

城市与矿山 地下工程

*Underground
Engineering of City
and Mine*

主 编：
王明远
王祖和

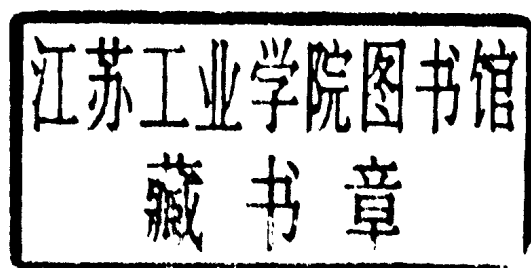
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序 言

中国和俄罗斯都是世界上的产煤大国,50年来两国在矿井建设和采矿领域有着密切的协作关系,特别是在20世纪50年代至60年代初苏联对中国建井技术、采矿方法、配套设备和技术等方面给予了大力支持与援助。使两国在矿山建设和地下工程技术方面有了长足的发展。先后恢复和建成了开滦、峰峰、鸡西、鹤岗、双鸭山、阜新、抚顺、平顶山、徐州等大型矿区,有力地促进了我国国民经济的发展。其中在冻结法凿井、立井施工、长壁式开采、U型钢支架、锚喷支护等技术取得了突出成效,为后来采矿业和地下工程的发展奠定了基础。

随着科学技术的进步和城市化进程的加快,许多城市出现了建筑用地紧张,基础设施落后、交通拥挤、生态失衡、环境恶化的“城市病”,严重制约了城市的可持续性发展。开发利用城市空间已提到经济发展的重要议事日程上来,如:地铁、地下街、地下商场、地下库房、人防工程、共同沟等地下工程在城市逐渐得到开发利用。苏联在20世纪30年代就在莫斯科、圣彼得堡等大城市修建地铁,现在已形成四通八达的地下交通网络。世界上一些大城市开发利用地下空间已成为建筑行业的一种发展趋向,如巴黎、伦敦、纽约、东京、香港等大城市不仅早已建成年客运量超亿人次的地铁系统,而且建设了大量地下商业街、地下车库等地下工程。我国20世纪60年代在北京开始修建地铁,目前北京、上海、天津、广州等城市的地铁正在运行和扩建中,南京、深圳、青岛、重庆等大城市也开始修建地铁及其他地下工程。据专家分析:“19世纪是桥梁的世纪,20世纪是高层建筑的世纪,21世纪将是开发利用地下空间的世纪。”

中国山东科技大学与俄罗斯库兹巴斯国立技术大学,多年来进行了学术交流和科研合作,为进一步扩大两校的科技合作交流领域,双方商定在2000年4月23~25日在中国山东科技大学召开第一届城市与矿山地下工程建设国际学术交流会,两国用中文和俄文分别征集论文并编辑论文集。中国方面共征集有关方面论文60多篇,反映了城市地下工程、矿井建设、采矿与支护、岩土工程、矿山地下工程管理方面的成就,旨在总结和探讨该领域的发展,推动国际学术交流和科技进步。相信通过这次论文交流,将进一步推动两国在矿山与地下工程技术的进步与发展。

王春秋

2000年4月18日

Underground Engineering of City and Mine

Preface

Both China and Russia are the biggest countries of coal mining in the world. Since 1950s, these two countries have made intimate cooperation in mine constructing and coal mining. Particularly, from 1950s to the beginning of 1960s, the former Soviet Union provided China with great helps in the respects of mine constructing techniques, mining methods, set devices and techniques, which made both countries have a great development in mine constructing and underground engineering techniques. In china, after that time, some great mines such as Kailuan, Fengfeng, Jixi, Hegang, Shuangyashan, Fuxing, Fushrn, Pingdingshan, Xuzhou etc. have been resumed or built early or late, which powerfully promoted the developments of state-operated industry and commerce. Furthermore, some outstanding achievements have been made in freezing method construction, shaft excavation, continuous mining, U type steel compression support, supported by rock-bolting and shotcreting etc, which laid the foundation for the development of mining and underground engineering.

With the progressing of science and technique, and accelerating of urbanization course, many cities are facing with the city's ailments such as the shortage of building land, the backward of infrastructure, the crowd of traffic, the imbalance of ecology, and the deterioration of surroundings, which seriously hinders the city's space, such underground engineering as subway, underground streets, underground stores, underground storehouses, man-made air defense works, common channel etc have been put at the front of the important agenda, some of which are being gradually exploited in cities. Russia built the subway in some big cities such as Moscow, St Petersburg etc. in 1930s, which have presently taken shape of all around subway networks. That such big cities exploit the underground space has become one of the constructional tendencies. For example Paris, London, New York, Tokyo and Hongkong have not only built the subway networks which transport 100 million person-time per year, but also built a large number of underground engineering such as underground street, underground park. Peking began to build subways in 1960s, Now, in China, the subways of Peking, Tianjin, Shanghai, and Guangzhou are in motion and expansion. Some big cities such as Nanjing, Shenzheng, Qingdao and Chongqing are beginning to build their subways and the other underground engineering.

According to the specialists' analyze: "19 century is the age of bridges, 20 century is skyscraper, and 21 century is the exploitations of underground space."

Shandong University of Science and Technology of China has cooperated with Kuzhibas National Technology University in learning and scientific research. To expand the area of exchanging and cooperating, the both universities agree to convene the first international exchanging and cooperating conference of underground engineering of city and mine in April 23~25, 2000, in Shandong University of Science and Technology. According to the agreement, each of the two universities should collect articles and compile the book with its own language, We have collected pertinent theses over 60 in China, which reflect our achievement in city underground engineering, mine constructing, mining and support, rock and soil engineering, management of underground engineering of mine etc. Our aim is to sum up the experiences to probe into the development and to push the interaction learning and science programs. We all believe that this conference will make contribution to the development in mine and underground engineering.

王 品 秋

2000. 4. 18

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Study on the Mechanism of Unloading Method to Cure Shaft Lining Fracture by Site Measurement

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Abstract: Combined with the practical engineer of fractured shaft lining being cured by the unloading method in thick alluvium, the long-term effect of the unloading curing technique were studied by site measurements based on — “ numerical simulation calculations and physical simulation tests. The variation laws of stress, strain in shaft lining, variation law of compressing number of the unloading-slot in every curing stage and in longer time after the shaft lining fracture being cured by use of the unloading method were obtained. The mechanicial mechanism of the unloading method to cure the shaft lining fracture was obtained which provides theoretic foundation and engineering parameters for the unloading method to cure shaft lining fracture.

Key words: shaft lining fracture; unloading method; site measurement

The Optimized Design Model of Tunnel' s Reniforced Conc Rete structure And it' s Application

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Abstract: This paper used the basic principle of inequality bounded optimized problem in Lagrange Multiplier Method, and With the basis of establishing the objective function of optimized computing model of tunnel' s reinforced concrete Lining structure, to develop correlation computing formulation and to give the computing process. And then, this method was used to analyze and to compare a project application

Key words: Lining of tunnel; Reinforced concrete structure optimized method; Living example of application

Design of shaft Lining by space Model

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Abstract: In this Paper, the stresses of a shaft lining are computed by space model under arbitrary axisymmetric Mormal loads and tangential loads. The method with which the thickenss of the shaft lining is determined is advanced using optimization method.

Key words: space model; Fourier integrals optinization method; design of shaft lining

Coupling Judgment Between Acoustic Emission and Pressure of Gob Surrounding Rock Stability

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Abstract: Many methods of pressrue observation, acoustic emission measurement and displacement observation etc. are combined ot supervise the stability of surrounding rock of gob of large area in Haigou golden mine which is taden as the researcher subject in this paper. To analyze the coupling relations between all information from viewpoint of process, three judgment modes i. e. pressure-increase stable mode, pressure-decrease stable mode and pressure-decrease unstable mode, which are co-expressed by pressure and acoustic emission, are obtained. Practice shows judgment modes gotten utilize the coupling connotation between pressure and acoustic emission, therefore have much better operation ability and is convenient to understand and learn.

Key words: acoustic emission; mined-out area; stability; coupling judgment mode