

城市道桥与防洪

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主办：上海市市政工程设计研究总院(集团)有限公司



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推进低影响技术研究 建设新时代美丽中国

2018城市道桥与防洪第十一届全国技术论坛在成都举办



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“2018 城市道桥与防洪第十一届全国技术论坛”于2018年9月18日至20日在成都市举办。本届论坛由上海市政工程设计研究总院(集团)有限公司、中国市政工程西南设计研究总院有限公司、成都市市政工程设计研究院联合主办。论坛主题为:推进低影响技术研究,建设新时代美丽中国。

习近平总书记在党的十九大报告中提出“加快生态文明体制改革,建设美丽中国”。低影响开发技术正是践行社会主义生态文明观的技术手段。

在现代社会,所有的城乡建设活动,都存在低影响开发问题。不仅包括对城乡水资源的影响,还包括对自然生态环境的影响,对居民生产生活的影 响,对城乡历史文化发展的影响。在城乡建设过程中,必须与当地的历史文化、产业特征相结合,对原有规划布局及传统特色尽可能降低冲击和保护,因地制宜,最大化继承和发展开发场地原有的景观特色,产业特色和民俗文化特色。

近年来,广大城市建设者就低影响开发技术,在城市道路、桥梁、防洪排水、建筑、隧道、综合管廊等领域进行了大量的探索和实践,并取得了可喜的研究成果,积累了丰富的实践经验,同时也遇到许多新问题,本届论坛对此进行总结和交流。

Urban Roads, Bridges & Flood Control

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Thinking on Planning and Design of Urban Road under New Development Concept Yang Bin (1)

Abstract: The article firstly reviews and rethinks the problems of large demolition and large construction, same imagines of the city and no regional features caused in the nearly 30 years of urban construction in China, and analyzes these problems from the levels of consciousness and technology. And then the article sets forth the development mode of city under the new development concept from the national level and based on the spirit of the conference on the city construction by the central government. Finally, the article puts forward the thinking on how to design the urban roads into the urban streets and how to build the urban roads into the humanized public space in order to promote a new type of people-centered urbanization.

Keywords: new development concept, urban road, planning, street, humanization, traffic

Experience and Summary on Implementing Construction of Slow Traffic in Wuhan
..... Jiang Le, Che Libin, Li Dan (5)

Abstract: In 2015, on the basis of the basic framework of urban expressway and rail transit, Wuhan put forward a new urban construction concept of "let the city quiet down", and push the construction of slow traffic. The article sets forth the characteristics of slow traffic in Wuhan, summarizes the experience and implementation effect in the construction of slow traffic system and the demonstrated project in Wuhan from three aspects of surface, line and point, and puts forward four aspects of thinking on sustaining and carrying forward the construction of slow traffic.

Keywords: slow traffic, greenway, walking street, experience

National Bus Metropolis Examination Evaluation Index System and Its Implementation Strategy
..... Wan Peng, Zhang Pingli, Huang Yun (10)

Abstract: This paper elaborates the macro background and evaluation indexes of bus metropolis, and introduces the basic strategies and effects in the construction of urban bus metropolis at home and abroad. According to the experience of building the demonstrated city of the national bus metropolis in Shanghai, this paper summarizes the relative implementation strategies and puts forward the proposals for further

perfecting the examination evaluation indexes of bus metropolis.

Keywords: bus metropolis, index system, evaluation, implementation strategy

Key Technologies in Upgrading Reconstruction of Main Trunk Roads in Central Area of City

..... Ma Guogang, Li Xiàomei, Gao Jianwei (14)

Abstract: With the increment of city scale, the road reconstruction of old city area and central city area is the inevitable way to improve the road traffic adaptation and to upgrade the urban landscape. The reconstruction of old road has more difficulties than the construction of new roads. Taking the Lanzhou Centre Avenue Upgrading Reconstruction Project as an example, the article sets forth the design concept in the upgrading reconstruction of the main trunk roads in the urban central area, introduces the key technologies of ensuring the traffic adaptation, realizing the landscape integration, realizing the connection of all non-motored vehicle lanes, controlling of green-wave coordination of traffic lights, reconstructing the bus stop, road intersection and flood bridge, and regulating the trenches and ditches in detail, and also puts forward the problems existing in the reconstruction.

Keywords: urban central area, main trunk road, upgrading reconstruction, design concept, landscape integration, refinement

Study and Design of Intelligent Expressway Operation Center Based on Cloud Computing

..... Bao Lixia (17)

Abstract: The article sets up the framework of the intelligent expressway operation center based on cloud computing to design the virtualization computing, virtualization network, virtualization storage and cloud management system. The article puts forward the intelligent expressway operation center platform based on GIS-T+BIM, designs the application functions of charge clearing settlement, charge management, operation maintenance, supervision management, data analysis, aid decision making, safety management and charge check inspection, and puts forward the system operation indexes of the maximum concurrent users, polysemy path to identify and calculate the maximum concurrent users, response time and model response time.

Keywords: cloud computing, intelligent expressway operation center, GIS-T+BIM

Study on Properties of Recycled Aggregate Grouting Material and Grouting Recycled Concrete

..... Feng Fang, Xu Bo, Song Hua (21)

Abstract: In view of the reinforcement and the repair of the old cement concrete roadbeds, the subgrade cracks, and the bottom cavity of pavement plates and so on, the fluidity and mechanical properties of the recycled aggregate grouting material are studied by the tests. Moreover, the mechanical properties of the grouting recycled concrete are further analyzed. The study results show the relationship among the recycled fine aggregate dosage, the ambient temperature and the fluidity of recycled aggregate grouting material, as well as the influence law of the recycled fine aggregate dosage and the water-binder ratio on the mechanical properties of the recycled aggregate grouting material and the grouting recycled concrete.

Keywords: construction waste, recycled aggregate grouting material, grouting recycled concrete, fluidity,

flexural strength, compressive strength

Overall Design of Jiangwan Bridge Peng Zhimiao, Cao Xuhua, Chen Wei (26)

Abstract: The article summarizes the design concept and scheme of the main bridge of Jiangwan Bridge. In the preliminary design period, three schemes of about 180-m span are proposed for the main bridge of Jiangwan Bridge. Finally, the single-pylon arched-pylon double-plane steel-concrete composite girder cable-stayed bridge is determined to use. The steel box girder is used for the main span of the main bridge, and the pre-stressed concrete box girder is used for the side span. The total width of bridge is 44.5 m with double-way eight lanes + pedestrian and non-motored vehicle lanes. The article introduces the survey method and result of karst caves. The relative design thought and experience can be referred for the similar projects.

Keywords: cable-stayed bridge, overall scheme, arched pylon, karst cave, geophysical prospecting CT, advanced drill

Design Method of Urban Bridge Modeling Landscape Lu Jun (31)

Abstract: The article sets forth the characteristics, principles and methods to design the urban bridge modeling landscape. According to the analysis on the design case of bridge, the article discusses the design method of urban bridge modeling landscape.

Keywords: urban bridge, modeling landscape, aesthetics, design method

Study on Rapid Implementation Design of Dianqi River Bridge Reconstruction Project in Beijing
..... Pan Keming, Xiao Yongming, Wang Haidong, He Dapeng (34)

Abstract: The conventional reconstruction projects of small and middle-span bridges greatly influence the existing traffic. The full prefabricated bridge technology and rapid construction method are firstly applied in the Dianqi River Bridge Reconstruction Project of the existing expressway reconstruction projects in Beijing. The construction period normally required for 2~3 months will be shortened to 25 d, which will minimize the impact of construction on the present traffic. The article introduces the design scheme, construction steps and period control of rapid implementation of the full prefabricated bridge, and sets forth the key technologies of the integral prefabrication, manufacture and installation of pier column and bent cap, the socket-type connection of prefabricated pier column and foundation, and the large self-propelled crane integrally to hoist the steel girder in detail.

Keywords: bridge reconstruction, small and middle spans, rapid construction, full prefabrication

Exploration and Practice on Full Prefabrication Technology of Bridge ... Zhou Liang, Yan Xingfei, Li Xuefeng (38)

Abstract: The full prefabrication technology of bridge is a high-efficient, low-carbon and environmental-protection bridge construction technology. This paper introduces the practice of this technology in detail. Firstly combined with the development situations at home and abroad, the article briefly introduces the prefabrication technology of the superstructure, then introduces the prefabrication technology of the

substructure in detail including the common assembly connection method of precast column and the seismic performance of prefabricated column at home and abroad, finally summarizes the full prefabrication technology.

Keywords: full prefabrication, superstructure, substructure, seismic performance, connection mode

Application of Prefabricated "Segment" Assembly Technology in Utility Tunnel

..... Zhong Xiang, Zhang Guo, Wang Qiang (42)

Abstract: The article briefly introduces the development history of urban utility tunnels at home and abroad, and the construction policies and forms of utility tunnels in China now. Taking the utility tunnel of Shulong Road Phase V as an example, the article sorts out the calculation method including the block size, load calculation, calculation model and analysis calculation of prefabricated "segment" assembly technology in the design of utility tunnel, which provides the reference for the application of this technology in the utility tunnels in the future.

Keywords: utility tunnel, prefabricated "segment" assembly, analysis calculation

Practice and Study on Reconstruction of Urban Damaged Bridges in China

Mu Xiangchun (47)

Abstract: The article introduces the present situation of the existing damaged bridges in China and analyzes these causes, comprehensively analyzes three typical cases of Beijing Xizhimen North Interchange Reconstruction Project, Beijing Sanyuan Bridge Reconstruction Project and Tianjin Jiefang Bridge Reconstruction Project, sets forth the study trends of this field at home and abroad, and puts forward the relative countermeasures and proposals in order to provide the reference for the reconstruction and management work of the urban damaged bridges in China.

Keywords: urban damaged bridge, reconstruction, countermeasures

Study on Application of Full Assembly Prefabrication Technology in Excavation of Urban Underground Road Tunnel in Soft Soil Region

Chen Naiji, Zhang Yinping, Hu Zhebin (51)

Abstract: The underground engineering industrialization construction is the development orientation of underground engineering. At present, the industrialization rate of underground road tunnel by the traditional excavation method is lower. The works of steel bar binding, concrete pouring and so on are all required to complete on site. The application of full assembly prefabrication technology can remarkably reduce the amount of field work, improve the efficiency of manual utilization, and at the same time improve the structure quality of tunnel. But limited by the characteristics of excavated tunnel, there are still some technical difficulties in the excavation of underground road tunnel in the urban core area of the soft soil region. There is no successful case now. Taking the scientific research task of *Study on Key Green Industrialized Intelligent Construction Technology of Tunnel Excavation Engineering in Complex Environment* as the background, and combined with a project in Shanghai, the article puts forward the solving scheme of full assembly prefabrication technology in soft soil region, which can be referred for the promotion of the full assembly prefabrication technology in future.

Keywords: full assembly, prefabrication, excavation method, road tunnel, soft soil region

Elementary Discussion on Planning and Construction of Garden City Oriented by Water Strategy
..... Duan Yu, Huang Chuanhe, Luo jie (54)

Abstract: Based on the background of garden city construction in Chengdu, the article studies the construction mode of garden city oriented by the water strategy, discusses the significance of water pattern, water treatment, water safety and water development for the development of garden city, and puts forward the construction strategy to upgrade the water planning, to ensure the water safety, to improve the water environment, to build the water landscape, to highlight the water culture and to integrate the water business forms in order to realize the maximization of ecological and economic values of garden city.

Keywords: water strategy, garden city, city planning, construction mode

Research on Key Technology of Urban Road Low Impact Development Design Zhu Gang, Peng Zhuwei (58)

Abstract: According to the national guidelines, the standard atlas and the related guidelines, and based on some problems in practical application, this paper discusses the way of achieving the upper planning index and the key technology of individual facilities in the practice of low impact development design of urban roads in order to provide certain reference for the similar projects of the other cities.

Keywords: urban road, low impact development, design, sponge city

Design Essentials of Flood and Waterlogging Control for Sunk Bridge Area (Tunnel) in Beijing
..... Deng Weidong (63)

Abstract: With the development of Beijing City, a large number of underground spaces of sunk interchange, underground road and tunnel are being developed, planned, designed and constructed. The roads under the sunk interchanges often become the severely afflicted area of waterlogging during the flood and waterlogging. The article introduces the technical lines in the flood and waterlogging control design of sunk bridge area (tunnel), and sets forth the investigation of the historical flood and waterlogging disasters of the project area in the flood and waterlogging control design stage, the determination of design water level of flood and waterlogging control, the division method of rainwater catchment area, the necessary non-engineering measures, the flood and waterlogging control design principle, and the other engineering flood and waterlogging control designs.

Keywords: sunk bridge area, flood and waterlogging control, design, essentials

General Deducing Method of Annual Runoff Volume Control Rate Corresponding to Design Rainfall
..... Lou Jian (67)

Abstract: One of the sponge city construction core indexes mentioned in *Sponge City Construction Technical Guide - Construction of Low-impact Development Rainwater System (Trial)* is the annual runoff volume control rate. Based on the 1983~2012 rainfall data of China in *Guide*, the basic annual runoff volume control rates corresponding to the design rainfall of 31 important cities in China are deduced. But in the practical

design work, there may be no sponge city planning for the project, and the project is also not listed in Appendix B of *Guide*. In order to satisfy the construction and design requirements of sponge city, the 1984~2014 annual daily rainfall data are used in an engineering practice near Ziyang City. The Excel software is used to deduce the relationship between the annual runoff volume control rate and the design rainfall. The article introduces the general deducing method of annual runoff volume control rate corresponding to design rainfall, and also provides the guidance for the construction of the sponge city in Ziyang City and its surrounding regions.

Keywords: sponge city, annual runoff volume control rate, design rainfall

Comprehensive Application of Sponge City Engineering Measures in Urban Landscape Square

..... Chen Lang, Mai Tianpeng, Zhang Tengcan (70)

Abstract: The article introduces the basic concept and common engineering measures of sponge city. Based on the practical engineering cases, the article sets forth the comprehensive application of many sponge measures of grassed swales, rainwater storage tank, rainwater garden and ecological tree pond in the water supply and drainage system of Minda Road Landscape Square in Southwest University for Nationalities in order to provide the reference for the design of the sponge city in the urban landscape square.

Keywords: sponge city, square, engineering measures, comprehensive application

Elementary Discussion on Section Design of Urban Ecological Hydrophilic River Embankment ... Wang Xu (73)

Abstract: The article discusses the urban inland river improvement methods by the Chengdu Jinjiang River Ecological Zone Improvement Project, further studies the design concept of urban inland river hydrophilic embankment, and introduces the overall layout scheme of the project, the section design of river flood channel and the ecological section structure design.

Keywords: river improvement, river embankment, ecology, hydrophilic, section design

Study on River Improvement of Livable Waterfront Engineering Jiang Shengyin (76)

Abstract: The article studies and discusses the design of Huanhua Brook Section Comprehensive Reconstruction Project in the "municipal demonstration section" Xijiao River of the livable waterfront in Chengdu, and analyzes the safeguard measures of river from the aspects of water source safety, riverside ecologicalization, water quality limpidity and landscape water storage in order to provide the reference for the ecological planning and design of urban rivers.

Keywords: improvement, livable, riverside ecologicalization, hydrophilia

ROADS & COMMUNICATION

Thinking about Planning and Construction of Express Roads in Medium-sized Cities Li Tianxiang (79)

Abstract: With the rapid development of social economy, the medium-sized cities of China have realized the rise of city and the upgrading of energy level. A strong transportation system is urgently needed to support the

city construction. Under the premise of upgrading the threshold of rail transit, the construction of a high-capacity transportation system represented by the express roads has become the consensus of all parties in society. Taking Xiangyang City as an example, the article summarizes the experience in the planning construction of the inner ring line of Xiangyang City, which can be referred for the similar cities of China.

Keywords: medium-sized city, express road, planning, construction

Elementary Study on Express System of National and Provincial Highways in Ningbo Chen Min, Li Feng (83)

Abstract: In order to enhance the traffic capacity, improve the service level and optimize the traffic environment of the national and provincial highways, and to build the "beautiful highway", the ordinary national and provincial highways are made to become the powerful transportation support, guarantee and important landscape of "beautiful city". Using the national and provincial highways of Ningbo City as the study object, the advanced construction concept is carried out, and the reasonable engineering optimization measures, intelligent transportation technology and advanced management methods are used to form the express system of the ordinary national and provincial highways in six types of rapid and smooth, safe and reliable, intelligent and high effective, people-oriented service, green environmental protection, and cultural experiential so as to scientifically guide the construction of the national and provincial highways, to play the good demonstration effect and to provide the important reference and basis.

Keywords: national and principal highways, express system, study

Study on Traffic Impact Analysis Method of Large-scale Theme Park Jiang He (87)

Abstract: This article analyzes and studies the traffic impact of perfecting the major construction projects, especially the analysis process of large-scale theme park. Taking the Liuzhou Kale Planet Project as an example, the article firstly analyzes the scale of passenger flow according to the characteristics of passenger source to the large-scale theme park, then determines the passenger scale and travel mode structure by combining the local situation of Liuzhou and referring the travel mode structure of other large-scale theme parks, and uses the software TRANSCAD to carry out the forecast and distribution of traffic volume, and finally analyzes the traffic impacts of the most influential road sections and intersections. The achieved conclusions provide the references for the proposal of the traffic improvement schemes in the future. Mainly starting from the characteristics of large-scale theme parks, the article introduces the transportation demand of such construction projects from both passenger distribution and travel modes so as to form a complete set of traffic impact analysis process.

Keywords: theme park, characteristics of passenger source, traffic mode, traffic forecast, impact analysis

Study on Coordination and Optimization of Traffic Organization for Multi-line Construction of Urban Road Network Hou Wei (92)

Abstract: Taking the centralized construction of multi-term occupying-road projects of viaducts, utility tunnels and metros in the north area of Urumqi as an example, based on the sorting out and analysis on the

traffic interaction in the construction period of each project, and the problems to be coordinated, the article puts forward the coordination and optimization methods of traffic organization of coordinating the setup of shortcuts at the upper and down nodes, coordinating the traffic diversion organization and coordinating the construction procedures during the multi-line construction of urban road network.

Keywords: municipal project, centralized construction, coordination and optimization, traffic diversion, scheme study

Analysis on Necessity of Constructing Entrance and Exit Interchange in Xinwu District of Nantong-Wuxi

Ge Gang (95)

Abstract: With the development of city, the entrance and exit of expressway interchanged with the urban roads become the mainstream. Some built expressway entrances and exits are also adjusted to interchange synchronously with the reconstruction of roads. But not all expressway entrances and exits are suitable to reconstruct. According to the analysis on the necessity of constructing the entrance and exit interchange in Xinwu District of Nantong - Wuxi Expressway, based on the surrounding road network planning, land planning and traffic volume, and the comprehensively considering the spacing between the upstream and downstream expressway entrance and exit, the conclusion is that the construction of interchange is unnecessary, which can be referred for the similar projects.

Keywords: entrance and exit of expressway, interchange, necessity

Analysis on Influence of Road Intersection on Driving Safety of Road Wang Xiaojun (99)

Abstract: The article concludes the road design characteristics and traffic organization features of line interactions, makes clearly the relationship between intersection design and traffic safety. Focusing on the intersections of the plane and tridimensional road lines, the article sets forth the relative design influence factors of intersection on the driving safety, and accordingly puts forward the design improvement measures and essentials.

Keywords: road line, intersection, branching, driving safety, influence analysis

Roadbed Treatment Scheme for Road above Metro Zhou You (102)

Abstract: Aiming at the road construction project above the built metro, especially the roadbed treatment and filling surrounding the metro station and above the shield, the article puts forward the suitable implementation scheme not only satisfying the road engineering quality requirements, but also guaranteeing the metro structure to be not affected, and discusses the treatment of the soft foundation surrounding the metro.

Keywords: road and metro collineation, roadbed treatment, surrounding metro station, above shield

Application of Permeable Asphalt Pavement (OGFC) in the Construction of Sponge City in Xiushan County

Li Gang, Zheng Yu, Liu Yan, Shao Qiang (105)

Abstract: The permeable asphalt (open graded friction course - OGFC) pavement can decrease the road surface runoff during rainfall and decrease the noise at both sides of road, has the advantages of rapidly

discharging the pavement waterlogging, the good anti-slide performance of pavement and the good driving safety, and is widely used in the construction of sponge city. Starting from the characteristics of OGFC pavement construction technology and relying on the implementation case of Xiushan County Sponge City Construction Project, the article analyzes the construction technology of OGFC pavement to be paved on the old concrete pavement, and puts forward the maintenance issue for attention in the late in order to reduce the influence on the service effect and durability of pavement.

Keywords: sponge city, permeable asphalt, open graded friction course (OGFC), concrete pavement, construction technology

Elementary Discussion on Interrelation of Rail Transit Project and Municipal Road Yu Miao (108)

Abstract: At present, the rail transit and municipal road are being constructed in all major cities of China. These two projects can all belong to the civil engineering, and are also the projects to better solve the problems of urban traffic. But according to the practical situation, these two projects are all separately constructed in many cities. In this way, this leads to the interference between two projects in a local road section and influences the whole construction progress of the project. Based on this, the article summarizes the characteristics of rail transit by a rail construction project, and further analyzes the relationship between the metro traffic project and the municipal road in order to save the construction fund, reduce the negative impact of construction on the environment and achieve the satisfactory benefits.

Keywords: P+R parking lot, social benefit, and bus stop

BRIDGES & STRUCTURES

Conceptual Design of Long-span Composite Girder Cable-stayed Bridges Chen Liang, Shao Changyu (111)

Abstract: The composite girder cable-stayed bridge has the great potential for development to longer span. In this paper, the principal technical issues of composite girder cable-stayed bridges that should be considered at the conceptual design stage are clarified. In the aspects of reasonable span limit, general arrangement and main structure parameters, the laws and essentials that should be well understood in the conceptual design of the type of the bridge are analyzed and expounded. The technical trends of the key issues on the mechanical effects, such as shear lag, shrinkage and creep, slip of shear studs, nonlinearity, decision of reasonable finished bridge and construction state are described. Finally, the vital importance of conceptual design to the practice and development of composite girder cable-stayed bridge is emphasized.

Keywords: long span, cable-stayed bridge, composite girder, conceptual design

Analysis on Overall Stability of Through Concrete-filled Steel Tube Arch Bridge Chen Jinlong (115)

Abstract: Combined with the design of Zhuji Road No.1 Bridge in Changde City, a spatial finite element model is established by using the finite element analysis software Midas/Civil. This model analyzes the overall elastic stability of structure and compares the influences of the different wind brace setting modes on the

overall elastic stability. On this basis, the nonlinear stability analysis of the structure is carried out by using the finite element software ANSYS. The effects of structural initial imperfection, geometric nonlinearity and material nonlinearity are considered in the analysis. The analysis results show that the overall stability performance of the bridge can satisfy the operating requirements by the reasonable wind brace setting, and the nonlinear factors of the structure have great influence on the stability.

Keywords: concrete-filled steel tube arch bridge, stability, nonlinearity, transverse brace

Design and Analysis on Stability of High-pier Long-span Continuous Rigid-frame Bridge Ma Lixiong (118)

Abstract: The high-pier long-span continuous rigid-frame bridge is a bridge structure more applied in the complex mountainous environment. Its stability is a critical point and difficult point of the design. Based on the principle of structural stability, the engineering significance of elastic stabilization for checking calculation of bridge design is expounded. Relying on a long-span continuous rigid-frame bridge, the design and construction methods to improve bridge stability are analyzed, and the parametric study and verification are carried out through the finite element analysis. The results show that the wall thickness of high pier and the design of connecting beam have the significant influence on the bridge stability. Finally, the optimal design scheme is given by the practical projects.

Keywords: continuous rigid-frame bridge, high pier, long span, stability, design method, safety calculation

Study on Key Anti-overturning Stability Technology of Steel Box Girder Bridge Wang Rui (121)

Abstract: Compared with the concrete box girder, the steel box girder is stronger than the low quality, has the advantages of high torsional rigidity, light dead weight, high strength and short construction period, and is widely used in the urban viaduct spanning intersection. The curve steel box girder is easy to cause the uneven forces on the inner and outer supports of curve, and even the inner support is empty because of "bend - twist coupling effect, which will be harmful to the anti-overturning stability. The analysis on three aspects of the most unfavorable tumble axis, end support spacing and support corner forms the anti-overturning checking calculation standards, which are used for the engineering practices.

Keywords: steel box girder, anti-overturning, the most unfavorable tumble axis, end support spacing, support corner

Simulation Analysis on Integral Hoisting of a Long-span Steel Box Continuous Girder Bridge ... Li Maowen (126)

Abstract: The long-span steel box girder has the advantages of light dead weight, large bearing capacity and convenient hoisting construction, able to obviously decrease the wading construction measures and reduce the engineering cost, and is widely used in more and more modern sea-crossing bridge projects. However, due to the crisscross arrangement of its vertical and horizontal stiffening ribs, and the local rigidity insufficiently at the roof and floor, the stress concentration is easy to occur at the hoisting point so as to cause the stress increment at the hoisting point, which will be related to the construction safety of the whole bridge. Therefore, it is very necessary to simulate and analyze the integral hoisting of long-span steel box girder in the

construction process. The reasonable finite element settlement results can improve the structure construction and hoisting position so as to guide the whole construction process and to reduce the construction risk. Taking a long-span continuous steel box girder as a study object, the mechanical performances of steel box girder and connecting bracket are simulated in the whole hoisting process through the finite element calculation. The simulating computation results show that the lateral position of hoisting point in the junction of solid-web diaphragm plate and mid-web plate is the best location, by this time all plate stresses of box girder are obviously improved. The calculation of the mechanical properties of steel box girder and connecting bracket in the hoisting process of the whole construction period can meet the construction needs, and has a large safety reserve.

Keywords: steel box girder, hoisting, bracket, finite element

Analysis on Diseases of Asymmetric Continuous Girder Based on Spatial Grid Model

..... Xu Yuehuo, Tian Zhiqiang, Ni Yingsheng (130)

Abstract: The article sets forth the present situations and causes of cracks and diseases of the variable cross-section continuous girder bridge, and its calculation and analysis, points out the deficiencies of single-girder model, plane beam grillage model and solid model used for the calculation in the design so as to educe the practical fine analysis method - spatial grid model, and introduces the principle of the spatial grid model in detail. Taking the disease bridges as the background, the article describes the detection results and preliminarily analyzes the crack causes. On this basis, the article analyzes the influence factors of overload and web temperature difference. The article contrasts the cracking positions of web and the transfinite range of stress from the views of the normal stress and surface tension stress. The result shows that the temperature difference is not a sensitivity factor to cause the web cracking, and the overload is the main factor to cause the web cracking. The conclusion is that the spatial grid analysis method can provide the significant guidance for the analysis of such box girder structure.

Keywords: asymmetric, web crack, variable cross-section continuous girder, spatial grid model, disease analysis

Finite Element Analysis on Ultimate Bearing Capacity of High-strength Steel-Concrete Composite Girders

..... Niu Liming (135)

Abstract: The composite steel-concrete girder is a new type of structures using the characteristics of good steel tension property and good concrete compression performance to integrate the steel and the concrete by connectors and to bear the force together. This kind of girder has not only the advantage of the steel structure and the reinforced concrete structure, but also the remarkable economic and social benefits of technology. In order to study the influence of structural geometric parameters and material strength on the ultimate bearing capacity of composite girder in the high-strength steel-concrete composite girder, the finite element numerical calculation model of 12 high-strength composite girders is established under the deuce symmetrical loads in the span to analyze its ultimate bearing capacity. The analysis result indicates that the

geometrical parameters (including the width and thickness of concrete wing plate) and the material strength (including the concrete strength and steel girder strength) of material strengths of the composite girder have the greater effects on the ultimate bearing capacity of composite girder.

Keywords: high-strength composite girder, ultimate bearing capacity, nonlinear finite element, parameter analysis

Design and Analysis of Hollow Reinforced Concrete Slab Arch Bridge Wang Bin, Ren Runtian, Sun Yagang (139)

Abstract: The arch bridge is a bridge structure system with a long history, and was considerably developed in the 20th century. In recent years, the design of arch bridge even more tends to the modern long-span concrete filled steel tube composite system. But the reinforced concrete arch bridge has the advantages of beautiful modeling, good durability and low maintenance cost, and is still widely used in some constructions of small-span and middle-span bridges. The article studies and analyzes the calculation theory, model simplification and calculation result of hollow reinforced concrete slab arch bridge through the practical engineering design cases, and puts forward the constructive proposal for the engineering design.

Keywords: slab arch bridge, hollow, two-hinge arch, bridge design

Design of Anti-collision Facilities for Long-span Cable-stayed Bridge Yang Haiping (142)

Abstract: Through the design and implementation of anti-collision facilities of a bridge, this paper introduces the ship anti-collision design scheme of floating-type flexible anti-collision facilities combined with the fixed composite material anti-collision facilities. This scheme has the advantages of effectively absorbing the impact energy and reducing the impact force. This scheme can furthest reduce the damage to the collision ship, which can be referred for the other similar projects.

Keywords: cable-stayed bridge, collision force of ship, floating, flexible, anti-collision facilities, fixed, composite material, anti-collision block

Landscape Design and Cost Analysis of Jiangwan Bridge Peng Shiyao, Peng Zhimiao (145)

Abstract: Combined with several bridge type schemes of Jiangwan Bridge, the article briefly discusses the relationship between the bridge modeling and urban aesthetics and cost. With the rapid development of city, the people have the higher requirements for the appearance of buildings. Some small and middle cities have few landmark projects. The unique bridge appearance design of city could upgrade the townie environment of local regions. It should be to fully consider the economy of this city besides its applicability of function and landscape during the design of urban landscape bridges so as to make the built bridges really able to satisfy the requirements of safety, durability, applicability, environmental protection, economy and beauty.

Keywords: landscape, cable-stayed bridge, design, construction cost

Study on Static Loading Test Method of Bridge Li Yancun (148)

Abstract: The bridge detection is an important method to guarantee the safety of bridge structure. The static

loading test is an important method to understand the structure property in all bridge detection items. Combined with the practical case of static loading test for a simple-pylon cable-stayed bridge, the article introduces the essentials and methods of the static loading test for cable-stayed bridge mainly including the test object, operation setting and testing contents, strain detection point arrangement, deflection detection point arrangement, main pylon displacement detection point arrangement, cable force testing and loading efficiency. The structure strength and rigidity of this bridge all satisfy the standards and requirements at this stage. The relative engineering experience can be referred for the static loading tests in the detection of the similar bridges.

Keywords: cable-stayed bridge, static loading test, method study

Study on Local Stress at End of 32-m Simple-supported Box Girder of High-speed Railway Xing Yu (150)

Abstract: Based on a design scheme of 32-m simple-supported box girder of high-speed railway, the article studies the influence factor of local stress at the girder end through the establishment of the finite element model, and determines the adjustment scheme. The study result shows that the local stress at the girder end is greatly influenced by the steel cable, but is not sensitive to the transverse spacing, vertical load and structural sizes of the support. The decrement of steel cable sizes and vertical bends can all decrease the principal tensile stress. The layout of steel cable also has the influence on the local stress at the girder end. The increment and decrement of the steel cable sizes at the relative positions can effectively reduce the principal tensile stress. The article checks and calculates the reinforcing bars at the girder end of the recommended scheme. The steel bar stress and crack width all satisfy the standards and requirements.

Keywords: simple-supported box girder, finite element, local stress at girder end, pre-stressed steel cable

Design and Discussion on Reconstruction of Pier Position for Pedestrian Overpass Keeping Existing Superstructure Wu Zhen, Liu Jianshe, Liu Peng, Xu Shengle (154)

Abstract: Combined with the implemented projects, under the condition of keeping the existing upper steel girder and on the basis of calculating and analyzing the structure, the pier position of the substructure for the main bridge of pedestrian overpass is reconstructed. This kind of reconstruction method can greatly shorten the construction time, save the construction cost and provide certain guiding significance for the reinforcement and reconstruction of the similar bridges.

Keywords: pedestrian overpass, reconstruction in situ, structure analysis

FLOOD CONTROL & DRAINAGE

Comparison of Mathematical Model and Reasoning Formula under Different Design Conditions ... Xiao Junjian (158)

Abstract: Aiming at the limitations of reasoning formula for the calculation of the design flow of urban rainwater pipe and channel referring to *Code for Design of Outdoor Drainage* (GB 50014-2006) in 2016 edition, this paper compares the differences of input parameters and calculation results between the reasoning formula and the mathematical model, and compares and studies the calculation results of two

methods under the condition of the different catchment areas, catchment area shape coefficients and ground catchment time. The results show that the difference of the rainwater design discharge calculated by two methods is less than 17%, and the difference of the rainwater design diameter is not more than 100 mm when the catchment area is smaller than 3km² and the catchment area shape coefficients are 0.026 ~ 0.417, and at the same time, the uncertainty of ground catchment time t_1 is considered. The result of this study can provide a reference for the selection of computing method and its reasonable valuing for the design discharge of urban rainwater pipe and channel.

Keywords: reasoning formula method, mathematical model method, rainwater pipeline, design discharge

Study on Rainwater Collection and Utilization System of Viaduct Liu Ji, Tai Hao (162)

Abstract: The common water sprinkler systems of viaduct are the drainage system, sponge system and so on. In order to solve the problem of green belt irrigation under the viaduct, this paper introduces a rainwater collection and utilization system. This system makes full use of rainwater from the viaduct deck to irrigate the greenbelts under the viaduct, decrease the construction cost of municipal pipeline network, and reduce the operation and maintenance cost of urban roads. After more than one-year service of this system used in the practical projects, its operation is good and the green belt grows better to achieve the ideal effect, which can be referred for the similar projects in the future.

Keywords: viaduct, rainwater collection and utilization system, greenbelt, irrigation

Application of a New Sewage Interception Well in a Municipal Project of Xian

..... Yin Bohan, Wang Jibin, Chen Weijing, Jing Minli (165)

Abstract: The article introduces the technological design and structural style of a new sewage interception well and its application in the practical projects. This kind of interception well has the advantages of simple process, small area occupation and low engineering investment, which can be selected by the design of the similar sewage interception projects.

Keywords: sewage interception, combined sewage pipeline, new type

Application of U-shaped Pre-stressed Concrete Sheet Pile in Flood Control Wall of Huangpu River

..... Yan Yanjuan (168)

Abstract: The U-shaped pre-stressed concrete sheet pile compared with the traditional prefabricated concrete plate, square pile and cast-in-place pile has the highlighted characteristics of large anti-bending section, short construction period and high economic benefit, and has been gradually applied in all engineering fields of China. Combined with the engineering practice of the estuary shoreline redirection of Zhangjiatang Harbor in Xuhui Riverside of Shanghai, the article introduces the application of the U-shaped pre-stressed concrete sheet pile in the flood control wall of Huangpu River from the selection of pile shape, the design of structure scheme and the matters for attention in the construction process. This project has get through a flood season safely and guaranteed the expected safety of flood control, which can be referred for

the similar projects.

Keywords: U-shaped, pre-stressed sheet pile, Huangpu River, flood control wall

Construction Technical Essentials, Management and Maintenance of River System Ecological Treatment Project (North Area) in First Phase Opening Range of Country Park in Minhang District

..... Chen Yunlan, Wu Zhijia, Chen Dongji (171)

Abstract: Taking the river system ecological treatment project (north area) in the first phase opening range of the country park in Minhang District as an example, the article introduces the early preparations of project implementation, the greening technology essentials, and the engineering management and maintenance in detail, and analyzes the construction technological essentials and the quality control difficulties in the implementation of this project. The implementation effect of this greening ecological comprehensive reconstruction is good. The better construction experience can be achieved by the analysis of this project in order to provide a certain reference for the follow-up projects.

Keywords: river greening, construction technological essentials, greening management and maintenance

MANAGEMENT & CONSTRUCTION

A Key Improvement Technology of Temporary Pocketing Hoist System for Suspender Replacement under Beam at Limited Height

..... Dou Yongzhi, Zhang Riliang, Wei Futang, Ning Shaofeng (174)

Abstract: According to the maintenance engineering practices of old bridge, the article introduces the type selection and system composition of the temporary pocketing hoist system for the suspender replacement under the beam at limited height of a through steel-tube truss concrete arch bridge, and the design essentials of its key components. And the theoretical calculation verification and test condition verification are carried out through the finite element program. The engineering practice has proved that this temporary pocketing hoist system safely and effectively realizes the suspender replacement. Also this practice can provide the reference for the replacement of the similar bridge suspenders, and the design and construction of the similar temporary pocketing hoist systems.

Keywords: limited height, through steel-tube truss arch bridge, suspender replacement, temporary pocketing hoist system

Application of BIM Technology in Rebar Modularization of Gaowan Oversize Bridge Project

..... Jiang Pengfei, Liang Jian (178)

Abstract: According to the rebar modularized construction of Gaowan Oversize Bridge Project in Xiangshan County, this paper introduces how to use BIM technology and to optimize and adjust the structural layout of rebar by 3D modeling so as to effectively improve the convenience of rebar modularized installation on site. The article analyzes the application prospect of BIM technology in the rebar modularized construction, which has a certain reference value for the rebar modularized construction of the similar projects.

Keywords: rebar modularization, BIM technology, 3D modeling, optimization of rebar layout

Analysis on Influence of Base Slab Construction for Small-spacing Bridge on Operation of Metro Tunnel Xie Chunhua (182)

Abstract: In Shenzhen, the base slab of a bridge project overpasses the tunnels of the existing Metro Line 5 and Metro Line 11 of Shenzhen at short range. The minimum clear distance of the base slab and tunnel is 4.6 m. Owing to the characteristics of complex soil property and closing to the tunnel, the excavation of foundation pit for base slab will cause the adverse impact on the tunnel. The 3D finite element numerical model is established to simulate and analyze the influence of the bridge base slab during the excavation and construction on the existing structure of metro tunnel through the structural deformation of the existing tunnel, the curvature radius of tunnel longitudinal deformation curve and the additional stress of tunnel structure, and demonstrate the operation safety of the existing metro tunnel. The study result can be referred for the design and construction of the similar projects.

Keywords: small spacing, base slab of bridge, metro tunnel, numerical simulation

Quality Control of Pre-stressed Pipe Grouting Technology in Bridge Engineering Construction He Qin (186)

Abstract: With the development of urbanization process in China, the construction scope of road engineering projects is getting larger and larger. The construction technology of bridge engineering as the constructional engineering emphasis is continuously perfected and developed. The relative construction quality is also upgraded to a certain extent. The article analyzes the quality control of the pre-stressed pipe grouting technology in the bridge engineering construction. The relative experience can be referred for the similar projects.

Keywords: bridge, engineering, construction, pre-stressing, pipe, grouting technology, quality control

Analysis on Engineering Quality Control Parameters of Large-diameter Buried Plastic Drainage Pipeline Zhang Qiang, Han Cong, Li Tong, Shen Hao, Liu Xingpo (189)

Abstract: In order to satisfy the demand of large-diameter buried plastic drainage pipeline in the municipal engineering the large-sized sand box test system is used to test and research the DN1200 and above large-diameter buried plastic drainage pipelines. The conformance test and the backfill contrast test prove the conformity of the theoretical calculation formula, which provides the test data reference for the design, construction and operation management.

Keywords: large diameter, plastic drainage pipeline, test analysis

Elementary Analysis on Foundation Treatment of a Wastewater Treatment Plant Upgrading Reconstruction Project in Qingdao Tang Xiaohu (193)

Abstract: The foundation treatment has the distinctly important practical significance in the construction process of civil engineering. Combined with the geological condition of a wastewater treatment plant upgrading reconstruction project, the article analyzes the foundation characteristics of the main buildings and structures, and puts forward the foundation treatment scheme combining the anchor rod, reinforced

concrete cast-in-place pile and rubble concrete with the natural subgrade for the main buildings and structures to satisfy the requirements of integral floating resistance, settlement deformation and bearing capacity of buildings and structures, which can be referred for the similar projects.

Keywords: foundation treatment, anchor rod floating resistance, cast-in-place pile

Innovation and Engineering Application of Injected Hole Hydraulic Test Dai Nan (196)

Abstract: The hydraulic test of steel pipe-jacking anti-drag slurry hole is the important guarantee of the underground pipeline construction quality. The traditional construction methods are inefficient and cumbersome in operation. In order to improve this situation, the article discusses and introduces a more effective and safe hydraulic test device and a using method of steel pipe-jacking anti-drag slurry hole. This equipment adopts the innovative method. After modification and discussion of the schemes for many times, and the simulative test of waste pipe, it has the more highlighted advantage than the traditional methods. This new equipment has the property of multi-hole synchronized pressure test to improve the construction efficiency for several times, to save the construction time and cost, and guarantee the construction quality, which can be referred for the similar projects.

Keywords: anti-drag slurry hole, distribution, pressure test

STUDY ON SCIENCE & TECHNOLOGY

Experimental Study on Pavement Performance of Fiber Reinforced Asphalt Mixture Zhu Xianzhi (200)

Abstract: To study the improvement effect of asbestos, nylon and polyester fiber on the long-term performance of asphalt mixture, the physical and mechanical tests of asphalt mixture are carried out. First, the different fiber concretes are tested and designed. Then the influence of fiber content on the physical properties of bitumen is studied, and the Marshall Test is carried out to determine the optimal proportion of fiber asphalt mixture. Finally, the long-term performance of fiber asphalt mixture is studied through the indirect tensile test. The study results indicate that the softening point of bitumen increases and the permeability decreases with the increase of fiber content. All indexes of asphalt mixture can meet the design standard when the fiber content is 0.2%~0.6%. The tensile strength and the dry-wet toughness of all samples are improved after the fiber is added. The results explain that the fiber addition can make the mixture stable, cracks decrease, water damage reduce and durability improve. The optimum proportion of asbestos, nylon and polyester fibers is 0.6, 0.4% and 0.4 respectively. In view of the low cost of polyester fiber, it is recommended to use polyester fiber to improve the long-term performance of asphalt pavement in practice.

Keywords: fiber reinforcement, asphalt mixture, pavement performance, experimental study

Study on Bond Anchorage Test of Steel Bar and Ultrahigh Performance Concrete ... Wang Ruilong, Ma Biao (204)

Abstract: According to the central pullout test of steel bar, the article analyzes the influences of the steel bar diameter, relative anchorage length and ultrahigh performance concrete (UHPC) material on the bonding property between the steel bar and UHPC, introduces the influence rules of various parameters on the

bonding anchorage performance of the specimens, and puts forward the design proposal for the anchorage length of steel bar in UHPC. The test result shows that the existence of steel fiber will greatly improve the tensile property and integrality of UHPC without the split damage. The UHPC material has little effect on the bonding strength of anchorage. The bonding strength of anchorage decreases with the increment of steel bar diameter. The effects of necking should be considered in the design of anchorage length if the diameter of steel bar is larger than 25 mm.

Keywords: ultrahigh performance concrete (UHPC), central pullout test, bonding property, anchorage length

End Effect of Bridge Cable in Electromagnetic Nondestructive Testing ... Li Xiang, Xin Rongya, Zhang Qiwei (208)

Abstract: The bridge cable is faced with the corrosion and durability problems in the long service process. The hidden danger of structure safety caused by the cable flaw is very severe. The electromagnetic nondestructive testing technique is used to carry out the damage identification of bridge cable. The end testing is critical. In the magnetic flow detection model test, the end magnetic flow signal is drifting and the end effect is obvious. Under the open magnetization of permanent magnet excitation, the change rule and influence range of end effect of bridge cable are analyzed. The analysis shows that the end effect is weakened with the increment of bridge cable length and cable diameter under the open magnetization of permanent magnet excitation. Its influence range is mainly in the 2 m~3 m zone at the end of bridge cable.

Keywords: bridge cable, electromagnetic nondestructive testing, end effect, model test

APPLICATION OF ACHIEVEMENTS

Application of Tubular Pile in Soft Foundation Reinforcement Engineering and Enclosure Engineering

..... Chen Dongshu (212)

Abstract: The tubular pile is all named as the large-diameter cast-in-place concrete pile. The main technical essentials are three essentials of high-frequency vibratory hammer, double steel-pipe sleeve and annular pile toe used in the construction site. The customized pile frame equipment is used to crush, cut or vibrate the double steel-pipe sleeve with bottom ring seal into the required underground depth, and then to carry out the reinforced concrete cast-in-place construction in the annular space body formed by the double steel-pipe sleeve so as to complete a large-diameter cast-in-place pipe pile. Combined with several using cases, the article introduces the application of tubular pile technology in the soft foundation reinforcement engineering and enclosure engineering. The results show the superiority of this technology.

Keywords: tubular pile, soft foundation reinforcement, enclosure engineering

THE RELATIVE SPECIALITIES

Prospect of Underground Space Development and Utilization in Chongqing Luo Rui (217)

Abstract: From the building of people's air defense to the development of underground business, and from

the excavation of underground traffic function to the comprehensive utilization and development of underground space, the mountain city of Chongqing has entered into the golden age of large-scale development and utilization of underground space. This paper introduces three underground space development and utilization projects of the Jiefangbei Underground Ring Road, the Lijia Business Core Area and the Douzibei Two-river Tunnel. These projects show the strength and creativity of underground space development and utilization. Looking forward to the future, the planners and designers should more daringly explore the utilization of underground space in order to let the city develop faster and better.

Keywords: Chongqing, underground space, underground ring road, tunnel beneath riverbed, comprehensive development

Analysis of Municipal Sludge Quality and Discussion of Its Disposal Method in Xian

..... Zhang Yu, Fan Yingjie, Yang Pengcheng, Li Xueqiang, Liu Jinqian, Dang Minhui (221)

Abstract: The article analyzes and detects the typical sludge characters in the area of Xian, sets forth the main sludge disposal methods now in China and discusses the sludge disposal methods suitable for the area of Xian. The analysis results of sludge quality show that the moisture content is 81%~86%, the pH is 7.03~7.75, the organic content is 60%~69%, the ash content is 29.94%~36.26%, the volatile component is 54.39%~59.13%, and the higher heating value is 14.73~16.47 MJ/kg. And a few heavy metal contents of Gray-King tar yield 25%~30% and char yield 41%~47% exceed the national relative standards and regulations of land utilization. Based on the analysis of sludge quality and the present situation of limited land resource, large sludge output and fast sludge increment in the area of Xian, the incineration and drying pyrolysis recycling technology of sludge is expected to become the important method of local sludge disposal. The attention should be paid to the "nimby effect" when the sites of incineration project are selected.

Keywords: area of Xian, municipal sludge, sludge quality, disposal method

Analysis on Influence of Cofferdam Construction and Foundation Pit Excavation on Adjacent Tunnel and Bridge ...

..... Yu Chunlong (226)

Abstract: Taking the excavation of foundation pit in cross-river section for Shanghai North Cross Channel as an example, the article analyzes the influence of cofferdam construction and foundation pit excavation on the foundations of adjacent metro tunnel and bridge. The analysis result shows that the deformations of metro tunnel and bridge base slabs meet the fixed standards, and the design schemes are safe and reasonable. The design schemes and analysis results can be referred for the similar design projects.

Keywords: foundation pit, metro tunnel, numerical simulation, influence analysis

Planning Study and Practice of Utility Pipelines in Small Towns of Western Underdeveloped Area ... Du Sen (230)

Abstract: The infrastructures of small towns in the western area are falling behind of construction and various urban pipelines are irregularly constructed. Under the guidance of new urbanization and the "One Belt, One Road" strategy, the city construction will certainly bring the great-leap-forward development. At

present, the construction of Minhe County in Qinghai Province has entered a stage of rapid development. The old city area is in the planning reconstruction period. The trunk and branch roads of the new city area are in the tight construction period. The above provides the important opportunity for the planning and construction of urban utility pipeline projects. The summarization of the planning study and practices of the utility pipelines in Minhe County is hoped to provide some reference for the planning and construction of the similar urban utility pipelines in the western area.

Keywords: small town, planning of utility pipelines, Minhe County

Application of Numerical Simulation and Calculation in Design of Shallow-buried Excavated Channel

..... Yang Kejun (234)

Abstract: The application of numerical simulation analysis and calculation in the design of shallow-buried underground channel is expounded. Combined with the practical cases, the result, analysis and application of the numerical simulation are described in detail in the construction excavation mode and the longitudinal un-bracing length control. The numerical simulation and calculation can completely simulate the lining stress change, the pavement settlement change, and the influenced status of the relative buildings and structures caused by the different construction methods and procedures in the construction process of underground excavated channel under the conventional geological conditions. The relative engineering experience can be referred for the similar projects.

Keywords: numerical simulation, design, shallow-buried, underground excavation

Prediction of Advanced Water Exploration in Tunnel under Condition of High Loss Electromagnetic Wave

..... Shao Jianguo, Liang Zhuqing (239)

Abstract: The complex frequency conductance (CFC) method is a new electromagnetic wave water exploration technology. This technology uses the mid frequency electromagnetic wave to detect the change of complex impedance caused by the change of electrical conductivity and permittivity of water bearing rock mass. This technology is suitable for the long-distance advanced water exploration of tunnel. Taking the Xulou Iron Mine as the object, this paper studies the effect of advanced water exploration under the condition of high loss electromagnetic wave by the CFC method. The result shows that the CFC can still work properly in the higher conductivity and dielectric constant of medium. The test successfully detect the containing water structures within 100 m in front of -217 10⁻⁵ and -205 10⁻⁶ face of the mine in Xulou Iron Mine in order to play the positive role for the subsequent construction.

Keywords: high loss electromagnetic wave, complex frequency conductance (CFC), advanced prediction of tunnel

Analysis on Bid Decision of Construction Project Based on Value Engineering

..... Qu Jingan (242)

Abstract: The value engineering theory since found is widely applied in the social and economic fields. The mathematical model is built by the method of systematically to carry out the function analysis, function

definition and function evaluation based on the value engineering theory, and the method how to distinguish the necessary and unnecessary functions, and to eliminate the latter. The final quotations several schemes are compared and selected by taking the tender offer as the element and taking the marking standard of tender offer as the function. The optimal quotation is achieved by the strictly systematic calculation and analysis. The evaluation system is built to analyze all influence factors in the evaluation marking tables stipulated in the bidding documents, and the first and second factors are evaluated by the single-factor fuzzy evaluation of the expert marking. Based on the maximum membership degree, the function evaluation score of each scheme is achieved. The scheme evaluation result is obtained by the basic formula of the normalization data using value engineering. The final bid decision is formed by comprehensively absorbing the advantages of each scheme. Combined with the bid and tender process of Beijing – Urumqi Expressway Gansu Section Baigeda – Mingshui Highway Project, the article introduces the decision analysis on the tender price of the project, which can be referred for the similar projects.

Keywords: value engineering theory, fuzzy comprehensive evaluation, tender offer

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