Summaries

ZBIGNIEW BESTYŃSKI, KAZIMIERZ THIEL

Geophysical Investigations to Evaluate Geotechnical Conditions of Tunnels Construction • Kwartalnik Górnictwo i Geoinżynieria • z. 3, 2007

The choice of optimal route and construction of the tunnel requires a geotechnical recognition of a wider area where the tunnel might be located. The recognition is possible if we use a proper suite of geophysical methods. In case of geophysical recognition of flysch formations in southern Poland, seismic and geoelectric surveys were proven as the most efficient. The surveys make it possible to characterize basic features of flysch, as lithology and tectonic. Numerous geophysical surveys carried out on area of flysch Carpathians to geotechnical purposes have proven also that geophysical parameters characterizing flysch (seismic wave velocity, electric resistivity) are sufficient to describe its geotechnical properties as geotechnical class. The formula on geophysical index of geotechnical classification, called KFG, was determined using statistical methods in a manner ensuring the index is equivalent to RMR Bieniawski value. KFG index was successfully applied to proposing routes and technology of boring of hydrotechnical galleries. It was also applied for reconnaissance of routes of communication tunnels planed in flysch Carpathians. Seismic and resistivity methods appeared to be very effective in recognition of fluvio-glacial deposits occurring along the tunnel route planned in Gdańsk.

Keywords: *geotechnical classification RMR, geophysical classification KFG, seismic wave velocity, electric resistivity, flysh formation*

KAZIMIERZ BUJAKOWSKI, JERZY CHWASTEK, JERZY MIKOŁAJCZAK

Tunnel Building, Underground Passages and Car Parks in Krakow Today and in the Future • Kwartalnik Górnictwo i Geoinżynieria • z. 3, 2007

Krakow in the last few years became the place of building great traffic undertakings, which were started to plan even in 1970s and 1980s. Structures, which did not bring the glory to the city, around Central Station in Krakow, disappeared, and in their place came into being Krakow's Communication Center with tunnels for vehicular and rail traffic. Investment policy of the City aims to radical improvement of traffic in the city, through constructing new routes, reconstructing existing communication systems including building tunnels. The elements which should improve the city road network are underground passages and car parks currently under construction. Those investments will improve the state of air as well as acoustic situation in the run of main streets of Krakow city.

Keywords: *difficulty of communication, communication routes, road tunnels, underground passages, underground car park*

MAREK CAŁA, SEBASTIAN OLESIAK

Slope Stability Analyses of Second Chamber of the New Municipal Waste Disposal in Zakopane • Kwartalnik Górnictwo i Geoinżynieria • z. 3, 2007

This paper continues description of activities with municipal waste disposal in Zakopane. The previous paper dealt with the reasons of failure of the first chamber embankment [1]. The propositions of stabilisation works were also presented. The process of design verification for the second chamber was described here. The good example of cooperation between

the designer and geo-engineering team was documented. It allowed optimisation of the design to serve the users of waste disposal and to protect the environment.

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

JANUSZ CHMURA, GRZEGORZ KŁYS, ANDRZEJ J. WÓJCIK

Unique Ecosystem's Protection and also Limitations to the Adaptation of the Tarnowskie Góry – Bytom Underground Spaces • Kwartalnik Górnictwo i Geoinżynieria • z. 3, 2007

Tarnowskie Góry — Bytom underground is an extensive and complicated system of mining excavations resulting from hundreds of years of mining and ore exploitation. The total length of all galleries, chambers and pits is over 300 km — it is one of the biggest underground system in the world. This system is connected with the surface of earth by five galleries, many shafts and excavations located in the neighbouring quarries. Over the years, an unique microclimate and a multifarious dripstone cover formed there. Because of favourable conditions, bats settled in it, using this labyrinth as a place of winter hibernation and a shelter during the summer period. Among the bats, eight species have been discovered so far, in particular: *Myotis myotis* and *Plecotus auritus*.

Keywords: *Underground Tarnogórsko-Bytomskie, areas naturally – cultural, protection of nature*

MIROSŁAW CHUDEK, STANISŁAW DUŻY, GRZEGORZ DYDUCH, ARKADIUSZ BĄCZEK

Problems of Loading Capacity of Yielding Heading Steel Set Support Used in a Long Time Period • Kwartalnik Górnictwo i Geoinżynieria • z. 3, 2007

Over 90 per cent of headings in collieries are made with steel support. This support is often under intensive, aggressive influence of mining conditions causing a slow decrease of construction load capacity. The paper presents results of in situ research of corrosion of steel support set ŁP, on the basis of headings steel supports set, used in a long period of time, reliability maintenance geomechanical and technical problems. On the basis of the results of the research, the characteristic features of the corrosion process and their influences of the construction load capacity are presented.

Keywords: *underground structures, steel arch support, corrosion, loading capacity*

PIOTR CZAJA, JOANNA HYDZIK

New Approach in Construction of Shaft Lining Sunk in Frozen Rock Mass • Kwartalnik Górnictwo i Geoinżynieria • z. 3, 2007

Application of new material presenting higher strength and lower heat conductivity are widely used in nowadays civil engineering. It brings specific economical and ecological profits. Application of the materials so called "new generations" in constructions of underground structures especially in tunnel and shaft lining can provide several advantages. This paper presents new concept of shaft lining sunk by the method of rock mass freezing. Replacement of the ordinary gravel concrete by means of High Performance Concrete (HPC) and Light Weight Aggregate Concrete (LWAC) we can reduce heat stream flowing across the lining. It means that temperature inside the shaft bottom can be increased up to +5°C without any risk of melting frozen rock mass. This let us in application into the permanent layer of the shaft lining the high performance concrete. This idea can be also introduced in the deep mines for lowering the quantity of heat flowing from rock mass to the ventilation air, resulting decrease of mine air conditioning power.

Keywords: *shaft sinking, shaft lining, HPC concrete*

DANUTA DOMAŃSKA, ANDRZEJ WICHUR

The Possibilities of Employing Inclinometric Measurements in Slope Stability Evaluation • Kwartalnik Górnictwo i Geoinżynieria • z. 3, 2007

The importance of slope safety for the human life and economy ensures the constant control (monitoring) of these objects, conducted with inclinometric measurement, among other means. In order to provide full implementation

of the measurement readings, their correct interpretation is essential. The course of horizontal shifts of the inclinometer hole axis obtained from the measurements constitutes the basis for the analysis. In the light of the conducted research, two methods of evaluating slope stability were evolved: the method of reducing the soil elasticity factor value and the method of analyzing the state of soil effort in the inclinometer hole axis and its relation to slope stability. The critical horizontal shift value obtained in this way is reliable in slope stability evaluation on the basis of inclinometric measurements.

Keywords: *inclinometric measurements, slopes, stability evaluation*

STANISŁAW DUŻY

Behaviour of Yielding Steel Arch Support in Rock Strata Deformation Pressures Conditions in Underground Observations · Kwartalnik Górnictwo i Geoinżynieria · z. 3, 2007

In the rock strata deformation pressures occurrence conditions a yielding steel arch support is commonly used. In the commonly used support work models, symmetrical support deformations, caused by a simultaneous dislocation in both arch locks, are adopted. Underground observations have shown that the deformations of even neighbouring arches may differ emphatically in quality as well as in amount. The paper presents results of yielding steel arch support behaviour in headings in mining exploit area, on the basis of which the statement can be made that the yielding steel arch support during the usage of the heading is deformed within the range of the susceptibility and the plastic elements deformations, in some arches the deformations had the factors of stiff support deformations, the support deformations are characterised by asymmetry, often the dislocations occur in only one lock and the deformation process of certain arches along heading coastings show its, which can be compared to a wave process.

Keywords: *underground structures, development excavations, steel arch support, loading capacity*

SŁAWOMIR FABICH, BOGDAN KOKOT, JACEK KULICKI, MARCIN SZLĄZAK

Cast Iron Shell Type of Shaft Lining Applied in the LGOM Copper Mines. Causes of Damages, Repairment Methods and Prevention Measures · Kwartalnik Górnictwo i Geoinżynieria · z. 3, 2007

At present on the area of LGOM mines operate 29 shafts. In all of them, on the section of Tertiary formations and upper layers of the bountersandstone tubbing lining is placed. This lining, in spite of many irrefutable advantages undergoes at present the gradual destruction resulting from taking over the significant deformations of the rock-mass being the consequence of mining operations impact. Damages refer to tubbing columns of the oldest shafts (period of operation over 35 years) having diameter of 6,0 m and picotage slots. Damages of the compression character firstly concern all tubbing segments built-up on picotage slots. A basic method of the repair of damaged tubbing segments is strengthening them by installing into inter-rib spaces, individually fitted cast-iron strengthening insertions of various construction, depending on the character of the damage. Nowadays, due to the more and more greater scale of mining impact on shafts lining, preventive actions aimed to limit the lining destruction, become of the critical importance. A first direction of activities undertaken is the selection of the suitable mining system in the close vicinity of protective pillars, to minimize their impact on the shaft. Second direction is preparation of the tubbing column to taking over the impact of mining operations safety. And there the activities targeted to strengthen or yield the tubbing column in the areas picotage slots are carried out.

Keywords: *cast iron shaft lining, damages, repairment, prevention*

KAZIMIERZ FLAGA, KAROL RYŻ

Didactic Activity of the Chair of Bridge and Tunnel Construction in the Cracow University of Technology in the Field of Transport Underground Construction · Kwartalnik Górnictwo i Geoinżynieria · z. 3, 2007

In the paper a characteristic of didactic activity of the Chair of Bridge and Tunnel Construction in the Cracow University of Technology in the field of transport underground construction is given. This activity has been described in the context of the history of the development of the Chair since the very beginning of CUT, it is since the year 1945. The characteristic includes: subjects and organizational framework of student lectures and classes,

diploma works, didactic excursions, conferences devoted to didactic, usage of Internet for teaching purposes, edited lecture notes and other editorials. Emphasis is put on continuous efforts toward harmonizing the didactic process with needs of investment and construction marked in Poland. Also the need for permanent education resulting from rapid development of the underground construction industry is underlined. Long term didactic work of the Chair is positively verified by professional achievements of many Chair absolvents being active in Poland as well as abroad.

Keywords: *transport underground construction, didactic, historical mentions, subjects and organizational framework of student lectures and classes, diploma works, didactic excursions, didactic conferences, usage of Internet for teaching purposes, edited lectures, other editorials*

NINA FOTIEVA, NIKOLAY BULYCHEV,
SERGEY ANTZIFEROV, ANDREY SAMMAL, PETR DEEV

Stress State of Multiple Tunnel Linings Constructed in Urban Areas with the Application of Grouting • Kwartalnik Górnictwo i Geoinżynieria • z. 3, 2007

A method for the design of multiple circular tunnel linings constructed in built-up areas with the application of soil grouting developed at Tula State University is described in the paper presented. The method allows the stress state and bearing capacity of linings to be evaluated under the actions of the soil own weight and the weight of buildings or structures both existing on the surface before the tunnels driving and erected nearly to the already exploited tunnels. The method is based on analytical solutions of corresponding plane problems of elasticity theory and is added by a special technique for approximate taking the 3D character of surface loads into account, caused by limited sizes of buildings in the direction along the tunnel axes and by spatial locations of several buildings in this direction. This approximate approach as well as a possibility of applying the linear solutions for tunnel linings calculations has been validated by comparison of the results obtained with the data from physical and 3D non-linear numerical modelling. The corresponding software has been developed. Examples of the design are given.

Keywords: *multiple tunnels, lining, soil mass, grouting, building, stresses, bearing capacity*

WOJCIECH GRODECKI

Experience of Warbud SA in the Field of Underground Construction • Kwartalnik Górnictwo i Geoinżynieria • z. 3, 2007

The paper presents Warbud SA's selected achievements in the field underground construction with the use of the cut-and-cover method and in particular with the use of the slurry wall method. The construction process for the A15 „Ratusz" and A19 „Marymont" underground stations was described as well as the methods for building underground levels of volume structures. The originality of technological solutions deciding about the contractors' success as well as technical and economic benefits resulting from the applied solutions were presented. The company's potential to build slurry walls and the possibilities for cooperation with Solétanche Polska was discussed. Solétanche is a French company which cooperates with Warbud SA within the French holding of construction companies — VINCI Construction.

Keywords: *underground structures, cut-and-cover methods, slurry walls*

WOJCIECH GRODECKI, ANNA SIEMIŃSKA-LEWANDOWSKA

Education of Civil Engineers in the Area of Underground Structures in Warsaw University of Technology • Kwartalnik Górnictwo i Geoinżynieria • z. 3, 2007

The paper presents the system of education of civil engineers in the area of Underground Structures in Bridges and Underground Structures specialisation. The total amount of obligatory lectures and practice courses on undergraduate (B.Sc.) and graduate (M.Sc.) levels are given.

Keywords: *underground structures, education*

WŁODZIMIERZ HAŁAT

Solution of Beams with Use of Heaviside's and Dirac's Functions · Kwartalnik Górnictwo i Geoinżynieria · z. 3, 2007

Utilization of symbolic calculations method (Computer Algebra System) allows to solve problems, that can be precisely described with mathematical formulas. Use of the method proposed by A. Clebsch — under condition of a certain way of notation —simplifies solutions of bending beams. This also allows introducing Heaviside's and Dirac's functions, connected with distribution theory, for solutions the problems. The functions connected with abstract differential operator noted as D**,** allow for compact symbolic way of calculations beams under bending conditions.

Keywords: *symbolic calculations CAS, A. Clebsch's method, Heaviside's and Dirac's functions, abstract differential operator D, beams' bending*

WŁODZIMIERZ HAŁAT

Use of Computer Algebra System for Beams' Bending Problems · Kwartalnik Górnictwo i Geoinżynieria · z. 3, 2007

CAS Calculations methods (Computer Algebra System) take a special position in supporting software packages for technical scientific research works. They can be used for a wide range of advanced applications in various engineering solutions including constructions and geotechnics. With the symbolic calculations method it has been presented the role of support onto: reaction forces, bending moments, transversal forces, bending angles and profile lines in the beams under bending process. The results in the form of symbolic mathematical formulas are illustrated with diagrams that have been plotted obviously based on number values but not symbols.

Keywords: *CAS packages, symbolic calculations, beam bending, reactions, bending moments, transversal forces, bending angles, bending profile line*

EVA HRUBEŠOVÁ, ZDENĚK KALÁB, ROBERT KOŘÍNEK, PETR ŽŮREK

Geotechnical Monitoring and Mathematical Modelling in Medieval Mine Jeroným (Czech Republic) · Kwartalnik Górnictwo i Geoinżynieria · z. 3, 2007

In this paper, methods of the geotechnical monitoring and results of the first stage of mathematical modelling in the Medieval Mine Jeroným in Czech Republic are presented. The mathematical modelling for the determination of stress-strain conditions and stability state in the six sections of the mine room K2 was realized by Plaxis programming system.

Keywords: *Medieval Mine Jeroným, geotechnical monitoring, mathematical modelling, Plaxis programming system*

JOANNA HYDZIK, PIOTR CZAJA

Light Weight Aggregate Concretes as Structural Element of the Preliminary Lining of Shaft Driven in Artificially Frozen Rock Mass · Kwartalnik Górnictwo i Geoinżynieria · z. 3, 2007

The application of Light Weight Aggregate Concrete (LWAC) as heat insulating and structural element for the preliminary lining of shaft fundamentally change the conditions of interchange heat between frozen rock mass and inside of shaft. This paper presents results of the laboratory tests in which the possibility of obtaining concretes especially with allow for binding and hardening in direct contact with frozen rock mass was specified.

Keywords: *the lining of shaft, Light Weight Aggregate Concrete*

JACEK JAKUBOWSKI, JACEK STYPULKOWSKI

Tunnel Stability Analysis in Blocky Rock Mass, for Manhattan Underground Tunnel Conditions · Kwartalnik Górnictwo i Geoinżynieria · z. 3, 2007

The paper presents discontinuities effect on tunnel stability conditions analyzed with MSB numerical simulation method. Based on statistical description of discontinuities network the MSB method and code creates representation of a blocky structure around a tunnel and analyzes it within a general statistical simulation scheme. Comprehensive description of geology in the vicinity of underground tunnel in Manhattan, New York was a basis for building a statistical model of discontinuities network followed by numerical simulation of stability conditions. Results for two different tunnel directions and for unsupported and rock bolted tunnel were compared. Information on observed geometry, location and size of real unstable blocks around the excavated tunnel allowed comparing computation results with observations.

Keywords: *rock mechanics, statistical simulation, numerical simulation, block theory, underground construction, tunnelling*

PAWEŁ JEDNACZ

Interpretation and Comparison of the CPTU Testing and Other Field Testing of Krakow Silts in the Light of Laboratory Investigations · Kwartalnik Górnictwo i Geoinżynieria · z. 3, 2007

The results of initial testing of Cracow silts and its interpretations clearly show this kind of soil are not described enough in the light of foundation design. This paper shows some interpretation's problems and the consequences of interpretation's errors coming from field investigations. This is the initial phase of research program, field tests and laboratory investigations will be extended.

Keywords: *in situ tests, cone penetration testing, silt, plasticity factor, interpretation*

TOMASZ KARNOWKA, WIESŁAW GRZYBOWSKI

The Reconstruction of the Casing of the Underground Receptacle of Borings in the Coal Mine „Rydultowy-Anna" · Kwartalnik Górnictwo i Geoinżynieria · z. 3, 2007

Intensive exploitation of the underground coal bunker in the coal mine „Rydultowy-Anna" caused significant damages of the lining and the shoot funnel that had been made on the joint of the older and younger part of the receptacle. Problems, connected with the repairing, resulted from the atypical construction of the bunker, a difficult access to places that need repairing and the impossibility of exclusion of excavation from exploitation apart from days-off. In the article, there is presented used technology of works connected with the reconstruction of the lining and the shoot funnel. For their realisation there was done an additional technological intake to the bunker. The casing was recreated using the repairing system for concrete CT-95.

Keywords: *coal bunker, the reconstruction of the lining*

MACIEJ KĘDRACKI

Prognosing the Subsidence of Terrain Surface Caused by Tunnel Building · Kwartalnik Górnictwo i Geoinżynieria · z. 3, 2007

The article presents a rough estimate of terrain subsidence resulting from tunnel building. After a short coverage of the topic of terrain subsidence resulting from tunnel construction with the use of the shield methods, the method of no-dig tunneling has been characterized, together with an indication of its effects on the surrounding environment. The majority of theories and methods concerning the prognosis of the terrain surface subsidence resulting from the process of tunneling, has been presented. The author of the article suggests that prognosing the terrain subsidence caused by tunnel building processed in soil, especially those using methods of no-dig tunneling, should adapt the relations resulting from the indicator of density.

Keywords: *pipe jacking tunneling, surface's subsidence, shield method*

ROMAN KINASZ

Reserves of Load-Carrying Ability of Crossbars of a Frame Systems of a Reinforced Concrete Skeleton · Kwartalnik Górnictwo i Geoinżynieria · z. 3, 2007

Thrust forces which arise on support of crossbars of a frame of a reinforced concrete skeleton of a building positively influence their work and as consequence-increase load-carrying ability. During carrying out of inspection of four-storeyed six flying frames the estimation of distribution of efforts thrust on support of reinforced concrete crossbars on all floors in view of features pivots connections of crossbars with columns is executed. Results of the executed researches have confirmed presence and influences of thrust efforts on support of reinforced concrete crossbars of a frame on increase in their carrying ability, that in the works many researchers theoretically expected. The essential increase in load-carrying ability of reinforced concrete crossbars of overlappings (from 40 up to 4%) depending on height of their accommodation in a frame system is received. Crossbars of a covering practically have no reserves on the second group of limiting conditions in connection with the big width of disclosing of normal cracks in them.

Keywords: *thrust forces, reserves of load-carrying, reinforced concrete skeleton, frame*

ROBERT KLISOWSKI, ANDRZEJ SZUMIŃSKI

The Feedback Factor of the Testing Machine Control System and the Results of the Research of Post-Failure Properties of Concrete Specimens · Kwartalnik Górnictwo i Geoinżynieria · z. 3, 2007

The selection of the feedback signals for the control of the loading of the specimen is particularly important in post-failure tests. Any mistakes in this area may significantly affect the results achieved, often preventing the correct execution of the experiment. The research conducted shows that the post-failure parameters of the specimens, depending on the selected command signal of the testing machine, may vary in quality, as well as quantity, showing varying behaviour according to the post-failure classification.

Keywords: *post-failure properties of materials, feedback signals*

ZDZISŁAW B. KOHUTEK

Conformity Testing of Concrete Properties Other than Strength — Theory and Practice · Kwartalnik Górnictwo i Geoinżynieria · z. 3, 2007

Conformity testing of concrete properties has been introduced to the engineering practice by the PN-EN 206-1 European Standard. Previous national regulation (PN-88/B-06250) provided for no requirements; it also did not state any criteria in this respect. The European Standard provides for the separate procedure of conformity testing of strength properties and separate for properties other than strength. The monitoring of conformity — separately for consistence and separately for group of other properties, like: density of light-weight concrete, density of heavy-weight concrete, water/cement ratio, cement content, air content and chloride content of concrete — have been presented in this publication. Each of the decribed procedures has been illustrated by a numeric example.

Keywords: *concrete, conformity*

OTAKAR KRÁSNÝ, VLADISLAV HORÁK

The Reinforcement of Tunnel Lining of Former Service Tunnel Due to the Load Caused by a New Underground Structure · Kwartalnik Górnictwo i Geoinżynieria · z. 3, 2007

Close to an eastern part of a historical centre of the city Brno, between the streets Benešova and Koliště, there is planned a project of huge multi-functional building called CD-Palace, which should be built up in area of already canceled depo of the Main Railway Station Brno. Under the south-eastern corner of a planned building is situated former deep layed service tunnel Malinovského náměstí. The underground foundation structures are ended only 4,75 m upon the top of the tunnel. Due to the increment of load of 200 kPa which will be caused by foundations there was set question whether the construction of tunnel is capable to carry such a load. The method chosen to calculate this problem was mathematical modelling with finite element method.

Keywords: *service tunnel, tunnel lining, reinforcement frames, mathematical modelling*

ROMAN ŁANOCHA

Impact of Foundation Heading Depth for Shape and Range of Loosening Zone • Kwartalnik Górnictwo i Geoinżynieria • z. 3, 2007

Dependence of stability flat roof, before and past of its crack on rock feature and depth of foundation heading as well as generation of trapezoidal arch are shown. The arch theories have been reviewed. M.M. Protodyakonov and P.M. Cymbarewicz theories have been set up based on the single common, inaccurate rock-hardness ratio. The influence of excavation loading has been omitted. In A. Sałustowicz's analysis it was pointed out that elliptic shape of excavation cross-section is good for lining brickwork, concrete and reinforced concrete.

Keywords: *arch, excavation*

DARIUSZ ŁYDŻBA, CEZARY MADRYAS

Teaching of Underground Structures and Urban Infrastructures at Civil Engineering Department of Wrocław University of Technlogy • Kwartalnik Górnictwo i Geoinżynieria • z. 3, 2007

The paper presents education system of underground structures and urban infrastructures courses guided at Civil Engineering Department of Wrocław University of Technology. Namely, the content of the courses of the first-degree study (engineering) as well as the second-degree study (master of science) are discussed. Special attention is paid to the courses content guided for students of master study of BPIM specialization. Teaching of underground structures and urban infrastructures at other specialization of the master study of Wrocław University of Technology are only presented in a superficial manner.

Keywords: *education, underground construction, urban infrastructure engineering*

TADEUSZ MAJCHERCZYK, ZBIGNIEW NIEDBALSKI, PIOTR MAŁKOWSKI

The Influence of the Underlaying Goaf on the Gangway Location • Kwartalnik Górnictwo i Geoinżynieria • z. 3, 2007

The paper presents the results of numerical calculations considering the gangway location during the drifting in the active roof fall zone of the underlaying seam. These calculations were the base of changing the gangway location in relation to the goaf. The presented solution is both safe and economical. Nowadays mining works points that this proposal of changing the gangway location influenced by the goaf zone is correct.

Keywords: *mining, geomechanics, stability of excavations*

TADEUSZ MIKOŚ, JANUSZ CHMURA

The Engineering Problems of Drainage, Stabilization, Modernization Antique of Srebrna Góra Fortress • Kwartalnik Górnictwo i Geoinżynieria • z. 3, 2007

The Srebrna Góra fortress, along with the town picturesquely situated below, forms an unforgettable tourist complex. Forgotten and neglected for years, the fortress is nowadays in poor technical condition and requires carrying out a great deal of protective treatment and restoration work. The mysterious atmosphere of the place attracts enthusiasts of various forms of tourism and leisure. A few years ago, the Stoszowice district established the Fortress Cultural Park in Srebrna Góra. These actions are aimed at saving and adapting this exceptionally attractive monument for practical purposes. The present technical condition of the fortress is poor, and in certain areas its stability is at risk. The main cause of the destruction of the fortress walls, both external and internal, is the occurrence of frost penetration produced by rainwater runoff uncontrolled for many years. The article presents the planned protective-restoring works aiming at stopping the progressing destruction caused by the lack of an effective and tight rainproof isolation. Such actions will enable the opening of this extremely precious monument.

Keywords: *Srebrna Góra fortress, insurance (security) and reconstruction of citadel, drainage, isolation*

MARTA PAJĄK

Cast in Situ Concrete Diaphragm Wall as a Lining of Deep Excavation for the Edison Investment Realization in Krakow • Kwartalnik Górnictwo i Geoinżynieria • z. 3, 2007

The paper described basic factors affecting the selection of a kind of lining of deep excavation: kinds of linings applied in Poland were enumerated. Also, construction and performing of concrete diaphragm walls were characterized as well as possibilities for their realization. Also the indications related to a forming of a design of works monitoring the realization of deep excavation for neighbouring constructions was presented. The paper characterized the construction process of concrete diaphragm construction, constituting the lining of deep excavation performed during realization of the Edison investment in Krakow. Geotechnical conditions for examined construction were presented. Subsequent stages of preparatory work were described as well as proper realization works construing the concrete diaphragm wall from the moment of preparation of the construction site to the moment of deepening of the excavation.

Keywords: *diaphragm wall, lining of a deep excavation*

DOROTA PAWLUŚ

Application of Neural Networks to the Prediction of the Surface Subsidence • Kwartalnik Górnictwo i Geoinżynieria • z. 3, 2007

This paper presents an application of neural networks for the prediction of a surface subsidence. The main advantage of the artificial neural network approach is that there is no need to assume the type of functional relation and there is no need to have an accurate knowledge of material properties in the area of interest. Only the geometry of the neural network has to be chosen and the learning procedure has to be successfully completed. The networks were used as a solution to following problem. There was given excavated quadrangular area which was described by the following factors: the cordinates of vertices of a worked area, the seam thickness, the depth of the opening, an angle of the mining influence and the subsidence factor. We want to predict the final subsidence of any point of surface. The the multi-layer feed-forward networks were used for modeling the surface subsidence trough. The supervised learning has been used. Figures 4 and 5 present the final subsidences of the points lying on two lines. The neural networks could be used for computing the surface subsidence. The autor will intend to use networks for computing the other factors of the surface deformations.

Keywords: *neural networks, surface subsidence*

RUDOLF PÖTTLER, FRANZ STARJAKOB, PAWEŁ SYSIK

Interdisciplinary Aspects of Tunnel Design • Kwartalnik Górnictwo i Geoinżynieria • z. 3, 2007

When taking all aspects (geology, environment, geotechnics, safety, traffic aspects, ventilation, economic aspects, operational aspects) into account tunnelling is a very complex design task. It is to be understood that the whole is more than the sum of its parts, and requires an interdisciplinary design process. The paper will deal in the first chapter with the success factors necessary for the interdisciplinary design and layout of high-speed railway tunnels. ILF carries out complex tunnel projects using its in-house capacity. Examples of how different aspects influence each other will be given with the high-speed railway tunnels in Germany and Austria.

Keywords: *tunnel, design, interdisciplinary, safety, methods, risk analysis*

WOJCIECH PREIDL

Building Disaster in the Czernicki Tunnel • Kwartalnik Górnictwo i Geoinżynieria • z. 3, 2007

In May 2007 passes the anniversary of the building disaster which occurred in 1857 in Czernicki tunnel on the route of the Wilhelm Railway on the Nędza – Katowice Ligota section. Built at a high cost and manpower from its beginning caused many problems for builders. Very weak clayey grounds with sand contents already during the cross cutting of tunnel caused deformation load on the wooden temporary lining caused its strong deformation.

Tunnel was set into operation at the beginning of 1857. The rainy spring of this year brought about sopping of the ground around the tunnel. At the begin of May of this year observed first cracks in the final tunnel lining and at the 17th of May the tunnel partially collapsed in its central section. Very important railway for the Rybnik coal mines was blocked. In his book [8] Leon Peszel basing on the opinion of prof. Karol Wątorek writes "...we can conclude about volume of the soil load basing on the temporary lining behavior. From the deflection's measurement, crushes of the lining elements we can calculate the volume of the pressure occurring in determined cross-section of the tunnel" [7]. This opinion was presented in the first half of the XX century so almost 70 years after the disaster in Czernica when the geomechanics and statics of underground constructions reached considerable higher level then in Franz Rziha times.

Keywords: *tunnel, underground construction, history*

KRYSTIAN PROBIERZ, PIOTR STRZAŁKOWSKI

Underground Construction and Surface Protection Studying Speciality on the Faculty of Mining and Geology, Silesian University of Technology • Kwartalnik Górnictwo i Geoinżynieria • z. 3, 2007

Basic information on study specialisation: „Underground construction and surface protection", led on The Faculty of Mining and Geology, Silesian University of Technology have been presented. The education profile of graduate has been characterised as well as information on didactic base.

Keywords: *didactics, Faculty of Mining and Geology, Silesian University of Technology, study specialisation*

TADEUSZ REMBIELAK, JAN KRELLA, JANUSZ ROSIKOWSKI, FRANCISZEK WALA

Injectory Rock Mass Firming During Rebuilding of Headings Junctions • Kwartalnik Górnictwo i Geoinżynieria • z. 3, 2007

The occurring mineral water in KWK "Piast" cause corrosion of the excavations' lining. Because of that it is necessary to rebuild these dog headings. In order to increase safety during rebuilding dog headings junctions, there were applied forthcoming injectory firming the rock mass in its surrounding, which prevents from occurring the fall of rocks and from the results of these fallings. In the paper there was presented an exemplary technology of headings junctions rebuilding in KWK "Piast".

Keywords: *mining industry, exavations driving, preceding rockmass firming, sealing and firming, mining safety*

JANUSZ RUSEK, TOMASZ SANOCKI

Przedsiębiorstwo Budowy Szybów (Shaft Sinking Company) — Non-Standard Tasks in Shaft Construction • Kwartalnik Górnictwo i Geoinżynieria • z. 3, 2007

In December 2003 Kopex SA concluded a Contract for main shaft deepening, construction and furnishing of support excavations at Çayeli Bakir Isletmeleri Zink and Copper Ore Mine in Turkey. From December 2003 till August 2007, PBSz SA carried out complete work in mining and mechanical branches, within the confines of a project consisting in opening-out a new production level. The scope of work included: deepening by 286 m an operating production shaft of 5.5 m diameter, construction and furnishing of shaft station room, skip pocket, conveyor drift, electric substation room and main pump room on the new production level, sinking of oblique ore passes and a ventilation raise, driving approx. 1000 m of stone headings with the application of shotcreted anchor support. During the shaft and ore pass sinking, the construction of support structures and driving of headings procedures employing the techniques of large diameter hole drilling and blasting were applied at a wide range. The procedures applied allowed the carrying out non-standard tasks in shaft construction.

Keywords: *shaft, shaft deepening, oblique ore passes, ventilation raise, fuel pipeline, large diameter holes, chute raises*

WITOLD STACHOŃ, JANUSZ CHMURA

Organic-mineral Silicate Resins in Underground Construction and Tunnelling • Kwartalnik Górnictwo i Geoinżynieria • z. 3, 2007

Organic-mineral silicate resins are a specific group of the injection-media widely at present used in underground construction and tunnelling. Their common feature is the water environment has no influence on the course of the reaction. The distinction between them and the polyurethane resins (PUR) is they do not transfer the flame and belong to the group of self-extinguishing resins. Both the characterization and examples of the use of organic-mineral silicate resins have been given in the paper.

Keywords: *silicate resins, underground construction, tunnelling*

MAREK SZEBESTA, WIESŁAW GRZYBOWSKI

Consortium PRGiBSz Joint-Stock Company — into the Future with Tradition • Kwartalnik Górnictwo i Geoinżynieria • z. 3, 2007

The Consortium of Polish enterprises for underground works and shaft sinking Join-stock company is originated from the tradition of the old Companies of Mining Works, which tasks were to build and extend coal mines. In the article, there is presented the actual organizational structure of the Consortium from the aspect of changes and historical transformations. The aim of the activities is joining knowledge and experience connected with realisation of various complicated undeground and surface works in one subject. It is reflected in the actual economical condtion of the joint-stock company — after the crisis, which has lasted in the mining trade lately. The examples of works, which were done and these ones, which are still making show the engineering, hardware and technological potential of the company. Numerous prizes and honours prove that our Consortium heads for the right direction of the activities that are taken in order to make the modern and well-developing company. Our company has its roots in the mining tradition and it's the base for the realisation of the overriding aim that is fulfiling customers and crew's expectations, making them satisfied and willing to constant improving.

Keywords: *the Consortium, PRG, tradition, future*

ANTONI TAJDUŚ, ANDRZEJ WICHUR

Staff Training for the Needs of Underground Construction in the AGH University of Science and Technology in Kraków • Kwartalnik Górnictwo i Geoinżynieria • z. 3, 2007

The AGH University of Science and Technology in Kraków is one of the largest and most important technical universities in the country; it is always classified high in rankings. The didactic activity of the University is conducted in 15 departments and two interdepartment schools. In the paper, the basic principles of underground construction staff training in the AGH University of Science and Technology have been presented. It points out the relations between the applied educational system with the environmental option, considering the mining environment (the rock mass) as the starting point. The advantage of the system facilitating the attainment of jobs („the university that gives jobs") and the step towards the realization of a geoengineer's profile have been capitalized upon.

Keywords: *underground construction, geoengineering, staff training*

PIOTR TRĘBACZKIEWICZ, MIECZYSŁAW WINCH

Binders Based on Expansive Cement • Kwartalnik Górnictwo i Geoinżynieria • z. 3, 2007

Expansive binders are active materials that meet the compatibility requirements of the concrete construction repairs. Thanks to self-tension of these materials, they react on construction before the forces extort collaboration. This feature is extremely important in underground construction when securing exposed rock mass.

Keywords: *expansive binders, mining excavation, mining lining, shotcrete, expansive concrete, steel micro-reinforcement, polypropylen micro-reinforcement, dry shotcreting, rock mass*

JAN WALASZCZYK, DARIUSZ WIEWIÓRKA

Analysis of Surface Oscillation Caused by Strata Cracking · Kwartalnik Górnictwo i Geoinżynieria · z. 3, 2007

There is computer modeling of strata cracking and influence this cracking on the surface presented in the paper. It was done for LGOM geological conditions. After several computer simulations results were digital processed. These results were performed as function of displacements, velocities and accelerations in the chosen points of numerical models.

Keywords: *geomechanics, dynamics, rockbursts, wave phenomena*

DANIEL WAŁACH, JAN WITOSIŃSKI

The Shaft's Lining Corrosion in Destructive and Non-Destructive Research in „Antoni" Shaft Hard Coal-Mine "Marcel" · Kwartalnik Górnictwo i Geoinżynieria · z. 3, 2007

A great number of destructive and non-destructive investigations were carried out by authors of the paper in 2006. Those researches were done in order to describe the technical condition of shaft's lining of hard coal-mine "Marcel". The results of investigation in shaft "Antoni" are presented in the paper. One evaluated the lining load capacity refer to actual lining thickness and loading on the shaft wall. On the base of results the analysis of increasing level of corrosion was carried out.

Keywords: *shaft lining, non-destructive investigations, research in shafts*

ANDRZEJ WICHUR

Remarks on Designing Technologies of Rock Mass Freezing for the Needs of Shaft Deepening · Kwartalnik Górnictwo i Geoinżynieria · z. 3, 2007

Domestic experiences indicate that the method of rock mass freezing may be applied practically in all geological-mining conditions; the sole limitation here are the costs, which, in many cases, render deepening with this method uneconomic. The collected research results and the need for applying this technology substantiate the requirement of evolving refined principles of designing technologies of freezing the rock mass to deepen shafts in the conditions of water-logged overlay of considerable thickness. These principles ought to be based upon previously elaborated guidelines that had proved their suitability during the designing of the rock mass freezing in the conditions of the Lublin Coal Basin.

Keywords: *rock mass freezing, mining shafts, designing technologies*

ANDRZEJ WICHUR, MAREK BAJOREK, KORNEL FRYDRYCH

The Method of Checking Shell Lining Flexibility · Kwartalnik Górnictwo i Geoinżynieria · z. 3, 2007

One of the elements of designing shell lining is checking its flexibility, which consists in demonstrating that the structural flexibility of the lining is greater than the forced rock mass shifts. The paper shows that the numerical factor 0,9 presented in the formula (21) of the standard (PN-G-05600:1998) has a diversified value dependent on the mechanical parameters of the rock mass and the lining. The analysis has been carried out on the basis of the solution evolved in the paper [9], with the assumption of the elastic work of the lining and the rock mass. Calculations have been made for 8 kinds of rock mass, characterized by values of the rock-hardness factor according to Protodiakonov $f = 1.5–5$ and for 13 lining sections according to (PN-G-06010:1998) at the cross-sectional area in the inside diameter of the mine working ranging from 10 to 53 square meters. The results of the work confirm the stated assumptions. The value 0.9 given in the standard (PN-G-05600:1998) corresponds to the values of κ obtained for the lining flexibility factor k_2 calculated with the formula (25). This is a case in which the lining flexibility factor constitutes around 60% of the rock mass flexibility factor.

Keywords: *underground workings, shell lining, flexibility*

ANDRZEJ WICHUR, KORNEL FRYDRYCH, AGNIESZKA ZIĘBA

Comparative Studies on Methods of Calculating the Load of Linings of Dog Headings Nonsubject the Influence of Mining Exploitation · Kwartalnik Górnictwo i Geoinżynieria · z. 3, 2007

The development of underground construction technology in the post-war period in Poland caused the improvement of the technique of driving and lining underground workings, in particular the construction of underground dog heading linings. In order to compare these methods, calculations have been made for 27 analytical variants. The obtained large discrepancies among the calculated values result from the lack of verification of these calculation results with load measurements in situ. It can thus be inferred that sole calculation results cannot be relied upon: carrying out measurements in mine conditions is essential.

Keywords: *dog headings, lining, load*

ANDRZEJ WOJTUSIAK

Struggles against water hazard in salt shafts of Bosnia · Kwartalnik Górnictwo i Geoinżynieria · z. 3, 2007

The article presents the story of struggle against a serious water hazard in a salt mine located in former Yugoslavia. Being poorly adapted to operating in the conditions of ground deformation, the shaft lining was subject to a rapidly increasing deterioration process. A particularly difficult situation occurred as a result of the front of uncontrolled salt leaching approaching the immediate vicinity of the main shaft, causing fractures and leakage of the tubbing. The inner steel-concrete lining applied and constructed already in the conditions of mine flooding allowed for the restoring of leaktightness and the extension of the mine's operational use by 20 years.

Keywords: *salt shafts, water hazard, lining tightness, tubbing security*

JACEK ZYNEK, ANDRZEJ ANTOSZ

Construction of a Drift under the Chmielnik Mountain in Jelenia Góra — Cieplice · Kwartalnik Górnictwo i Geoinżynieria · z. 3, 2007

The paper presents all stages of tunnel (drift) construction underneath Chmielnik mountain massif near Jelenia Góra city. Detailed descriptions of execution techniques, natural rock mass conditions and principles of drivting with drill and blast method are presented in it. Reasons for execution of elements which were not predicted in primary documentation but were necessary for the safety operation of the object were also presented. Due to very difficult local rock conditions, the whole tunnel was supported with lining of portal type. The paper consists a set of the most significant theoretical knowledge and experience of the contractor, who have provided safety execution the work with proper quality and within scheduled time. Excavated tunnel serves for water pipelines conduct treated water from water treatment station on one side of Chmielnik Hill to retention/reserve reservoirs on the other side.

Keywords: *Chmielnik Hill, drift, tunnel, PeBeKa SA, Water Treatment Station in Jelenia Góra city, driving with drill and blast method*