

WOJCIECH GRODECKI, CEZARY MADRYAS, ANTONI TAJDUŚ, ANDRZEJ TOKARZ,  
ANDRZEJ WICHUR, RYSZARD ŻYLIŃSKI

**Selected Problems of the Underground Construction** • Kwartalnik Górnictwo i Geoinżynieria • z. 3/1, 2005

The basic problems of the Polish underground construction both in the rocks (chapt. 2) and grounds (chapt. 3) have been discussed in the paper. The problems of the underground net infrastructure of cities have been focused on in the chapt. 4. Selected topics of the geotechnical designing in the underground construction and cross relations among the underground construction, geotechnics and geoengineering, have been presented in the last part of the paper. It has been finished by the summary indicating the prospects for the development of the underground construction in Poland.

**Keywords:** *underground construction, development's barriers, development*

JOSEF ALDORF, LUKÁŠ ĎURÍŠ

**Atypical Solution of a Road Tunnel Valík** • Kwartalnik Górnictwo i Geoinżynieria • z. 3/1, 2005

The contribution informs of advancement for solving the stability of the tunnel Valík reinforced concrete abutment. This concept option was due for lowering the environmental impacts accompanying the tunnel excavation.

**Keywords:** *road tunnel, reinforced concrete, abutment*

JOSEF ALDORF, EVA HRUBEŠOVÁ, PAVEL ŠÍPEK

**Contribution to the Synergic Impact of the Stabilization Intervention During Pit Deepening** • Kwartalnik Górnictwo i Geoinżynieria • z. 3/1, 2005

This paper deals with the pit construction of the exit facility, which will serve as an escape route from a sewer collector located in front of the Imperial Hotel in the city centre of Ostrava. The design is based on ground stabilization by means of sheeting, nailing, and anchoring. The pit construction was executed within the project "The enlargement of the sewage network of Ostrava — Stage of construction II — City centre sewer collector — SO 024 escape route of the Imperial Hotel".

**Keywords:** *ground stabilization intervention, pit deepening, escape pit, sewage net*

BRONISŁAW BARCHAŃSKI

**Liquidation of a Hazardous Waste Disposal Site on the Example of SMD Kölliken (Switzerland)** • Kwartalnik Górnictwo i Geoinżynieria • z. 3/1, 2005

On the area of the liquidated clay outcrop in Kölliken (Switzerland) 375 000 Mg of hazardous wastes have been deposited in the years 1978–85. As a result of protests of the population in 1985 the disposal has been officially closed. Ordered research proved that potable ground waters in the vicinity of the disposal site have been contaminated by leakages deriving (washed away) from the disposal site. In order to avoid further contamination of potable ground waters a decision was made about making a barrier around the disposal site in the form of 129 drainage holes (wells) connected to a collective dewatering gallery of total length of 600 metres. Tapped conta-

minated leakages have been treated on the spot in a specially built treatment plant. Simultaneously to the aforementioned works preparations for liquidation of the disposal site have been initiated.

**Keywords:** *waste disposal, underground building, liquidation of waste disposals*

NIKODEM BUTRYMOWICZ, ZBIGNIEW REKUĆ

**Protection of the Historic Fortress Tunnel from the 19<sup>th</sup> Century in the Frames of Building the Subway in Warsaw District of Żoliborz** • Kwartalnik Górnictwo i Geoinżynieria • z. 3/1, 2005

In the course of clearing the building site of the subway in the Plac Inwalidów (Invalids Square) in Warsaw, an outcrop of the west end of a fortress tunnel was made. In the year 1925 the last part of the tunnel along with the fort has been taken apart down to the floor-level without ensuring any protection of the interior of the remaining part. The end of tunnel is situated under the arterial west drive of the square and above the subway tunnels. The fortress tunnel is protected by a vertical brick wall built specially in order to prevent soil from sliding into its interior as a result of traffic above and below this historical construction.

**Keywords:** *protection of tunnels*

MAREK CAŁA, JERZY FLISIAK

**Sheet Pile Wall Stability Analysis with Finite Difference Method** • Kwartalnik Górnictwo i Geoinżynieria • z. 3/1, 2005

This paper deals with designing and stability analysis of sheet pile walls (SPW). SPW are commonly used for stabilizing walls of trenches. Classical limit state methods are usually applied to design simple constructions. Application of simple design schemes may lead to several mistakes. According to Eurocode 7-1, numerical methods (NM) are among four main design methods of design. For to demonstrate possibilities of numerical methods application, several examples of SPW stability analysis were performed, utilizing Finite Difference Method code FLAC v. 5.0. Comparing NM with limit state methods, it must be underlined, that application of numerical methods has one serious limitation. NM may be used only to analyze initially designed construction. Straight use of NM as a design tool may be quite difficult, but not impossible. However NM suits perfectly for verification and correction of results obtained from limit state methods. Five different models of anchored SPW were considered. Several conclusions regarding number of anchors, bending moments distribution and global construction stability were formulated.

**Keywords:** *sheet pile wall, construction stability*

JANUSZ CHMURA, ANDRZEJ LASON

**The Protection Design of the “Ważyn” Chamber** • Kwartalnik Górnictwo i Geoinżynieria • z. 3/1, 2005

Several hundred years long mining perforated considerably the underground rock mass of Bochnia. Damaging influence of time has resulted in advancing destruction of a unique, historic salt mine, shaped by many generation of Bochnia miners. The advancing alterations of the “Ważyn” underground chamber are a spectacular example of destructive changes within the rock mass. Convergence of excavations is much more pronounced in the Bochnia salt mine in comparison with the salt mine in Wieliczka: the underground deformations result from different geological structures of both mines. Protecting old excavations is a must if the historic substance of this unique mine is to be preserved. This assumption was a basis of investigations on how to protect the “Ważyn” chamber.

**Keywords:** *underground construction, numeric modeling, injections, roof bolting*

JANUSZ CHMURA, TOMASZ MIGDAS

**Bochnia Chambers in the “Bochnia” Salt Mine Combined with a Surveying Proposal of New Sites** • *Kwartalnik Górnictwo i Geoinżynieria* • z. 3/1, 2005

Most of accessible excavations of the “Bochnia” salt mine are several hundred years old and over this long time span they were frequently rebuilt and protected. For this reason, it has been very important to determine the stability of these underground workings, which are frequently visited by tourists and also used by out-door patients being treated in two sanatorium units. Analyses of distortion of excavation outlines are a significant element of these investigations as they allow establishing stress and strain within the rock masses. As a result of such measurements it is possible to gauge current and predict future displacements of excavation outlines, describing thus their tendencies and hazard for people staying underground.

**Keywords:** *stability of excavations, deformation measurements, underground tourist route*

JANUSZ CHMURA, ANDRZEJ J. WÓJCIK

**Problems of Protecting and Developing Underground Geosites in the Mines of the Upper Silesian Coal Basin** • *Kwartalnik Górnictwo i Geoinżynieria* • z. 3/1, 2005

Several hundred years long mining in the area of the Upper Silesian Coal Basin has left behind many historic sites, visualizing advances in mining technique. The passage of time and widespread commercialization impart negative effects on these valuable relics of the nature and the mining craft, both on the surface and underground. All kinds of activities directed at protecting valuable sites of old mining and making them available to the public are of considerable significance.

**Keywords:** *geotourism, geological heritage, history of mining industry*

KRYSTIAN CHOJNACKI, AGNIESZKA FABRYCZEWSKA

**Fire Safety in Tunnels** • *Kwartalnik Górnictwo i Geoinżynieria* • z. 3/1, 2005

Nowadays tunnels and underground transports facilities are important means of communications, not only because of shorter journeys, but also increasingly out of consideration for the local population and the environment, as well as the local economy and industry. However fires in tunnels are a major hazard to human life and cause costly damage to the infrastructure. He limited escape facilities and the difficulties encountered the intervention forces in gaining access, call for extensive safety arrangements which must be complementary and mutually coordinated.

**Keywords:** *fire test, fire safety, fire in transport tunnels, fire protection*

MIROSLAW CHUDEK, STANISLAW DUŻY

**Geotechnical Problems with Maintaining Excavations in Complex Geological and Mining Conditions** • *Kwartalnik Górnictwo i Geoinżynieria* • z. 3/1, 2005

The output of useful minerals with underground methods causes the necessity of accomplishing and maintaining excavations in a defined time. These excavations often, when used, are liable to changeable influence of the rock strata mostly caused by the influence of mining works. It has a consequence in the conditions of selective mining exploitation which is an answer to market requisition. The paper presents problems in maintaining excavations localised in a rock strata characterised by i.e.: changing the geological structure along a shift of the analysed excavations, complicated tectonical structure, complex layout of former exploitation etc., on the examples of

excavations from chosen collieries. The course of convergence of two roadways in the influence field of an active exploitation front.

**Keywords:** *mining, development excavations, stability, geotechnical problems*

*PIOTR CZAJA, ADAM GAŚIORCZYK*

**Influence of Shaft Liquidation Method on the Surface Collapse Hazard** • Kwartalnik Górnictwo i Geoinżynieria • z. 3/1, 2005

After ending of the mine operation all galleries and shafts lining can not be any more checked by the miner's teams. In such case the problem of its long-term stability in condition of the dynamic geological and others processes is very difficult for description. From the land owner point of view surface destruction hazard is very important. The results of some underground process can be observed at the surface even dozens or hundreds of the years. A very interesting results of the observations and protection works around closed down in 1906 year mining shaft "Wattensheid" in Bochum (Germany) has been shown in the paper. In some day of the year 2000 two very large craters were created at the surface near the forgotten shaft even in the years of 1980 some protection injections has been done. Showed in the paper example should be a warning for all designer of shaft liquidation and post-mining land owner.

**Keywords:** *shaft construction, shaft liquidation, underground construction*

*PIOTR CZAJA, JOANNA HYDZIK*

**Protection of the Central Pumping Station Bolko against Subsidence Hazards Caused by the Deep Coal Exploitation under Bytom City** • Kwartalnik Górnictwo i Geoinżynieria • z. 3/1, 2005

Water hazard in Bytom City caused by both old shallow Led and Zinc mines and active present deep hard coal mines become to be a very complicated in recent years. Very reach water inflow from the Triassic strata needs permanent pumping of 30 cubic meters/min for — among the others - protections of operating under them hard coal mines. Exploitation of the seam 510 by the "Centrum" Colliery in the part laying exactly under the Central Pumping station Bolko caused a strong damage hazard. Protection of the Central Pumping Station include special compensation system for the pipelines situated both, in one's an also in main pumping shaft and inclined galleries connecting the pump chamber and the shaft. Designing of the compensation system special flexibility rubber compensators has been used. For the shaft's pipeline of 600 mm in diameter steel compensators has been proposed. The paper presents proposed system and discuss obtained results.

**Keywords:** *underground construction, mine dewatering, pumping stations*

*DANUTA DOMAŃSKA, ROMAN GRUSZKA*

**The Relationship between Temperature and Stress and Strain State in the Vicinity of the Chamber "Porąbka-Żar" Power Station** • Kwartalnik Górnictwo i Geoinżynieria • z. 3/1, 2005

In the paper the preliminary estimation of the stress and strain state around the underground excavation under an influence of temperature is presented. Discussing problem is very important especially for the large chamber (e. g. chamber of the "Porąbka-Żar" power station is described) for which even small fluctuation of temperature can induce big changes of stresses, significant from a static point of view. The analysis presented in the paper is based on measurements that have been executed by Budokop in the excavation. The stress and delamination functions are got from measurements and temperature is taken in the chamber, are interconnected by correlation function. In accordance with expectations coming from the thermoelasticity theory (the paper includes results of approximate calculations), existence of the significant relationship between tem-

perature field and parameters from measurements (i. e. stress and strain in the vicinity of the chamber) is found.

**Keywords:** *the large chamber, temperature, stress state, strain state*

STANISŁAW DUŻY

**The Elements of the Reliability and Safety Theory of Constructions in Designing of Underground Structures** • *Kwartalnik Górnictwo i Geoinżynieria* • z. 3/1, 2005

The choice of support of underground structures is executed with the usage of a range of data describing with smaller or bigger approximation. This status leads to a situation in which most of the data may be treated as variable. The valuation of mining support safety is possible only with the usage of the construction safety and reliability theory in which we can see three basic ideas: reliability, safety and quality. The paper presents the results of excavation realising quality and an analysis of reliability and safety of 178 excavations located in 17 regions of GZW mines has been executed and has shown that an applicated support, due to the changeability of input data differences, was characterised by changeable error possibility. A possibility of using risk function as a target function in the excavation construction optimisation has been indicated. The expediency of using the reliability and safety theory in underground structure designing has been proven.

**Keywords:** *underground structures, safety of structures, reliability theory*

JERZY FLISIAK, SEBASTIAN OLESIAK

**Analysis of Retaining Embankment's Stability Conditions of Municipal Wastes Disposal and Proposed Ways of Stabilization** • *Kwartalnik Górnictwo i Geoinżynieria* • z. 3/1, 2005

At the beginning of 2004, after intensive rainfalls, soil masses of the retaining embankment of municipal wastes disposal "Zoniowka II" in Zakopane has slide down. Landslide blocked concrete road, which was the only link with sewage treatment plant. Entire loss of retaining embankment's stability could have conducted to geotechnical and ecological catastrophe. As a result it would be necessary to close the disposal and deprive the city Zakopane a possibility of wastes disposal. On the request of municipal wastes disposal users the expertise was made, targeted on finding a reason of landslide and offer a way to secure the retaining embankment of the disposal. The task included field geotechnical studies, analysis of the embankment's stability separately and analysis of stability assuming disposal completely filled with wastes and reclaimed according to executive project. The temporary and final protection of the retaining embankment of municipal wastes disposal has been proposed.

**Keywords:** *land slide, wastes disposal, field geotechnical studies, slope protection*

NINA FOTIEVA, NIKOLAY BULYCHEV, ANDREY SAMMAL, PETR DEEV

**Stress State and Bearing Capacity of Shallow Tunnel Linings Undergoing the Influence of Nearby Located Buildings** • *Kwartalnik Górnictwo i Geoinżynieria* • z. 3/1, 2005

The paper describes a new analytical method of designing shallow tunnel linings of an arbitrary cross-section shape undergoing the influence of buildings both erected nearby the already existing tunnel and constructed before the tunnel driving. The method is based on analytical solutions of the corresponding elasticity theory plane problems for a heavy semi-infinite medium weakened by a supported opening. The approximate technique is proposed for taking the 3-D character of problems into account caused by limited sizes of buildings in the direction along the tunnel axis and by the location of several buildings on some distances between them in this direction. It gives a possibility to determine the stress state and evaluate the lining bearing capacity in different cross-section along the tunnel axis. Examples of the design are given.

**Keywords:** *tunnel, lining, stress state, bearing capacity, building, influence, elasticity theory, approximate technique for 3D problems solution*

KORNEL FRYDRYCH

**Influence of the Circle Cross-Section Tunnel Lining's Structure on the Value of the Coefficient of Subgrade Reaction** • Kwartalnik Górnictwo i Geoinżynieria • z. 3/1, 2005

The existence of elastic passive rock mass pressure significantly increases the bearing capacity of lining, thus it is important to include its effect in calculating internal forces of lining in a tunnel. While designing the lining a designer faces a problem how the construction of this lining influences a value of a coefficient of subgrade reaction. This paper contains computational results of a coefficient of subgrade reaction  $C$  for various types of lining in tunnels with a circle cross-section. It has been shown how the construction of lining influences a value of this coefficient.

**Keywords:** *linning, coefficient of subgrade reaction, elastic passive rock mass pressure, dog headings, tunnels*

ANDRZEJ GALIŃSKI

**Estimation of Dependence between Parameters of Rocks Ceiling and Floor on Sample Select Region of Mine "Rudna"** • Kwartalnik Górnictwo i Geoinżynieria • z. 3/1, 2005

In the paper were analyzed accounts between parameters of rock ceiling and floor basing on seven openings in region XIX of mine „Rudna”. Estimation on statistical of six parameters of rock mass in select mining — region, using one factor analysis of variance. Factor classifying was partition on roof strata, opening and floor strata. It was showed which parameters have better homogeneity and how they depend on place of receiving of samples

**Keywords:** *parameters of rock mass, statistics, analysis of variances*

WŁODZIMIERZ HALAT

**Bearing Capacity of Selected Steel Arch Support** • Kwartalnik Górnictwo i Geoinżynieria • z. 3/1, 2005

Numerical simulations based on 66 models allowed a bearing capacity of the steel arch support to be estimated. It has been shown some results of calculations for three types of profiles: V21, V25 and V29 and three sizes of the support: LP8, LP9 and LP10. Each of the support model was induced — besides of active loading — with four passive loadings modeling strata influence upon the support. It has been found that complete use of bearing capacity of the arch support depends not only on value of bearing capacity of the arch, what is connected with yield limit of steel, but it also equally depends on bearing capacity of joints of the arches.

**Keywords:** *bearing capacity, numerical simulations, steel arch support*

ROMAN KINASZ

**Estimation of Reliability of Reinforced Concrete Truss on Basis of Limited Number of Experimental Data** • Kwartalnik Górnictwo i Geoinżynieria • z. 3/1, 2005

It is proposed the method of establishing the reliability by Monte Carlo method on condition when at any of numbering testing the critical state was not achieved, what indicates the high reliability of structure. It could be possible in two cases: when using Monte Carlo method the real figures of structures are used if there is no opportunity to define their great number for correct determination of distributions and their parameters or at high reliability of structures. In this case it is proposed: to put non-dimensional parameters, which characterize the relative value of “unattainableness” of critical value by each of the structure’s element on each iteration; to unite all non-dimensional parameters doesn’t matter to which class the input data belonged and where were they taken from into one block; to made histograms of this block, to approximate them by suitable

distribution and to define the square under the extra polar separate part of abscissa graph, which could become the probability of destroy.

**Keywords:** *reinforced concrete structure, reliability, Monte Carlo method, loads*

ZDZISŁAW B. KOHUTEK

**PN-EN 206-1 Standard — the New Dimension of Concrete Quality** • Kwartalnik Górnictwo i Geoinżynieria • z. 3/1, 2005

Over one year ago in Poland the European Norm: PN-EN 206-1 was officially given priority in relation to previous national standards. Polish old regulations, which were hitherto obligatory, have been derogated. The European Standard for concrete, along with related documents specify so far known notions in the field of technics of concrete, also introducing many other definitions. The Standard arrange and classify both parameters of material itself, its properties and exposures of concrete related to environmental actions. It admits the substitution of part of cement (CEM I and CEM II/A) by fly ash and silica fume equivalent. The Standard in question render a modern workshop of the production control and conformity control accessible to producer. The objective of the European Norm is to guarantee durability of concrete construction and to ensure its other, desirable properties to investor or to user. Principal sections of the PN-EN 206-1 document have been discussed in this article. Those sections include: systematics of concrete and of its exposure applications, questions concerning selection of concrete components and of concrete composition, specification criteria, issue of delivery of fresh concrete and method of production evaluation and of material quality evaluation.

**Keywords:** *standard, concrete*

MACIEJ KOSMAŁSKI, ROBERT KOZŁOWSKI

**Modern Ways of Warsaw Metro Extension Based on Mechanised Full-Face Shields (TBM)** • Kwartalnik Górnictwo i Geoinżynieria • z. 3/1, 2005

The paper covers history of design, concept changes and stoppages in Warsaw metro construction process. Technologies used in construction of existing network were presented. Necessity of mechanised tunnel machine (TBM) implementation was presented on background of geological and hydrogeological conditions. The paper describes tunnel boring machines suitable to Warsaw conditions, as slurry and earth-pressure balance machines. Briefly Madrid metro extension programme was depicted. Differences in cost of execution Madrid and Warsaw was shown as well as reasons of their origin. Effect of range of TBM tunnelling works into construction cost was presented on the diagram

**Keywords:** *metro construction, tunnel boring machine TBM, slurry shield, EPB shield, tunnel lining*

TADEUSZ MAJCHERCZYK, PIOTR MAŁKOWSKI, ZBIGNIEW NIEDBALSKI

**Loading Support Research in the Chosen Dog-Headings** • Kwartalnik Górnictwo i Geoinżynieria • z. 3/1, 2005

The paper presents the results of support loading measurements. The results come from a few dog-headings Polish hard coal mines. There were different mining-geological conditions around workings, where research were carried out. Loading from the fractured zone in the roof and sides of the support was measured by hydraulic dynamometers and instrumented bolts. These research enabled the loading estimation of the workings' support not only in the heading outline but in the direct roof layers as well.

**Keywords:** *loading of dog-headings' support, dynamometers, instrumented bolts*

TADEUSZ MIKOŚ, JANUSZ CHMURA

**The Revitalisation and Adapting the Monumental Undergrounds under the Square of Przemyśl for Tourist Purposes** • Kwartalnik Górnictwo i Geoinżynieria • z. 3/1, 2005

Rich and a thousand-year-old history of “Przemyski” settlement is hidden underground. The present, secondary system corresponds to the buildings coming from the 19th and 20th century, but it does not fit the architectonic system that existed a few centuries ago. The original system of the medieval houses has the authentic single and double floor cellars. Its availability to the visitors and linking into the whole underground communication system with the accompanying medieval sanitary collector can constitute an attractive commercial, gastronomic and didactic tourist trail. This project is devoted to the idea of the development of the historical undergrounds of Przemyśl.

**Keywords:** *underground construction, geotechnics, underground touristic routes*

RUDOLF PÖTTLER, FRANZ STARJAKOB, DANIEL SPÖNDLIN

**Tunnelling Through Highly Squeezing Ground — a Case History** • Kwartalnik Górnictwo i Geoinżynieria • z. 3/1, 2005

The adaptability of the New Austrian Tunnelling Method in design and construction has been proven once more at the Strenger Tunnel, where highly squeezing rock mass caused considerably high deformations and loadings of the primary and secondary lining. By adjusting the support measures especially rock bolting and yielding steel elements installed in slots of the shotcrete lining large deformations up to 0.5 m due to progressive fracturing could be successfully mastered. Calculations using FE-models have been found to be helpful for decision making on site and therefore should increasingly be used in future. Calculations also showed that asymmetric rock mass behaviour is not necessarily decisive for the loading of the inner concrete lining in case of extensive fracture processes. Thereby the general practice used in Austria to employ an unreinforced concrete lining was verified. For this decision it was considered that the shotcrete lining which undergoes repair works at the most critical sections will not completely fail but keep apart of its load bearing capacity with respect to normal forces.

**Keywords:** *case history, squeezing rock mass, NATM*

WOJCIECH PREIDL

**The Lower Silesia Railway Tunnels — Technical Monuments** • Kwartalnik Górnictwo i Geoinżynieria • z. 3/1, 2005

In this paper have shown genesis of the development of the railway in the south-west and west provinces of Silesia. Described the railways with tunnels and presented their short technical data. Have shown as well perspectives of tunnels further use and possibilities of adoption the tunnels for the tourist purposes. It's significance as a technical heritage, which should be protected from the devastation. Those tunnels are the traditional elements of the regions architecture and landscape, as for example the tunnel in Ogorzelec.

**Keywords:** *railways tunnels, monuments of technics*

TADEUSZ REMBIELAK, LESZEK ŁASKAWIEC, MAREK MAJCHER,  
ZYGMUNT MIELCAREK

**Injectory Sealing and Firming of Rock Mass in Front of Binding Cross-Cut and Drilled through Andaluzia Fall Zone in ZG „Piekary” Conditions** • Kwartalnik Górnictwo i Geoinżynieria • z. 3/1, 2005

In ZG „Piekary” there was a necessity to undertake a binding cross-cut 1 in the seam 506 through the Andaluzia Fall Zone in the range of the mining area “Brzeziny IV” and “Rozbark II”. In order to avoid several problems and to increase safety during undergoing the cross-cut through tectonically



disturbed zone, there was designed advancing by cementation, sealing and firming of a rock mass in front of its head, using injectory holes drilled by drills.

**Keywords:** *mining industry, excavations drilling, preceeding rockmass firming, sealing and firming, mining safety*

TADEUSZ REMBIELAK, LECH MIELNICZUK, JANUSZ ROSIKOWSKI,  
JÓZEF RUSINEK, FRANCISZEK WALA

**Injectory Rock Mass Firming During Rebuilding of Dog Headings as a Way to Prevent from Rocks Falling and from the Results of these Fallings** • Kwartalnik Górnictwo i Geoinżynieria • z. 3/1, 2005

The occurring mineral water in KWK "Piast" cause a corrosion of the excavations lining. Because of that it is necessary to rebuild these dog headings. In order to increase safety during rebuilding crossings of excavations there were applied forthcoming injectory firming of 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 example of crossing rebuilding technology from a lining LP to the crossing of the POLYTRAB type in the Heintzmann Company in KWK "Piast".

**Keywords:** *mining industry, excavations drilling, preceeding rockmass firming, sealing and firming, mining safety*

KAROL RYŻ

**Strengthening of Arch Stone Lining of Railway Tunnel Using Interacting Shell Made from Steel Cylindrical Corrugated Panels and Self-Compacting Concrete** • Kwartalnik Górnictwo i Geoinżynieria • z. 3/1, 2005

The railway tunnel in Kamionka Wielka, located within the Tarnów-Leluchów line, is at present over 100 years old. It is an arch type stone structure. At the tunnel inlet at the Tarnów side an unacceptable deformation as well as a cracking of the stone lining was noted at the range of several meters. The risk of the collapse of the structure and soil mass was apparent. Moreover separation process between portal and the arch stone lining is going on and there is a possibility that loose stone blocks will fall out from the structure. The described technology of the structure rehabilitation contains both immediate actions and final measures undertaken during further steps of the repair procedure. Immediate strengthening and stabilization of the structure at the zone where structural damage had occurred was performed by inserting of steel arch support of V-section connected to the stone by means of in-glued anchors. Final strengthening at the zone of 30m and at the tunnel portal consists of a steel shell at the arch zone and the reinforced concrete abutments at the walls. The steel shell is made from bolted corrugated panels. Connection of the shell with the existing tunnel lining is assured by infilling the interface gap with a self-compacting concrete. Presented repair procedure was possible due to the usage of modern measures like bolted corrugated steel panels and self-compacting concrete. At each stage of the rehabilitation procedure, railway traffic can be continued which may be recognized as an important advantage of the presented technology.

**Keywords:** *railway tunnel, arch stone lining, deformation and cracking, risk of structural and soil collapse, strengthening and protection, steel arch support of V-section, shell lining, bolted corrugated steel panels, self-compacting concrete*

LECH SKOPIAK, WACŁAW STACHURSKI, MARIA MAJ, JAROSŁAW PIEKŁO

**Monitoring of Stress Changes in the Cast Iron Tubbing by Means of Photo-Elastic Method** • Kwartalnik Górnictwo i Geoinżynieria • z. 3/1, 2005

In the article the problem of the measurement and determination of the stresses existing in the tubbing lining of the shaft was raised. The investigations were carried out in the P-III and P-V shafts conditions in O/ZG "Polkowice-Sieroszowice" (KGHM Polska Miedź SA — KGHM Polish

Copper in Lubin). Rock mass movements, created by deposit exploitation and dehydration of the water-bearing layers, result in occurring of high forces affecting the shaft lining, especially in picotage tubbing area. It, more often, results in cracking of those and in consequence of that fact causes the partial loss of the load capacity and leakproofness in the sensitive places of the shaft. In connection with that the frequent monitoring of stress changes in chosen picotage rings is necessary. This article presents the investigation method depending on numerical determination of dangerous areas of stress concentration as well as using the photo-elastic strain measurement to periodical observation of those.

**Keywords:** *photoelastic investigations, numerical calculations, stresses' measurement*

ANNA SOBOTKA

**Logistic Management of Construction Projects** • Kwartalnik Górnictwo i Geoinżynieria • z. 3/1, 2005

There is a possibility to introduce modern forms of organization and logistic management conceptions in construction projects, construction companies and in general in construction industry. Logistic management covers a performance of planning, organizing, piloting and controlling logistic processes in order to meet strategic objective in area of logistic. Knowledge of logistic process mechanism and possibility of usage proper instruments which support logistic decision is essential for increase of effectiveness construction performance. Such knowledge is delivered by detailed research of logistic processes and systems in construction companies. That research allows defining a strategy and method of its implementation considering new trends in economy. This paper presents the results of logistic process research in construction companies, which pointing out a must of method and conception logistic management adjustment for realization construction project condition changes. The research results provide a election basis for logistic service performance examination adequate for nowadays trends in management and realization construction performance systems. There is also a presentation of two logistic system models with diversification of logistic passage structure and method conducting and logistic decision influence on system quality management indicator in terms of logistic expenditure. The paper emphasizes a must of complex logistic process planning and management during life cycle of construction project.

**Keywords:** *construction project, logistic management, logistic processes, logistic model, costs*

KRYSTYNA STACHOWIAK-MACIEJOWSKA

**Underground Construction Technologies Used in Przedsiębiorstwo Budowy Kopalń PeBeKa SA** • Kwartalnik Górnictwo i Geoinżynieria • z. 3/1, 2005

This paper presents the history of development and the output of Przedsiębiorstwo Budowy Kopalń PeBeKa SA. In the first part of the paper the history of the company — 45 years of experience in civil and underground engineering is described. Second part covers achievements in mining construction, specialist engineering technologies and potential of PeBeKa SA during its 45 years of existence: shaft sinking, driving mine excavations, ground freezing, road and railway tunnels building, Warsaw underground, trenchless technologies, construction of water and sewage pipes, protection and reconstruction of the “Wieliczka” Salt Mine, construction and furnishing of industrial plants, housing. The third part, summary, presents awards, distinctions and certificates obtained by the company.

**Keywords:** *shaft sinking, ground freezing, tunnelling, civil and underground engineering, piling machine*

EDWARD STEWARSKI, MAREK PETRI

**Technical Advisability of Application of Micro-reinforcement with Polypropylene Fibers in Mining Construction** • Kwartalnik Górnictwo i Geoinżynieria • z. 3/1, 2005

Both the raw material characteristics and mechanical characteristics of micro-reinforcement fibers have been presented. The behavior of different cement mortars in the fissuring process has been compared, taking into account the micro-reinforcement degree. The analysis of the beha-

viator of cement mortars and resistance of them to percussion loads has been carried out on the basis of laboratory tests of the change of fissure work.

**Keywords:** *microrinforcement, polypropylene fibres, cement, process of cracking, mining construction*

*PAWEŁ SYSIK, ANNA SIEMIŃSKA-LEWANDOWSKA*

**Application of the Random Sets' Theory for the Calculations of a Tunnel Built with the New Austrian Tunneling Method (NATM)** • Kwartalnik Górnictwo i Geoinżynieria • z. 3/1, 2005

In the article a method for capturing uncertainty in geotechnical engineering based on random sets' theory was proposed. This approach allows for assignation of probability masses to sets or intervals. Assumption regarding probability distribution is not required. Information about soil parameters from different sources appearing as intervals can be used. Practical application was demonstrated by means of tunnel excavation problem. The tunnel was excavated according to the principles of New Austrian Tunneling Method (NATM). In the analysis deformation of tunnel lining was investigated. As a result ranges of displacements were obtained. This showed possible behavior of the structure. One of calculation steps was sensitivity analysis. On its basis soil parameters which have the biggest influence on displacements were identified. Only these parameters were used as variables in further analysis. Thus computational effort was reduced significantly.

**Keywords:** *random sets' theory, sensitivity analysis, ranges of values, New Austrian Tunneling Method*

*NIKODEM SZŁĄŻAK, MAREK BOROWSKI*

**Air Pollution by Diesel Exhaust During Drifting Headings with Diesel-Powered Vehicles** • Kwartalnik Górnictwo i Geoinżynieria • z. 3/1, 2005

The ventilation methods of drifted headings where diesel-powered vehicles work were presented in the paper. The factors influencing exhaust emission are characterised and harmfulness of both exhaust components: particles and gases is discussed. In order to determine air pollution by diesel particles and gases of both particles and gases were taken. The results statistically analysed. The ventilation conditions for preserving permissible diesel gases and particle concentration content.

**Keywords:** *diesel exhaust emission, harmfulness of diesel exhaust, air pollution in underground excavations*

*NIKODEM SZŁĄŻAK, DARIUSZ OBRACAJ, ŁUKASZ SZŁĄŻAK*

**Designing Duct Ventilation System in Drifter Underground Headings Using AGHWEN-3.0 Computer Programme** • Kwartalnik Górnictwo i Geoinżynieria • z. 3/1, 2005

The principles of designing duct ventilation system and calculation of air distribution along underground headings fitted with leaky ductlines using AGHWEN-3.0 computer programme are presented in the paper. The algorithm of the calculation takes into consideration methane emission into a heading and both the air temperature and humidity distribution along a heading. It takes into consideration the cooperation between ventilation system, dust collection system and air cooling system. On the basis of a few examples the possibilities of AGHWEN-3.0 used in designing a ventilation system are presented.

**Keywords:** *auxiliary ventilation, design duct-line ventilation, methane hazard, temperature conditions*

*NIKODEM SZŁĄŻAK, DARIUSZ OBRACAJ, ŁUKASZ SZŁĄŻAK*

**Dust Health Hazard in Underground Headings with Continuous Miners** • Kwartalnik Górnictwo i Geoinżynieria • z. 3/1, 2005

Dust hazard in drifted headings with continuous miners is discussed in the paper. The amount of dust emission and its harmfulness according to lithological rock properties are taken into consi-

deration. On the basis of measurement results of dust concentration the influence of rock-cutting sort on concentration of respirable fraction is shown. The basic methods for dust controlling in drifted headings are discussed and factors influencing the fault of satisfactory dust collection efficiency are presented. The analyses of the measurement results and dust collection efficiency allowed drawing conclusions about the effectiveness of ventilation — dust collection system.

**Keywords:** *excavation by using continuous miners, health — detrimental dust, dust sampling, dust control, dust collectors*

JACEK ŚCIGALŁO, ANTONI FLORKIEWICZ

**Selected Problems of Design of Subterranean Structures** • Kwartalnik Górnictwo i Geoinżynieria • z. 3/1, 2005

The purpose of this paper is presentation of differences in static calculations and design of structures depending on design assumptions. As an example a multi-level subterranean car park in Poznań where the soil consisted of pliocene clay is presented. Static calculations were performed for various soil parameters and selected load cases. These calculations showed a significant sensibility of design process of cavity walls to the adopted values of soil parameters. Taking into account the real values of cohesion  $c_u$  and the angle of internal friction  $\phi_u$  — much higher than the values from codes, allowed for significant decrease of anchoring length of cavity walls in the soil. The influence of the soil parameters on the ultimate and serviceability limit states of the cavity wall itself was much smaller. It must be pointed out that several existing objects founded on this type of soil confirm the correctness of the suggested approach and existence of significant discrepancy between the real and code values of parameters for the pliocene clay (Poznan clay).

**Keywords:** *pliocene clay, cavity walls, soil parameters, ultimate limit state, design*

KAREL VOJTASIK, JOSEF ALDORF, EVA HRUBEŠOVÁ

**Underground Storage Tanks and Containers from Plastic Material** • Kwartalnik Górnictwo i Geoinżynieria • z. 3/1, 2005

The contribution describes an evaluation method of an external wall of underground storage tanks and containers. The walls are of a sandwich — composite construction. The composite is formed by plastic tabular or wall elements and layers of concrete. In some cases, concrete is supported by a steel mesh. The evaluation method is based on the determination of deformational parameters of the composite and the straining coefficient of material forming the composite. These are determined based on a condition regarding coequal dislocations on internal borders between the layers — materials of the composite.

**Keywords:** *underground tanks, plastic materials, composite structures, design calculations*

JAN WALASZCZYK, STANISŁAW HACHAJ, ANDRZEJ BARNAT

**Computer Simulation of Internal Energy Changes in Pillar-Room Field Caused by Progressing Exploitation of the Rock Mass and by the Change of Physical Properties of Pillars** • Kwartalnik Górnictwo i Geoinżynieria • z. 3/1, 2005

The paper presents general rules of the mathematical modelling of the results of the internal rock mass destruction. This model is based on the finite element method and on the physical model of rock mass dynamic relief. The authors present the use of the model for the computer simulation of internal energy changes in a pillar-room field caused by the change of physical properties of pillars (caused by their weakening).

**Keywords:** *geomechanics, numerical modeling, changes of the specific energy*

**Mathematical Model of Layered Roof Structure Destruction** • *kwartalnik Górnictwo i Geoinżynieria* • z. 3/1, 2005

In the process of deformation of roof rocks in the neighbourhood of the long-wall exploitation horizontal displacements are of special importance. It especially concerns the situation when the roof is strongly layered and the cohesion between layers is small: it leads to a displacement between layers (after breaking the inter-layer contacts), which substantially changes the stiffness of rock mass and influences the destruction of the internal structure of the exploited roof. For the mathematical description of the situation mentioned above the model used in the paper was a mathematical one based on the distinct element method, taking into consideration a strongly layered rock mass and inter-layer slips. Horizontal displacements of roof layers over the long-wall exploitation area were analysed in a special way.

**Keywords:** *geomechanics, stability of the rock mass, mathematical modelling*

**Principles of the Shell Lining's Selection** • *kwartalnik Górnictwo i Geoinżynieria* • z. 3/1, 2005

Shell lining had been wider known in Poland during 70s of the previous century. A present standard concerning design of the shell lining presents the range of the lining usage in a very general manner. It is only confined to a few basic technical conditions which must be fulfilled in order to apply this type of lining. The aim of this study was to supplement this scope with an economical criterion, which facilitates the optimal selection of the lining construction. The carried out analysis of principles of the shell lining's selection was based on 144 projects for series of data, with application a.o. various geotechnical parameters of rocks, depths of dog headings and three types of steel sets. The obtained results can be applied in the shell linings' design.

**Keywords:** *shell lining, dog headings, tunnels*

**Influence of Shallow Mine-Workings on Crack Failure of Overburden Strata** • *kwartalnik Górnictwo i Geoinżynieria* • z. 3/1, 2005

Coal exploitation in Shendong mining area in Shaanxi province of China is based on shallow mine-workings, which is the main reason for surface subsidence. A great deal of analysis and research indicates that the crack damage is controlled by the key stratum in the overburden strata. The paper studies the relationship between the stability condition of the key stratum structure and the mining damage, supplying the theoretical evidence for implementing an effective mining method to protect the environment in Shendong mining area.

**Keywords:** *shallow seam, mining damage, controlled mining*