven. For reinforced concrete piles made of the C50 concrete, the elastic wave velocity measured before driving reaches 4500 m/s, and after the driving — it oscillates around 4000 m/s. That is probably connected with the micro-cracking caused when driving the pile. The errors in velocity estimation may lead straight to proportional faults in the estimation of the pile's length (10%). It is even more complicated to determine the wave velocity in the process of the young concrete setting (before the 15<sup>th</sup> day of concrete embedding). Very few publications on that subject show large changeability of the estimated velocity and suggest that each time at the construction site calibration should take place. Calibration, however, is possible only when the person who runs the tests is in possession of fully credible information about the length of the examined (controlled) piles. The research conducted at Wrocław University of Technology show that in the case of the concrete piles made of the C25 concrete, examined between the 5<sup>th</sup> and 15<sup>th</sup> day after the concrete embedding, the measured elastic wave velocities ranged from 3000–4000 m/s.

**Keywords:** *wave velocity, integrity testing, concrete*

ANDRZEJ GRUCHOT, EDYTA RESIUŁA

**Influence of Compaction and Saturation on the Shear Strength of an Ash-slag Mixture and the Stability of the Embankment Built of the Mixture** • Kwartalnik Górnictwo i Geoinżynieria • z. 2, 2011

The work presents the results of tests of the influence of compaction, saturation and the assumed shear stress criterion on the shear strength of the ash-slag mixture from the Power Plant “Skawina”, geotechnically qualified as well-graded, non-swelling silty sand. In view of verification of a possibility of using the mixture for earth structures, calculations of stability of the embankment made of this material were performed.

The tested mixture was characterised by big values of shear strength parameters, and showed slight dependence on compaction. However, there was stated the significant influence of its saturation causing decreasing of the angle of internal friction and cohesion. The calculations of the stability of slopes of the embankments made of the tested mixture revealed that they would be stable in the case of assuming shear strength parameters for the samples of the optimum moisture content, and that they would be unstable in case of assuming shear strength parameters for the saturated samples.

**Keywords:** *ash-slag mixture, shear strength, shear stress criterion, stability*

BOGUSŁAW GUZIK, MIROSLAW LASKOWSKI, JERZY WRÓBEL

**Method of Passing with the Exploitation Front Through the Bundles of Drift Headings in Various Geological and Mining Conditions at O/ZG “Rudna”** • Kwartalnik Górnictwo i Geoinżynieria • z. 2, 2011

In order to make the exploitation fields in “Rudna” mine accessible it was earlier necessary to cut through the deposit with the network of preparatory headings. Together with the development of exploitation it became necessary for the fronts to pass through headings executed in such a way. The mine formulated numerous solutions whose priority was to minimize the risk of rock bursts and roof falls. At the same time it was essential to prevent delays connected with the entry into the long-term exploitation headings and with the cutting of the pillars in them. The difficulties encountered when passing through the bundles of headings situated parallel to the front line were.

**Keywords:** *exploitation fields; drift headings, risk of rocks bursts and roof*

**The Geotechnical Parameters of the Subsoil in View of Purpose of Plot of Land in the Land Development Plan** • Kwartalnik Górnictwo i Geoinżynieria • z. 2, 2011

In that paper we try to show all important aspect of soil condition and natural hazards that will be helpful to designed appropriate load-bearing capacity of subsoil that are used in The Land Development Plan in commercial way That information help estimate the cost that should be spend by investor before starting to built the construction over that ground and in that area. The purpose for plots of land in the land development plan should take into consideration soil structure and geotechnical condition, dynamic environment influenced by both internally and externally imposed forces, types of stresses and strains to which the soil is subjected. There are important natural factors that have big influence on type of buildings foundation and all architecting construction. Geotechnical experts should assist in the development processes that will result in economic solutions. Planning and building authorities should require geotechnical hazard reports as part of submissions for approval of subdivisions or development plans; and such reports should include evaluations of the hazards to various structures and recommendations on the most suitable design and construction practices to ensure economic long-term performance. All of this information give estimators possibility to calculate market value of plot use the residual method which base of land market value and take into consideration the cost of reinforced the weak land by comparison with market value of land in good geotechnical condition.

**Keywords:** *the Land Development Plan, subsoil geotechnical parameters, weak subsoil, natural hazards, development processes*

WŁODZIMIERZ HAŁAT

**Impact of Elastic Yield of Roof Support on its Loading Capacity** • Kwartalnik Górnictwo i Geoinżynieria • z. 2, 2011

In this paper it has been presented the analytical solutions considering influence of elastic yield of individual props on loading capacity of roof support used in underground drifts. The analytical relations were obtained as a result of solutions of sets of canonical equations forces method. In the presented problem the sets of canonical equations arise from direct application of five moments equations (or theorem).

Solutions actually published in the literature, resulted from equation (or theorem) of three moments, do not allow for including within the calculations the elastic yield property of the props. These solutions are particular cases of those presented in the paper.

The successful analytical solutions of the equations were possible thanks to application of CAS type software. This kind of codes allow to solve problems, that were impossible for solution in the past.

**Keywords:** *elastic yielding, individual props, set of canonical equations of forces method, CAS type programe*

PIOTR JABŁOŃSKI, IRENA BAGIŃSKA

**Multivariate Work of Slurry Wall in Top-down Method** • Kwartalnik Górnictwo i Geoinżynieria • z. 2, 2011

The paper presents constructional stages of slurry wall in shallow tunnel made by making use of top-down method. Only one static scheme is analyzed, i.e. the dependence of the elastic constraint stiffness on internal forces of slurry wall is investigated. The main problems governing the design process of slurry walls are discussed. Based on iterative calculations the soil resistance, bending moments as well

as displacements of slurry wall are determined. It has been shown that the value of elastic constraint stiffness strongly affects the value of bending moments.

**Keywords:** *slurry wall, elastic constraint stiffness, top-down method*

JACEK JAKUBOWSKI

**Comparative Analysis of Rockbolt Pattern in Tunnel by Stochastic Simulation of Blocks Stability** • Kwartalnik Górnictwo i Geoinżynieria • z. 2, 2011

Paper presents comparative analysis of rockbolt pattern for the conditions of overflow sewer storage tunnel in Atlanta. For the tunnel stability assessment the stochastic simulation of block stability method (MSB) was applied. The method incorporates modified block theory stability analysis within Monte Carlo simulation scheme and stochastic model of discontinuity network. A series of simulations for 3 rockbolt patterns and 14 tunnel intervals has been performed. For each set of data, results describe tunnel stability measures in the means of statistics and probabilities.

**Keywords:** *rock mechanics, block theory, blocky rock mass, rock bolting, stability of rock excavations, probabilistic methods in rock mechanics, stochastic simulation*

JANUSZ KACZMAREK

**Long-term Laboratory Investigation of the At-rest Earth Pressure Coefficient of Granular Medium by the Method of Friction Resistance Measurement** • Kwartalnik Górnictwo i Geoinżynieria • z. 2, 2011

In the paper the results of the long-term lab investigation of the at-rest earth pressure coefficient are provided. It has been shown that in the case of the at-rest earth pressure coefficient such approach is necessary. A scheme of the laboratory model is presented. Its construction as well as the measurement method are also discussed. The results concerning the investigation of the internal friction angle are provided — the examination has been performed by the direct shear test. Based on the values of the internal friction angle the earth pressure coefficient  $K_o$  has been estimated.

For investigated industrial waste the at-rest earth pressure coefficient has been determined by the method of friction resistance measurement. The testing time is sixteen months. The value of the initial coefficient  $K_{o(1)}$  (immediately after loading the sample) as well as the value of coefficient  $K_{o(2)}$  (after 16 months with constant loading) have been estimated.

**Keywords:** *the properties of granular media, at-rest earth pressure coefficient, laboratory investigation*

MIECZYŚLAW M. KANIA, ALBERT KUBZDELA

**Analysis of Pile Displacements in the Three-layered Elastic Medium with Use of the MARS Functions** • Kwartalnik Górnictwo i Geoinżynieria • z. 2, 2011

Pile foundations are used on sites with compressible soils. In some cases a pile passes through layers having large differences in soil modulus values. Displacements of a pile toe depends on position, thickness and geotechnical properties of soil layers. Influence of those factors on displacements of the pile has been investigated by the finite element method analysis the axially-symmetrical elastic problem, in the multi-factorial numerical experiment. The computations were conducted for various combinations of the main factors, such as: modulus of elasticity distribution in the three-layered medium and dimensions of particular layers. As the result of the numerical experiment, substantial amount of data was collected.

The way to improve understanding of the investigated relationships, was application of a relatively novel exploratory analysis technique: Multivariate Adaptive Regression Splines (*MARS*). Detailed discussion of the factorial interactions in received *MARS* approximation is presented in the paper.

**Keywords:** *geotechnics, numerical experiment, data mining*

PIOTR KANTY, SŁAWOMIR KWIECIEN

**The Influence of the Formation Energy on the Shape of the Columns Formed With the Use of Dynamic Replacement Method** • Kwartalnik Górnictwo i Geoinżynieria • z. 2, 2011

Driven stone columns formed with the use of dynamic replacement method is one of many geoenvironmental methods, widely used to strengthen the cohesive and/or organic soils under the linear and cubature objects. It is based on ramming of the aggregate into weak soil using drops of high energy in the specified grid of points. Despite apparent simplicity, the method may pose some problems in practice. They may be caused by inadequate choice of the drop energy during the soil reinforcement which influences the diameter and the length of the columns. In extreme cases the columns may be too short or there may appear a total soil replacement. For these reasons the authors of the paper decided to carry out a series of laboratory tests which aimed at determining the influence of the drop energy on the shape of the columns.

The research was carried out on the test stand that allowed the observation of the formation process of a rammed column. Its dimensions were adjusted so as to reflect the real dimensions in scale 1:10. In order to carry out the observations of the processes intervening during the rammed column formation the experiments were filmed and photographed. Three following variations of reinforcement were analysed: by using a relatively constant but low (column No. 2), constant and maximal in the carried research (column No. 3) and gradually increasing (column No. 1) energy. The obtained columns differed in shape. The whole is preceded by a short information about the dynamic replacement method.

**Keywords:** *model research, dynamic replacement, stone columns*

MAREK KAWA, ADRIAN RÓŻAŃSKI, MATYLDA TANKIEWICZ

**Reliability of Excavation Protection in Varved Clay** • Kwartalnik Górnictwo i Geoinżynieria • z. 2, 2011

This work deals with reliability approach for designing a protection of excavations located in varved clays. Using methodology presented in previous work of authors, this time the problem in which the load acting on construction depends on stratification angle is considered. The lamination angle is assumed to be a single random variable. A methodology of global safety factor determination for anchor load is presented. For assumed value of failure probability these factors are presented as a function of mean value and deviation of lamination angle. An attempt of obtaining partial factor of safety is also performed.

**Keywords:** *strength anisotropy, varved clays, reliability, factor of safety*

AGNIESZKA KATARZYNA KŁOPOTOWSKA

**Resistance of Szydłowiecki Sandstone to Salt Crystallization in Terms of Structural Strengthening** • Kwartalnik Górnictwo i Geoinżynieria • z. 2, 2011

This article presents the results of tests on the crystallization of salt on the example of treatment of szydłowiecki sandstone, which underwent treatment of structural strengthening. During the study

two types of sandstone were analyzed: A — from a building in Warsaw and B — with a similar lithological formation, but from the quarry in Śmiłów. The progress of degradation was monitored by measurements of ultrasound tests. Final results were observed in a scanning electron microscope. It was shown that the impregnation of sandstone did not materially affect the improvement of its resistance to salt crystallization, but the additional hydrophobisation largely limited the progress of degradation.

**Keywords:** *hydrophobisation, impregnation, crystallization, sodium sulfate, strengthening structural*

MALWINA KOLANO, MAREK CAŁA

**The Loess of Sandomierz Region in the Light of Geological–engineering Researches** • Kwartalnik Górnictwo i Geoinżynieria • z. 2, 2011

The aim of this study was to determine geological-engineering conditions of loess from Sandomierz region. Research includes geotechnical analyses of material which was gathered from Queen Jadwiga ravine, which is within the administrative Sandomierz. Additional information was obtained from archival documents and literature.

The paper presents the results of the basic physical and mechanical properties of studied grounds. Summarized results show that tested loess are soil sensitive to changes in moisture. They have partially unstable structure and are susceptible to scouring processes. These parameters show, that the discussed loess form a substrate with negative geological–engineering conditions.

**Keywords:** *loess, physical and mechanical properties of loess, geological–engineering conditions*

URSZULA KOŁODZIEJCZYK

**The Geoengineering Opinion Relating Flood Protection of the Hospital in Slubice (Poland)** • Kwartalnik Górnictwo i Geoinżynieria • z. 2, 2011

The extreme river water stages cause intensive seepage on flooded area, normally protected by levees. The example of this is town Slubice (Lubuski District), situated in 2 m lower than alarm water level. The paper describes the geoengineering opinion relating the quality of embankments in Slubice focused on the intensivity of water percolation from Odra bed to the terrains outside levees, where the hospital is situated. The modernization in 1999 limited, but not eliminated, the water percolation through the banks and, due to financial deficiency, did not included the proper condensation of subsoil and the body of banks, where, as it was proved by geotechnical analysis, still remain parts of soil of loose or average structure and parts of soil rich in organic matter. New flood protection solutions in Slubice are necessary and as long as they are not become realized, the town would fight against the excess of water percolating from Odra river bed.

**Keywords:** *flood, embankment, percolation*

HALINA KONDERLA

**Evaluation of the Bearing Capacity of Piles Based on CPT Test** • Kwartalnik Górnictwo i Geoinżynieria • z. 2, 2011

The possibilities evaluation of the bearing capacity of piles based on the static penetration test has been presentation in the paper. The indirect method of the bearing capacity calculate based on the Polish pile norm was discussed. Two direct methods were described in detail and used in the numerical example.

One example of CPT result with their interpretation was included in the paper. The results calculation of the bearing capacity pile foundation were compared for considered methods.

**Keywords:** *bearing capacity of piles, CPT test, Philipponnat's method, Energopol's method*

MILOSLAV KOPECKÝ, MARTIN ONDRÁŠIK, DARINA ANTOLOVÁ

**Unstable Slopes on Right-Side End of the Dam Body of Liptovská Mara Water Reservoir** • Kwartalnik Górniczo i Geoinżynieria • z. 2, 2011

Construction of the water reservoir Liptovská Mara required remediation of two landslides, Velkomarský and Vlačiansky landslides, which are located on a right-side end of the dam body of the water reservoir. The effectiveness of the remediation methods has been monitored by monitoring system since 1974. Partial reactivation of the landslides in spring 2006 and especially a fact that the monitoring network is already not in good physical condition have called for proposal of complex monitoring system of the two landslides. The mentioned proposal of the new monitoring system is the main content of the presented article.

**Keywords:** *landslides, monitoring, water reservoir*

JÓZEF KOSZELA, ANDRZEJ BATOG

**Slope Stability Analysis of the Citadel in Algier in Case the Earthquake Risk** • Kwartalnik Górniczo i Geoinżynieria • z. 2, 2011

This paper presents the stability analysis problem of the citadel in Algier in case the earthquake risk. There is an interesting masonry object, by reason of used structural material, which consist of stones and compacted soil, so-called pisé. Geological and geotechnical conditions of analyzed problem were presented. Methods of analysis were selected to the conditions of appearing of seismic loads. The wide analysis of slope stability were performed. The risk of landslide or collapse of the citadel construction were discussed.

**Keywords:** *slope stability, seismic load, historic buildings*

EWA KOSZELA-MAREK

**Effect of High Hydrostatic Pressure on the Chemism of Water-clay Suspension** • Kwartalnik Górniczo i Geoinżynieria • z. 2, 2011

The paper presents the results of the effect of hydrostatic pressure 400 MPa on water-clay suspension. It was used the prototype "high-pressure research position" for testing pressure. The chemical analysis of effluents from water-clay suspensions were made for examine changes in concentration of 6 selected metal ions. It was found that the content of  $\text{Na}^+$ ,  $\text{Mg}^{2+}$ ,  $\text{Ca}^{2+}$ ,  $\text{K}^+$  significantly increased compared to the concentration of ions before the pressure and the concentration of ions  $\text{Al}^{+3}$  i  $\text{Fe}^{+2,+3}$  disproportionately decreased. Changing the sorption equilibrium of the system „clay particles — water” is the first, giving up easily determine the effect of the impact of high hydrostatic pressure (400 MPa) on the water-clay suspension. Indirect proposal, arising from the analysis of the phenomenon, is that the observed change in ion concentration in water is a consequence of structural remodeling of clay minerals.

**Keywords:** *water-clay suspension, high hydrostatic pressure, ion exchange*

**Evaluation of Overall Properties of Geocomposites Based on Digital Image of Their Microstructure** • Kwartalnik Górnictwo i Geoinżynieria • z. 2, 2011

The paper proposes and discusses the procedure of evaluation of overall properties of geocomposites based on a digital image of their microstructure. The overall property of composite is defined as an expectation of an associated microscopic variable called as a structural function. Mathematically, expectation is an average over all the possible realization of random medium, i.e. the infinite number of realizations. The paper formulates an original method of overall properties evaluation using the so-called 2-point probability function. The procedure proposed involves the notion of a sample and that of Representative Volume Element (RVE). The expectation is evaluated as an average over the sample. The sample is defined to be a set of a finite number of RVE elements, each of them of the same size. Proper evaluation of the expectation requires, within this method, an estimation of the appropriate size of the sample and the RVE element. The size of RVE element is proposed to be determined based on the 2-point probability function and the Monte Carlo simulation whereas the sample size is estimated based on the Central Limit Theorem.

**Keywords:** *overall properties, geocomposite, representative volume element, 2-point probability*

TADEUSZ MAJCHERCZYK, ZBIGNIEW NIEDBALSKI, PIOTR MAŁKOWSKI

**The Influence of Support Pillar for the Main Gate on the State of Stress** • Kwartalnik Górnictwo i Geoinżynieria • z. 2, 2011

The paper presents the analysis of the influence of support pillar width left between a goaf and a gate drifted for the consecutive longwall on the state of stress and strain. The widths of pillar from 4 m to 10 m were analyzed to ensure the gate functionality for the subsequent longwall panel. The case concerns the necessity of defining main gate locations which close the panel for longwalls B-11 and B-11a in the seam 348. The mining and geological conditions on the spot were found as exceptionally hard due to bed inclinations up to 240, methane hazard and goafs on both sides of the longwall panel. The location of the analyzed workings takes into consideration both the economic conditions and the optimal pillar width, which additionally ensure gate stability.

**Keywords:** *intergate pillars, gates, state of stress*

CZESŁAW MATUSZ, JAN KOBZIŃSKI, GRZEGORZ TEKIELI

**Seismic Activity Prevention During Copper Ore Excavation in Limited Conditions Based on the Example of the G Mining Area Panelling at Polkowice-Sierszowice Mine** • Kwartalnik Górnictwo i Geoinżynieria • z. 2, 2011

The G mining area of Polkowice-Sierszowice mine is located in so called Polkowice-Wschodnie region, where after the shafts P-III, P-IV liquidation, were left for excavation reserves until now bound in created for them protective pillar. In the years 2007-2010 the excavated deposit was located within the G mining area. This mining area is marked with the III degree of seismic activity/ rock burst hazard and the existing hazard is really high. In the final stage of this mining area excavation due to the occurred rock bursts and accidents, the mine was forced to excavate with the exploitation front moving towards the goaf area. Because of the very high rock bursts hazard some means were undertaken to decrease the hazard by using special and not used until now means of prevention. These were the simultaneously implemented: very thin technological pillars, deep breaking of the compact sandstones in the floors of the headings by blasting works, as well as locating ore (backfilling) in some of the excavation headings to limit the deformation over the mined out area.

Thanks to the used means of prevention and current designing changes it was possible to do the paneling for the rest of the deposit in the G mining area.

**Keywords:** *panelling towards, goafs, seismic activity*

JAKUB MAZUREK, MAREK CAŁA

**The Conditions of Landslide Expansion Affecting Habitable House** • Kwartalnik Górnictwo i Geoinżynieria • z. 2, 2011

In spring of 2010, landslide occurred due to unusual rain falls. It happened on the terrain of inclination of 14°, stable and safe before. This paper presents the description of landslide, results of drills and probe testing, investigations of soil properties and slope stability analysis. The landslide occurred between two others — stable till spring 2010. The conditions of landslide expansion affecting habitable house were also formulated.

**Keywords:** *landslide, slope stability*

ZBIGNIEW MUSZYŃSKI, JAROSŁAW RYBAK

**Application of Geodetic Survey Methods in Load Capacity Testing of Piles** • Kwartalnik Górnictwo i Geoinżynieria • z. 2, 2011

Conventional measurement of pile settlement during pile load test may be affected by ground movement due to displacements of anchor piles. The application of direct leveling of high precision enables to provide an independent reference measurement which is free from systematic errors. However this method is less accurate than the use of displacement sensors but provides good results. Some case studies of the use of geodetic methods in vertical and horizontal pile load testing were presented in the paper.

**Keywords:** *pile load test, geodetic survey of displacement*

BARBARA NAMYSŁOWSKA-WILCZYŃSKA, BOŻENA SKORUPSKA, ANDRZEJ WIENIEWSKI

**Spatial Analysis of Ash–Slags Recoverability Using Geostatistical Methods** • Kwartalnik Górnictwo i Geoinżynieria • z. 2, 2011

Spatial analyses were carried out to develop a 3D geostatistical model of the spatial variation in the technological parameters of an ash–slags heap connected with the operation of the power utilities located near Świecie (Toruń). Tank A filled with ash–slags was the subject of geostatistical studies. The spatial variation of recoverability  $e'$  (defined as the amount of carbon kg recovered from 1 ton of ash–slags), was analyzed. The variation of these parameters in the horizontal and vertical extents of the ash–slags heap was subjected to structural (variographic) analysis using the directional variogram function. The parameters of geostatistical models approximating the directional variogram recoverability  $e'$  were the basis for the estimation. Averages  $Z^*$  and corresponding standard estimation deviations  $\sigma_k$  were estimated for the particular depths of the tank using (3D) ordinary (block) kriging.

Thanks to the application of the geostatistical methods to describe the parameters of the waste material (treated as an anthropogenic deposit) databases containing complete valuable input information for a project aimed at utilizing the deposited material were created.

**Keywords:** *ash–slags, recoverability, variation, spatial analysis, directional variogram, ordinary kriging*



SEBASTIAN OLESIAK

**Calibration of Weight Sounding Test (WST) in Investigations of Upper Miocene Clay in Carpathian Foredeep on Krakow Area** • Kwartalnik Górnictwo i Geoinżynieria • z. 2, 2011

Polish Standards concerning field investigations with application of (among others) Weight Sounding Test (WST) probe gives an interpretation of results only for non cohesive soils. Scarcity of results interpretation for non cohesive soils to some extent disqualifies this tool for estimation of strength parameters of those soils. Present paper shows a proposal of interpretation of WST probe measurement results for upper Miocene clays in Carpathian Foredeep on Krakow area. The paper can be a base for future, full interpretation of cohesive soils measurement with application of WST probe.

**Keywords:** *geotechnical engineering, geotechnical site characterisation, geotechnical laboratory investigations*

RENATA PATYŃSKA

**Probability of Matching the Parameter Distribution of Tremors in Neighborhood Headings in the Upper Silesian Coal Basin from 1989 to 2009** • Kwartalnik Górnictwo i Geoinżynieria • z. 2, 2011

On the basis of the analysis of tremors that occurred neighborhood headings in coal mines in the Upper Silesian Coal Basin from 1989 to 2009, the parameters influencing the location of the problem have been selected. The theoretical distribution has been compared with particular real measurable tremor parameters and thanks to this the probability has been estimated.

**Keywords:** *rockbursts, probability the parameter of tremors*

DANIEL PAWELUS

**The Estimating of Horizontal Stress Value Around Underground Excavations by the Azimuths Difference Method** • Kwartalnik Górnictwo i Geoinżynieria • z. 2, 2011

The paper presents the azimuths difference method. This innovative method can be used to estimate numerical quantity of the perpendicular and parallel horizontal stress around underground excavations. The azimuths difference method has importance for the process of improvement of mining support stability. *In situ* stress measurements and horizontal stress field in the Rudna mine were described. Calculations of the horizontal stress were carried out for underground excavations in the “Rudna Północna” mining region by the azimuths difference method.

**Keywords:** *horizontal stress, stability of underground excavations, azimuths difference method*

WITOLD M. PYTEL

**Technical and Geomechanical Aspects of the Main Detektor Cavern’s Excavation for an Underground Astrophysical Laboratory Located in the Polkowice-Sierszowice Mine** • Kwartalnik Górnictwo i Geoinżynieria • z. 2, 2011

The Polkowice–Sierszowice mine is considered to be a candidate for the future pan–European underground laboratory analyzed in the framework of the LAGUNA project. The review of the local technical/infrastructural, geological and geomechanical conditions has proved that it is a perfect place to host the 100 kton liquid argon detector.

The geomechanical models have been developed and solved using FLAC3D software utilizing the finite differences method. Calculation results have been presented in the form of 3D stress and translation distribution contours, and the areas prone to instability occurrence have been indicated as well. All rocks of the coherent type (anhydrite, dolomite, sandstone) have been modeled as elastic-plastic (some of them ideally plastic, some of them with strain softening). Due to extremely large size of the analyzed object (47.5 m of height, 79 m of the diameter) as well as due to severe consequences of its possible failure, the geomechanical considerations have been performed for a sufficiently large safety margin. The heterogeneous state of the primary stress with different spatial characteristics has been also considered in the analyses.

**Keywords:** *numerical modeling, stability of underground rock chamber*

JAROSŁAW RYBAK, MAREK WYJADŁOWSKI

**Experimental Validation of Pile Lateral Capacity Computation** • Kwartalnik Górnictwo i Geoinżynieria • z. 2, 2011

The computations of the lateral capacity of piles and their horizontal displacement are extraordinarily complex and they depend on the underlying assumptions. Designing lateral capacity of piles, therefore, bears the risk of errors — no matter how advanced the method of computations is. One way to obtain correlation between the computations and the pile's actual work in a structure is to carry out lateral load tests. Such examination makes it possible to estimate the displacement and to determine (depending on the predefined criteria) the maximum force loading the pile. This work presents the results of static computations and their experimental verification in relation to a small diameter pile (injection micropiles) reinforced with a steel pipe. The computations were carried out by means of the norm method, taking into account the actual pile rigidity and assuming that the pile head had not been fixed.

**Keywords:** *micropile, lateral load test, displacement*

KRZYSZTOF SETLAK, MIROŚLAW MOSZKO, ŁUKASZ SIODŁAK

**Analysis of the Arch Support Displacement with the Help of the MONSUPPORT System in Coal Mine "Ziemowit"** • Kwartalnik Górnictwo i Geoinżynieria • z. 2, 2011

In the article chosen results of underground measurements of the arch support displacement were presented. The applied monitoring system of roadways allowed constant measurement of many parameters, giving the image of the work of the mining support. Obtained measuring data could be used in the process of selection and reinforcement the mining support, located in zones of increased stresses.

**Keywords:** *crucial words: support monitoring system, roadways' stability, mining gates, maintenance of the mining workings, roadways' reinforcement*

ALEKSANDRA SĘDOR, LEOPOLD CZARNECKI

**Landslide Hazards in the KWB "Bełchatów" Mine while Mine Technology for Extraction in II Order Graben, the Deepest Part of the Brown Coal Deposit Bełchatów** • Kwartalnik Górnictwo i Geoinżynieria • z. 2, 2011

In this article described landslide hazards occur while mine technology for extraction in II order graben, the deepest part of the brown coal deposit Bełchatów. Discussed major tectonic structure have influence to safe mine extraction. The Article contains precise characteristic fault line called "North border fault line" (UNB no. 2) documented while mine extractions. Drop has been recorded in the Mesozoic

substratum and amount 60 to 200 meters. The style of zone is varied from expansive flexure to series fault lines varied angle and dip direction. Interest aspect of this zone is appearing more often imply surfaces in the north side of fault line. The second important aspect described in this article is block of Mesozoic rock which is building south border Kleszczow graben. The zone called paleolandslide block (BP) is locating in the south border fault line Kleszczow graben called USB no. 1. Paleolandslide block is 1700 meters long and it is probably blocks group move to the north board fault line USB no. 1 about 140 meters bring about old landslide. Estimate volume BP is 118 mln m<sup>3</sup> with documented depth 260 meters. In the board BP charted 11 lower block group deposit in the Tertiary sediments. Described results previous field work driving to better knowledge deformations inside BP. It was taken note of practical aspect recognition structure cause steady inside block as necessary element to right planning and safe mining extraction.

**Keywords:** *fault, move, flexure, breccia, landslide, rocks, graben, stratification, dip, inversion, rotation, block, stability*

ANNA SOBOTKA, MARTA PAJAŁ

### **Use of Computer Records of Quality Dates for Realization Continuous Flight Auger (CFA) Piles in Piling Works Designing** • Kwartalnik Górnictwo i Geoinżynieria • z. 2, 2011

There is a possibility in high-tech monitoring systems of construction works to gain many dates, which can be used in structural design and works execution. That concerns CFA piling system, where piling machines are furnished in computer for recording quality dates of each pile's execution. On the basis of received dates (14 dates recorded at the pile's metric) we can determine a labour consumption and material consumption index for piles execution. These dates are the basis for determining standard worktime and materials consumption standard (concrete mix), which are decisive for duration of construction works, material consumption, and effectively for costs. They are basis for designing of construction works (technological projects and organization of labour, cost calculations, time scales, offers).

In the paper a principle of operation for computer monitoring CFA piles, specification of receiving dates, which are recorded and a possibility of using dates, which are suitable for labour consumption analysis as the relationship with soil's plasticity degree and pile's geometry and draft a standard worktime for execution of CFA piles is given.

**Keywords:** *continuous flight auger (CFA) piles, computer monitoring, labour consumption, standard worktime*

MACIEJ SOBÓTKA, MAREK KAWA, ADRIAN RÓŻAŃSKI

### **A Verification of Shape Optimization Procedures of Tunnel Underground Excavations** • Kwartalnik Górnictwo i Geoinżynieria • z. 2, 2011

A verification of shape optimization procedures of tunnel underground excavations is presented. Elliptic shapes of underground excavation with permanent support are investigated. For different values of a ratio of horizontal and vertical initial stresses an optimum ratio of main axes of ellipse is quested. Three different quantities are considered to determine optimum shape: a convergence, an energy of volumetric strain in a core and maximum normal stress within the support. For chosen value of initial stresses ratio also an influence of support stiffness is examined. Conclusions are formulated on the basis of comparison of obtained results with the results from shape optimization procedure presented in previous paper.

**Keywords:** *shape optimization, underground excavation, energy of volumetric strain*

**Mock-up Experiment for Bentonite Barrier Testing** • Kwartalnik Górnictwo i Geoinżynieria • z. 2, 2011

The mock-up experiment simulates vertical placement of radioactive waste in the underground repository. Relatively small model is basically a stainless steel cylinder (400 mm diameter and 600 mm height), simulating a section of gallery in which the radioactive waste will be disposed. The cylinder is equipped with a 140 mm diameter central tube, in which heating elements — simulating the heat produced by the waste — are placed. Heating temperature is 120°C. The annular gap between the central tube and the outer lining is backfilled with pre-compacted bentonite blocks. Major part of blocks is made of pure bentonite from Jelšovský Potok deposit and the other from Lieskovec deposit, both milled into < 250 µm fraction. Some blocks contain either 5% of pyrite concentrate to simulate pyrite presence in a gallery host rock or 5% of powdered elementary iron to determine iron-bentonite interactions (iron components in gallery).

In the host rock the bentonite water saturation occurs naturally. In the experimental mock-up the hydration is ensured from the external water source. Water is distributed using 23 hydration holes placed outside of the backfill block. The water chemistry is based on the composition of the original water present in the most perspective area for geological radioactive waste repository in Slovakia.

**Keywords:** *mock-up experiment, bentonite barrier, mineral stability*

JOANNA STRÓŻYK

**Application of Compression Index  $C_c$  Equations for Estimation the Compressibility of Poznan Clay** • Kwartalnik Górnictwo i Geoinżynieria • z. 2, 2011

Compressibility index  $C_c$  next to the swelling index  $C_s$  and oedometric modulus  $E_{oed}$  is the basic parameter characterizing the soil compressibility. This parameter is widely used in the prediction of ground settlement. In the case of fine-grained soil, determination of  $C_c$  in laboratory test is time-consuming and expensive. For this reason, the correlation between  $C_c$  and basic value of geotechnical parameters of soils, are searched. The most widely known equation used for determination of  $C_c$  for clay is Skempton's equation, allowing to determine the index value on the basis of liquid limit  $w_L$ . The analysis showed that this equation can not apply in the case of a overconsolidated Poznan clays. It was found that the better the correlation is obtained by making the value of the index  $C_c$  from the initial soil porosity  $e_0$ .

**Key words:** *clay, overconsolidated soil, compressibility, compressibility index, porosity index*

TOMASZ STRZELECKI, MICHAŁ STRZELECKI

**Numerical Model of Draining the Złoczew Lignite Deposit** • Kwartalnik Górnictwo i Geoinżynieria • z. 2, 2011

The paper presents the results of numerical calculations of draining the Złoczew lignite deposit with finite element method. The paper is a part of pre feasibility study report. The numerical model was made using FlexPDE v 6 soft. At calculation of the model a previously performed analysis of hydrogeological and geological conditions containing among others of supplying water, proposals of the way of draining and carrying underground waters.

**Keywords:** *numerical methods, finite element method, hydrogeological conditions, mine drainage*

**Analysis of Seismic Activity in Trace and Weak Seismic Phenomena Correlated with Passive Tomography Results on the Example of the Field Branch G–7/5 O/ZG Rudna KGHM S.A. Branch** • Kwartalnik Górnictwo i Geoinżynieria • z. 2, 2011

The article presents the results of an activity analysis of trace and weak seismic phenomena, supported by the passive tomography results. The analysis was conducted on the area of the G–7/5 O/ZG Rudna KGHM SA exploitation field between 2008 and 2010.

The analysis revealed that the hypocentres of the strong tremors foci of the orogen were not connected with the zones of high velocity of *P* wave propagation. However, correlations of the zone of very low velocity field with the zones of current weak seismicity were observed. It was also observed that trace activity does not make it possible to predict high energy tremors.

**Keywords:** *seismic activity, traces, passive tomography, tremor prediction*

**Historic Sewage Channels Adaptation Regarding to Underground Touristic Routes** • Kwartalnik Górnictwo i Geoinżynieria • z. 2, 2011

Historic sewage channels are remarkable engineering structures of high architectural values. In consequence of their magnificence, they are compared to monumental basements, passages etc. Because of their uniqueness, the possibility of adaptation for touristic purposes is seriously considered. The article identifies threats, defines formal and technical requirements in terms of individual or partial adaptation. As far as the impact of impurities on health is considered it is of great importance to examine channels for the possibility of bacteriological threats.

**Keywords:** *underground engineering structures, underground tourist routs, revitalization, adaptation, diagnostics, design, formal requirements, technical solutions*

**Methane Pressure Distribution before a Head of Gallery. Some Considerations Based on Measurement Results Obtained in the Coal Bed Threaded by Methane and Coal Outbursts** • Kwartalnik Górnictwo i Geoinżynieria • z. 2, 2011

Some methane pressure measurement results carried out on the head of gallery in the hard coal mine, as well as the analysis of variability of those results were presented in the paper. The pressure measurements were carried out by means of an IMG–CZ pressure probe designed and produced in the SMRI PAS. It is necessary to mention, that In Upper Silesian mines these measurements were carried out sporadically.

Obtained results showed, that if the coal compactness *f* is not smaller than 0.36, it is possible to conduct coal exploitation safely — from the point of view of outburst hazard — with the pressure of coal bed methane exceeding 4bars. Results of desorption intensity coefficient measurements that were carried out together with methane pressure measurements did not show any distinct correlation between these two gas parameters *in situ* conditions.

**Keywords:** *methane pressure, gas and coal outburst, mining hazard*

**Seismic Investigation for Seismic Hazard Assessment in Boundary Pillar in Coal Mine “Mysłowice–Wesola” Part “Mysłowice”** • Kwartalnik Górnictwo i Geoinżynieria • z. 2, 2011

The results of seismic investigation performed in the area of pillar in coal mine “Mysłowice–Wesola” Part “Mysłowice” are presented. Pillar region is a zone of high seismic activity. Seismic activity is caused by former and present coal seams exploitation. The seismic hazard were diagnosed by geophysical research of the geotechnical properties of the coal seam and sandstone in the coal seam roof. Geotomography was performed cross the galleries in the same coal seam in horizontal plane and cross seams in vertical plane, exploring sandstone between coal seam no 418 and 501/1. Based on results of measurement, ability of roof rocks to generate rock bumps and stress condition in coal seam were recognized as well as seismic hazard. To prevent seismic bumps the controlled explosion were carried out in boreholes drilled in coal seam and in layer of sandstone in the vicinity of major transport galleries crossing the pillar. Repeated seismic measurements were used to assess the effectiveness of prevention and assessment of the state of stress in coal seam after prevention also to current seismic risk assessment. It was found the effectiveness of the prevention and reduction of seismic hazard.

**Keywords:** *geotomography, seismic profiling, mining bumps, seismic hazard, seismic prevention*

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**Monitoring of Earthwork Structures Using Spatial Distributed Fibre Optic Sensors Embedded in Geosynthetics** • Kwartalnik Górnictwo i Geoinżynieria • z. 2, 2011

In modern earthwork structures (roads and railway embankments, dikes and dams), it is common procedure to embed geosynthetics like non-woven and grid structures into their soil bodies. These geosynthetic materials act as filters, reinforcement and drainage elements. They are also integrated for strengthening of the earthwork structures and prevention from surface erosion. By incorporating sensors in the geotextiles, “smart” technical textiles can be realised. Such multifunctional technical textiles can interact with their environment and sense various measurement categories such as temperature, strain and chemical parameters which allow to detect and to locate the presence of any damages and destructions in real time. In comparison with traditional measuring systems (pressure cells, piezometers and inclinometers which produce only point measurements) fibre optic sensors are well suited for mentioned spatial distributed monitoring purposes. The very tiny optical fibres of a diameter of less than 1 mm can operate as sensors in strong electromagnetic fields, under “harsh” explosive and chemical environments and under ionizing radiation. The spatial distributed fibre optic sensors are based on Brillouin scattering in glass optical fibres and on optical time domain reflectometry (OTDR) in polymer optical fibres. The paper gives an overview of these innovative fibre optic sensors embedded in geosynthetics and presents field test results.

**Keywords:** *fibre optic sensor, spatial distributed sensor, polymer optical fibre (POF), glass optical fibre (GOF), POF OTDR, Brillouin sensor, BOTDA, BOFDA, Fibre Bragg grating (FBG), geosynthetics, geotextiles, technical textiles*

BOGUMIŁ WRANA, BARTŁOMIEJ CZADO

**Application of the CPT Results to Assess the Carrying Capacity of the Pile** • Kwartalnik Górnictwo i Geoinżynieria • z. 2, 2011

Article takes up the idea of designing pile foundations based on the results of *in situ* tests performed by CPT. The basic results of the static cone penetration test CPT are: the cone resistance value of  $q_c$  and the sleeve friction  $f_s$ . Currently research problem is the relationship between the results of the CPT and the

bearing capacity of single pile on axial force, which consists of a pile base load carrying capacity and a pile surface carrying capacity. The article presents recent state of art in this regard. Also presents the results of pile load capacity according to Eurocode 7 and proposals for Purdue University, USA.

**Keywords:** *CPT test, load carrying capacity of piles foundation*

*BOGUMIŁ WRANA, MICHAŁ SKRZYCKI*

**Influence of Clay Content and Water Content on the Strength Parameters in the Industrial Landfill Cap Cover** • Kwartalnik Górnictwo i Geoinżynieria • z. 2, 2011

The article consider the strength parameters of the layer covering the landfill of industrial waste. The multi-layered roof consist with drainage and geosynthetics layers and sandy clay layer called „structural”, which covers the local settlement of waste. The problem of designing mineral material of this layer is to selection of an appropriate percentage of clay content and water content (optimal) to get the highest strength parameters: a) the maximum tensile strength and b) the maximum shear strength. These parameters should be retained for a long period operation of the landfill.

**Keywords:** *industrial waste landfill, landfill strength engineering, mineral mix design*

*TYMOTEUSZ ZYDRÓŃ, MAŁGORZATA KOGUT, ANDRZEJ GRUCHOT*

**Influence of Shear Speed on the Shear–strength of Soils from the Carpatians’ Region** • Kwartalnik Górnictwo i Geoinżynieria • z. 2, 2011

The results of shear-strength tests performed on cohesive soils taken from landslide prone’s areas from Chalakówka (Pogórze Wielickie), Krynica (Beskid Sądecki Mts.), Ropica Polska (Beskid Mały Mts.) and Targanice (Beskid Mały Mts.) are presented in the paper. The aim of the tests was determination of influence of shearing speed on maximum and minimum shear strength of tested soils. The tests were carried out in a standard direct shear apparatus of dimensions of the box 60×60 mm on soils on materials without grains coarser than 2 mm. The samples were formed directly in the box of the apparatus at the natural moisture content. Shear speed were equal to 0.1; 1.0 and 10 mm/min. Each sample were sheared three times up to obtain the relative horizontal displacement of 20%. During shearing the sliding surface was watering. On the basis of the obtained results, one can state that the watering of shearing surface cause decrease of initial (maximum) shear strength of soils up to 80%. The another important factor controlling shear resistance of soils is shearing speed. Increase of shearing speed caused increase maximum shear strength of tested soils. Io the other hand, increase of shearing speed caused decrease of minimum shear strength (obtained during third shearing at large horizontal displacement).

**Keywords:** *shear strength, shear speed, landslides*