

中华人民共和国住房和城乡建设部优秀期刊

# 城市道桥与防洪 (月刊)

CHENGSHI DAOQIAO YU FANGHONG

2010年 第10期 (总第135期)

2010年 10月 15日 出版

1984年 创刊

主 管: 中华人民共和国住房和城乡建设部

主 办: 上海市政工程设计研究总院

协 办: 全国城市道路与桥梁技术情报网

上海斯雄复合材料有限公司

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出 版: 《城市道桥与防洪》编辑部

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国外发行: 中国国际图书贸易总公司 代号: BM 1859

排版印刷: 上海申光印刷厂

地址: 上海市纪念路500号 邮编: 200434

标准刊号: ISSN 1009-7716

CN 31-1602/U

广告许可证号: 3101020070052

中国土木工程学会市政工程分会 刊物  
中国勘察设计协会市政工程设计分会

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期刊基本参数: CN 31-1602/U \* 1984 \* m \* A4 \* 198 \* zh \* P \* ¥15.00 \* 10000 \* 52 \* 2010-10

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# Urban Roads, Bridges & Flood Control

(Monthly)

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### REPORT ON SPECIAL TOPIC

Traditional and Modern Urban Bridges in England ..... Mu Xiangchun(1)

**Abstract:** The article systematically introduces the general impression and the detail investigation of the urban bridge construction in London, Nottingham, Coventry and Leeds during the visit in England. The article focuses bringing forth on the successfully and organically combining cases of the traditional and modern urban bridges constructed in England, and strives to provide the referred information and experience for the local designers so as to improve the health development of the urban bridge construction in China.

**Keywords:** England, urban bridge, bridge construction

### ROADS & COMMUNICATION

Using Two-phase Turn-around Signal Control, Discussing Intersection Crowding of City .....

..... Jiang Hongxin(8)

**Abstract:** The intersection of urban ground road is the place where the traffic jam is the most easy to happen. The article discusses a new two-phase (turn-around) single control mode, which not only keeps the high efficiency of two phases, but also organizes the turn-left vehicle flow. It fully play the integral superiority of the road network system, greatly upgrades the traffic efficiency of the plain intersection, and is propitious to relax the traffic jam status in the large cities.

**Keywords:** traffic jam, signal control mode, phase, new two-phase signal control mode

Discussion on Comprehensive Treatment Measures for Traffic Jam of Urban Roads .....

..... Zhu Fangzheng, Liu Jihua, Xu Yongbin(12)

**Abstract:** With the increasing pushing of urbanization course, the traffic jam problem of urban roads also increasingly stands out. The article puts forward a series of measures to resolve the urban traffic jam problem from two aspects of planning and management so as to relax its jam situation.

**Keywords:** urban road, jam, treatment measure, planning, management

Attempting Traffic Quietude in Zhongxin Tianjin Ecological City ..... Cheng Haibo, Zhou Liwei(15)

**Abstract:** The traffic quietude is the general term of the motor vehicle speed-down technology and is an important aspect in building the green traffic. The article sets forth the basic theory, idea and main practical measures of the traffic quietude, and puts forward the traffic quietude planning and implementing gist of the ecological city fully by combined with the traffic development trend of the ecological city able to ensure the realization of areal green traffic.

**Keywords:** ecological city, green traffic, traffic quietude, Tianjin

Discussion on Design of Harbor Interchange ..... Bai Zijian(18)

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**Keywords:** harbor road, interchange, ramp, main line, speed-down lane

Road Scheme Supported for Passenger Transportation of Tianjin Binhai Airport ..... Zhen Xi, Xing Jin, Wang Yuxiu(22)

**Abstract:** With the implementation of Tianjin Binhai International Airport Phase II Extension Project and the increment of the passenger throughput, the existing passenger transportation roads of the airport has not been able to satisfy the requirement of the collection, evacuation and transportation of the airport. According to the supporting road planning outside of the airport, the article analyzes the external traffic status of the airport after extension, and puts forward the supporting road scheme to resolve the passenger transportation traffic of the airport.

**Keywords:** Binhai Airport, passenger transportation traffic, supporting road, Tianjin

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**Abstract:** The article introduces the design scheme of the underpass of the main line, underground open bus station, ground square, ground second road and bridge, underground pipeline and protection of high-floor buildings to be organically blended for Wuhan City No.2 Ring Line Mafang Mountain Passage Project. This design scheme exerts itself to build “harmonious human and vehicle traffic environment”, fully embodies the design idea of taking people as the foremost and gives prominence to the landscape design.

**Keywords:** No.2 Ring Line, Mafang Mountain Passage Project, Design, Wuhan

Design of Diaphragm Wall for Underpass Grade Separation in Dongfeng Road of Zhengzhou ..... Shen Guochao, Cui Yaxin, Yang Lei(30)

**Abstract:** By way of the main selection mode for the urban expressway and grade separation system, the tunnel is the important method to resolve the urban traffic problems. The article discusses some common problems in the design of tunnel underpassing the busy urban area by Zhengzhou Dongfeng Road and Wenhua Road Underpass Tunnel Project for seeking and accumulating more engineering experience.

**Keywords:** tunnel, pit, diaphragm wall, Zhengzhou

Elementary Discussion on Design of Deyang City Minjiang Road Underpass ..... Wu Qiang, Wang Zhihua, Jiang Lin(35)

**Abstract:** The article sets forth the design experience of Deyang City Minjiang Road Underpass Project. The engineering scheme is made up according to the local situation of the intersection. The project put into operation promotes the recovery production and life of the residents in Deyang City. As the first urban underpass opened for the traffic in Deyang City, it brings the practical experience for the complete reconstruction of the old city area in Deyang City.

**Keywords:** underpass, design, Minjiang Road, Deyang

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..... Wang Xinqi, Yang Xiaorong(38)

**Abstract:** The evaluation of soft soil subgrade treatment technology is an issue not only having the quantitative factor, but also including the qualitative factor. It is more difficult to apply the traditional math method to set up the evaluation model. The article utilizes the fuzzy theory to analyze the non-quantitative problems so as to make the complicated technical evaluation simple and explicit. The multi-layer comprehensive fuzzy evaluation model is set up to carry out the fuzzy comprehensive evaluation on the soft subgrade treatment technology of Jinbing Expressway.

**Keywords:** expressway, soft subgrade treatment technology, fuzzy theory, layer analysis method, evaluation model

Application of Prestressed Anchor Bolt Side Slope Supporting Technology in Deep Foundation Pit .....

..... Sun Ximin(42)

**Abstract:** The article briefly introduces the main method of the construction pit supporting technology. Taking a tunnel engineering deep pit supporting of Tianjin as an example, the article analyzes and compares the feasibility and superiority of pile in row + cement-soil agitating pile with using the prestressed anchor pole system, and then sets forth the cautions in the design, construction and inspection test of the prestressed anchor pole system applied in supporting the deep pit able to provide the help for the similar projects.

**Keywords:** supporting of deep foundation pit, range pile, prestressed anchor bolt, design, construction

Elementary Analysis on Protective Design of High Side Slope ..... Huang Ping(47)

**Abstract:** The anchor-cable lattice frame beam is one of more types applied for the protection of the high side slope in recent years. According the engineering cases, the article elementarily discusses the design and calculation of protecting and supporting the five-class side slope up to 40 m.

**Keywords:** high side slope, pre-stressed anchor cable, anchor pole, steel reinforced concrete, lattice frame beam, herringbone framework, Shenzhen

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**Keywords:** rubblization, multi-hammerhead crush, material parameter, cement reconstructed to asphalt, assessing index, pulling stress at bottom

Discussion on Relative Problems in Design of Pavement Structure for Recovery and Construction of Highways after Earthquake ..... Wang Yuansheng, Dong Quanxi(53)

**Abstract:** “5.12” Wenchuan Earthquake has caused the calamity demolition to the highway engineering in Sichuan and neighboring provinces and cities. Beijing City is charged with the partner support to City which is one of the harder-hit areas this time. Taking Guangqing Highway Recovery and Reconstruction Project as an example, the article sets forth the main working thinks and methods in the design of pavement structure for the recovery and construction of the highways after the

earthquake by the investigation, analysis and appraisal of the damage conditions after the earthquake, the analysis of recovery and reconstruction conditions, and demonstration of the implementing schemes able to provide the reference for the design of the later relative projects.

**Keywords:** earthquake, recovery and construction, pavement structure

Discussion on Design of Mountainous Highway Route by Combined with New Ideas of Highway Design from the Ministry of Communications ..... Pang Huaqiang(57)

**Abstract:** The route design is the foundation and soul of the highway engineering design. The design quality of the route directly affects the merits and construction cost of the whole project. The conditions of the complex mountainous terrain and geology still determine the complexity of the route design. Based on the new ideas of highway design from the Ministry of Communication, the article analyzes the characteristics of mountain highway route design, summed up the basic principles of the mountain highway route design under the new ideas by combined with the detail design practice, and puts forward the problems for attention in the implementation of new ideas of designing the mountainous highway route.

**Keywords:** mountainous area, highway, new ideas, route design

Brief Introduction of Barrier Free Design Scheme for Municipal Road Projects ..... Hu Chunqing, Li Jianping, Zhu Xueping(59)

**Abstract:** According to the current barrier free design criterion, the article introduces the schemes and characteristics of barrier free design and construction in the municipal road projects of Suzhou. The similar experience can be provided to the relative professional members for reference.

**Keywords:** municipal road, barrier free, blind sidewalk, slope, crossing

Application of Human Basis Slow Traffic in Municipal Construction ..... Wang Yuna(64)

**Abstract:** The slow traffic as a part of green traffic is significant to relax the urban traffic problem. More attention should be paid for the municipal construction process. The article analyzes some extruding problems existing in the planning, design and management of the slow traffic, and puts forth the detail measures of the idea to use the human basis accordingly, reasonably arranges the road resource, improves the road distinguishing condition, perfects space-time layout of overpass facilities and enhances the safety and comfortableness of the slow traffic environment for perfecting the slow traffic system.

**Keywords:** slow traffic, humanization, measures, application

Traffic Optimization Design for Urban Road Construction Flow ..... Li Wendong(67)

**Abstract:** The traffic optimization design in various stages of the urban road planning, design, construction and management is the important link effectively able to link up various stages of the road engineering works, and to ensure the smooth implementation of the traffic planning and the road engineering. The article sets forth the connotation, necessity and design flow of the traffic optimization design, and puts forward the suggestions for pushing the traffic optimization design.

**Keywords:** urban road construction flow, traffic optimization design, necessity, design flow

## BRIDGES & STRUCTURES

Design of Bowstring Girder for Lupu Bridge ..... Zeng Yuan(70)

**Abstract:** Shanghai Lupu Bridge is a half-through bowstring arch bridge with the main span of

550m. It is a bridge of girder-arch combined system. The structure of the bowstring girder is all-welded steel box girder with orthotropic slab. The article focuses introduction on the method of stress calculation considering shear lag effect. According to the Britain Standard of BS5400, the article calculates the effective distribution widths of the different sections and gives the corresponding stresses of the different stages on the stress characteristics of the different sections. The article also introduces the structure and design of the special segment combined with the big column.

**Keywords:** mid-span bowstring girder, side-span bowstring girder, shear lag effect, effective distribution width, section characteristic, Lupu Bridge

General Design of Urban Bridges Crossing River and Road ..... Tao Yuhua, Ji Yongxing(74)

**Abstract:** Taking the general design of Hongsheng Road Bridge in Shanghai Pudong New District as an Example, the article analyzes the characteristics and various considered factors i.e. considering the city planning, field conditions, and also considering the function, grade and traffic capacity of the crossed roads and the flooding drainage and shipping grade of the crossed rivers in the general design of the urban bridges crossing not only the roads, but also the rivers, and analyzes and discusses the bridge type, linear selection and the determining factors of bridge width, span size and beam bottom elevation, and briefly introduces the basic structural design of the bridges.

**Keywords:** urban bridge, crossing river and road, general design, Shanghai

Sub-arch Design and Fabrication Characteristic for Main Sea-route Bridge of Jiubao Bridge .....

..... Zhang Chunlei(78)

**Abstract:** The main sea-route bridge of Hangzhou Jiubao Bridge is a beam-steel arch combined system of arch bridge. The arch rib constructions of three spans are same and the spans are all 188 m. The arch rib structure uses the new modeling of butterfly-shaped arch, in which the sub-arch is the space torsion member. The article mainly introduces the construction, space torsion modeling and faceplate space surface development method of the sub-arch for the main sea-route bridge, discusses the reasonable fabrication method of the space torsion member, and analyzes the torsion deformation in the course of torsion member fabrication.

**Keywords:** steel box arch, torsion member, surface development, bridge design, fabrication of steel structure, Hangzhou

Reinforcing Design and Practice of Rigid Frame Arch for Huiqiaopu Bridge in Wenzhou .....

..... Wu Lifeng, Liu Jia(83)

**Abstract:** Taking Wenzhou Jiangbing Road Huiqiaopu River Bridge as an example, the article analyzes the faults happening in the type of rigid frame arched bridge widely applied in the partial areas in China, puts forward the relative reinforcing design, and sums up the effective reinforcing method and construction technology fro this kind of bridge.

**Keywords:** rigid frame arched bridge, early fault, primary reinforcing design, later fault, secondary reinforcing design

Discussion on Necessity to Install Safe Anti-collision Facilities at Shipping Span of Bridge and in Neighboring Water .....

..... Zhu Haitao(86)

**Abstract:** According to the statistics and cases of the accidents that the vessels bumped four early built Changjiang River bridges in the construction and operation, the article explains that the vessels are at the disadvantage status in these accidents caused by the bridge spans being constructed at the original vessel sea-route. The vessel leeway happens because of water level eat and flow climate

change, person operation and so on. It is necessary to install the buffering safe facilities at both sides of the shipping span and their neighboring spans, which protect not only the bridges and but also vessels so as to be favorable for developing the economy, protecting the environment and protecting the safety of the people's life and possession.

**Keywords:** bridge shipping span, safe anti-collision facilities, bumping bridge accident

Design of Barrier Foundation for Test able to Simulate Bridge Flange Plate ..... Yan Shuming(89)

**Abstract:** In order to get effective data of the bridge design from bridge barrier impact test, a barrier foundation is required to design to simulate bridge flange plate. The foundation is proved to be able to supply data to meet bolt connection strength index requirement between barrier and bridge flange plate and meet steel beam design index requirement in bridge flange plate by theory analysis and finite element imitating calculation. The barrier foundation can be used in the bridge barrier impact tests.

**Keywords:** bridge, barrier, foundation flange plate, finite element, simulation

## FLOOD CONTROL & DRAINAGE

Brief Introduction of Kunming City Sewage Sludge Treatment Disposal Project ..... Wang Yuyao(93)

**Abstract:** The article introduces the general situation of Kunming City Sewage Sludge Treatment Disposal Project, and contrasts the economy of the technical engineering scheme. The proposed project adopts the sludge high-load anaerobic digestion + dewatering + heat drying technology to achieve the aim of sludge reduction, stabilization, hazard-free and utilization as a resource. The article introduces its technological flow, general design, sludge treatment objective and energy balance, sludge digestion and drying engineering.

**Keywords:** sludge treatment and disposal, high-loading anaerobic digestion, heat drying, Kunming

Elementary Discussion on Action of Underground Water in Engineering Reconnaissance of Tianjin .....

..... Zhao Chunming(97)

**Abstract:** The article discusses the significance of underground water in the building engineering, and analyzes the bad action possibly brought by it able to provide the reference for the relative professional members.

**Keywords:** underground water, bad action, building engineering

Elementary Analysis on Cause and Countermeasure of City Waterlog after Rainstorm .....

..... Song Qiyuan, Su Gongjun(99)

**Abstract:** With the continuous speeding up of the urbanization course in China, some local urban drainage facilities can not satisfy the development demand, which are most easy to cause the waterlog after the rainstorm in flood seasons. Based on the waterlog happening in the flood seasons in some cities now, the article analyzes the waterlog cause and the countermeasures to be taken from many aspects.

**Keywords:** city waterlog, cause, countermeasure

Discussion on CASS Technology to be Worth Optimizing in Design Course ..... He Zhigang(102)

**Abstract:** CASS technology of cycle active sludge standard has more experience and parameters in the course of design, but the standard only limits the valuing range of the partial parameter. Therefore, there may be considerable discrepancy among the calculation results of the different designers. Combined with the using condition of this technology in China, the article summarizes the



adaptable condition of this technology, the valuing of the partial key parameters and the problem to be worth optimizing in the course of design so as to apply in the similar projects able to combine own characteristics of each project.

**Keywords:** CASS technology, operation time, blower aeration system, optimization

## MANAGEMENT & CONSTRUCTION

Summarization on Design and Construction Technologies for Four Bridges of Mingzhou Bridge and so on in Ningbo City ..... Quan Jun(105)

**Abstract:** Ningbo Five-Road and Four-Bridge Project contains four long-span bridges spanning Yong River and Yao River. According to the construction idea of "one bridge, one landscape" and the construction conditions, four bridges separately use the different bridge schemes. Each bridge structure is novel, special with the totally different architectural style and different characteristic, which can provide the invaluable experience for the construction of the city bridges in China.

**Keywords:** double-wing steel box bowstring arch bridge, through steel truss arch bridge, arch bridge, triangle pylon, dissymmetrical pylon, cable-stayed bridge

Analysis, Study and Practice of Multi-section Composite Vertical Curve Steel Beam Jacking Construction of Hangzhou Jiangdong Bridge ..... Hao Weisuo, Wu Dongsheng(112)

**Abstract:** Taking Hangzhou Jiangdong Bridge as a case, the article sets up the finite element model, and dynamically analyzes the jacking construction process of multi-section composite vertical curve continuous steel box beam. On the basis to master the changing rules of the reaction of the temporary pier and the inner forces of the steel box beam, the article optimizes the scheme for the initial elevation of temporary pier and the elevation adjustment of temporary support so as to provide the theoretical guidance for the jacking construction of multi-section composite vertical curve steel box beam.

**Keywords:** steel beam, multi-section composite vertical curve, jacking construction

Analysis on Carrying Capacity and Stability of Construction Bracket for a Railway Bridge .....

..... Guo Jian, Li Jie(117)

**Abstract:** According to 3D finite element numerical simulation, the article analyzes the carrying capacity and stability of components used for the construction bracket of a railway bridge. The results shows that the components used for the bracket is safe during the construction. The deformation of the bracket meets the construction requirements. The bracket components and the whole bracket are stable during the construction. The minimum carrying capacity required for the subgrade is given on the bracket reaction. The analysis result can be referred for the similar projects.

**Keywords:** railway bridge, construction bracket, carrying capacity, stability analysis

Railway Pier Cap Construction Technology of Beijing-Guangzhou Passenger Transportation Railway Zhengzhou Yellow River Highway-Railway Bridge ..... Zhao Hong(120)

**Abstract:** The article introduces the general construction scheme of Beijing-Guangzhou Passenger Transportation Railway Zhengzhou Yellow River Highway-Railway Bridge, and focuses setting forth on the construction method of main bridge pier and its pier cap, and the temperature control measures of the bulk mass concrete construction.

**Keywords:** highway-railway bridge, pier body, pier cap, construction technology, high performance, bulk mass, temperature control

Construction Technique of Shanghai Metro “Cross-shape” Interchange Station ..... Qing Song(124)

**Abstract:** Shanghai Metro No.9 Line Xizang Road (S) Station and No.8 Line Lujiabang Road Station are the typical “cross-shape” interchange stations. The difficulties of the dense ground buildings, heavy traffic facilities, many underground pipelines and high underground water level occurred in the construction of No.9 Line Xizang Road (S) Station. The article sets forth the typical “cross-shape” interchange metro station construction technique, and better resolves many difficulties existing in the excavation of the foundation pit. This technical construction is used effectively to control the deformation of the pit and ensure the smoothness of the trunk traffic and the safety of the surrounding buildings.

**Keywords:** metro station, cross-shape interchange, double-side bypass, frame top-down construction, symmetrical excavation, construction monitor

Metro Bypass (Pumping Station) and Construction Risk Analysis by Freezing Process and Suggestion ..... Zhang Yining(128)

**Abstract:** The article puts forward two kinds of schemes that the bypasses can not be constructed in the areas of the metro from the angle of the functions, construction and optimization design of the bypass (pumping station), suggests to refer the achievement of the large tunnel (crossing Huangpu River) further to optimize the design of the metro bypass (pumping station). The article applies the principle of the artificial freezing process, analyzes the risks of the construction, freeze-thaw settlement and operation maintenance in the construction of bypass (pumping station), suggests to strengthen the experiment and study of freezing freeze-thaw settlement rule, enhances the reliability and durability of construction by artificial freezing process, and puts forward the relative suggestions.

**Keywords:** metro, bypass, freezing process, construction, risk, analysis

Loess Tunnel Construction Technology and Quality Control Gist ..... Qian Gang, Zhang Li(132)

**Abstract:** There are 78 tunnels in ZQ- II Bid of Taizhongyin Railway constructed by China Communications Construction Group, in which there are 13 loess tunnels constructed by China Communications Construction Group First Highway Engineering Bureau. These tunnels are located at the hill area of loess plateau. The loess tunnel has its own characteristics: easy to deform, easy to collapse, collapsible with water, difficult for pre-grouting and unsuccessful for anchor construction and so on. This article briefly describes the construction technology and quality control gist of the loess tunnel according to the construction practice of loess tunnel.

**Keywords:** loess tunnel, construction technology, quality, control

Construction Technology of CFG Pile Composite Foundation for Passenger Dedicated Line ..... Lv Xiangming, Li Guohong(140)

**Abstract:** Beijing-Shijiazhuang PDL is designed at speed 350km /h. The settlement control of subgrade after construction is required strictly. CFG pile composite foundation is the major foundation reinforcement measures in the project to improve the foundation carrying capacity and stability, reduce foundation deformation. Combined with the Beijing-Shijiazhuang Project, the article mainly describes the construction technology of composite foundation and the inspection and testing technology of the pile foundation to provide a reference for similar projects.

**Keywords:** CFG pile, composite foundation, construction technology, foundation inspection and testing

Application of Bubble Concrete in Expressway Widening Project in Soft Subgrade Area .....

..... Yu Hangbo, Lv Xiling, Jiang Tianhe, Zhou Honghai(144)

**Abstract:** In the existing expressway extension projects, the traditional construction method of splicing the old with the new roadbeds is easy to produce the different settlement, which results in the pulling to crack the structures at both sides of pavement and embankment so as to greatly increase the maintenance fund after the highways put into operation. Bubble concrete can resolve the different settlement difficulty of the old and new roadbeds because of having the physical mechanics characteristics of the solidified independence, low-spring damping, adjustable strength, wear and so on, and at the same time able to greatly save the land resource and to shorten the construction period. According to the engineering cases, the article introduces the application of bubble concrete in the soft subgrade expressway widening project.

**Keywords:** bubble concrete, soft subgrade, different settlement, to widen expressway

Old Cement Concrete Pavement Overlay Asphalt Concrete Reconstruction Technology .....

..... Wang Tiefsa, Kong Fanliang(147)

**Abstract:** According to the construction case of the old cement pavement to be built into asphalt pavement of Anhui Province Jie-Bu-Bang Expressway, the article summarizes and discusses the key technology of the old cement pavement overlay reconstruction.

**Keywords:** old cement pavement, overlay reconstruction, asphalt concrete, technology, Anhui

Elementary Discussion on Treatment Measures of Karst Cave Collapse in Tunnel .....

..... Lin Zhijun(151)

**Abstract:** In the construction of highway tunnel in karst cave area, the karst cave collapses often happen because of geological problems. In order to search for more effective treatment measures, this article introduces the karst cave and crack treatment of Shangzhai Tunnel, and analyzes some treatment schemes of the karst cave and cracks in the tunnel to be referred for the similar projects.

**Keywords:** Shangzhai Tunnel, karst cove, karst cave collapse, treatment measure

Construction Technology of Deep Foundation Pit Adjacent to Flood Prevention Embankment in Soft Soil Subgrade .....

..... Wu Shengyong(154)

**Abstract:** The supporting and protecting structure of deep foundation pit not only ensures the normal working safety within the pit, but also controls the soil movement in the bed and outside the pit so as to ensure the normal operation of its adjacent buildings, roads and power facilities. D3 base slab of Yongjiang Bridge is adjacent to the flood prevention embankment, construction bypass and transformers. According to the geological and hydrological prospecting, the schemes are reasonably designed for the supporting, excavation and dewatering of the pit. After the comparison and selection of the schemes and the demonstration of the experts, the quality control measures are taken for guaranteeing the construction engineering quality of deep pit and the safety of the flood prevention embankment.

**Keywords:** deep foundation pit, soft soil subgrade, flood prevention embankment, construction technology

Application of Cement Deep Agitating Pile in Flood Control Wall Project .....

..... Gao Xingfu, Wang Wei(159)

**Abstract:** The article introduces the construction technology, monitor gist and quality inspection method of the cement deep agitating pile in the flooding control wall project by taking the enterprise-protected embankment flood control wall at the wharf of Nanjing Longtang Harbor Jianghai Group as the engineering case.

**Keywords:** cement deep agitating pile, flood control wall, application

Elementary Analysis of Common Problems in Municipal Engineering Reconnaissance .....  
..... Zhang Jiagen, Xu Pengxiao, Liu Guoquan, Meng Qinglin(162)

**Abstract:** The article analyzes the typical problems commonly shown in the examination and checkup of construction drawings according to the current criterions, which can provide the reference for the professional members.

**Keywords:** municipal engineering reconnaissance, examination and check up of construction drawing, commonly shown problem

Practice and Discussion on Construction Agent Mode for Investing Municipal Infrastructure Project .....  
..... Liu Jiwei, Zhu Hongbo(164)

**Abstract:** The infrastructure construction is the basis of the social economical development. This kind of projects is generally invested by the state and organized to construct by the government. This traditional mode is hard to satisfy the social demands, and also will bring the following problems. The construction agent system is the primarily practical and effective mode. The article discusses the construction agent system able to provide the reference for the relative professional members.

**Keywords:** construction agent system, infrastructure, investment management mode

## STUDY ON SCIENCE & TECHNOLOGY

Application of Cubic Spline Interpolation in Bridge Deflection Measurement ..... Li Xumin(167)

**Abstract:** Bridge deflection measurement is the important composed part in the bridge inspection and measurement. The article introduces the method and its calculation principle of the inclinometer used to measure the bridge deflection. The inclinometers are installed at the inspected bridge to measure the obliquity values at the installed points of inclinometers, and then the cubic spline interpolation is utilized to build the bridge deflection curve function so as to calculate deflection, obliquity and curvature value of the bridge section able to provide the basis for evaluating the bridge safety. This method is simple and effective, not only to be applied the simple supported beam and static load cases, but also in the multi-span beam and dynamic load situations.

**Keywords:** inclinometer, cubic spline interpolation, deflection, corner, curvature

Analysis on Support Reaction of Prestressed Concrete Skew Bridge .....  
..... Xu Zhiqin, Yu Jianguo, Zhu Nansong(171)

**Abstract:** Through the calculation and analysis of a continuous prestressed concrete skew box girder, the article summarizes up the support reaction distributed feature of skew box girder, and gives some useful conclusions. The support reaction at the side web plate is larger, and but the one of mid web plate is smaller. It is required to strength the bending and shear capacity of side web plate. It needs to consider the skew bridge effect for selecting the support because of distributed inhomogeneity of reaction. Analysis shows that the support reaction for the symmetrically distributed span of continuous beam skew bridge should be anti-symmetrically distributed.

**Keywords:** skew, continuous box girder, support reaction, skew bridge effect

Study of Appraisal Standard for Carrying Capacity of Existing Concrete Bridges .....  
..... Xu Wenping, Yang Zi(174)

**Abstract:** Referencing the appraisal method and grade evaluation standard of building structures, the

article puts forward the practical appraisal formula for the carrying capacity of the steel reinforced concrete and pre-stressed concrete highway bridges, collects the experts' opinions in the evaluation of the carrying capacity for the concrete bridges, deduces the relation curve between the reduction coefficient  $\eta$  of carrying capacity and the reliability index  $\beta$  of structure bending resistance, and suggests the appraisal grade standard of carrying capacity for concrete bridges.

**Keywords:** bridge, carrying capacity, appraisal

Experimental Study on Pile-soil Stress Ratio of Soil-cement Compacted Piles under Embankment .....

..... Lai Tianwen(177)

**Abstract:** The pile-soil stress ratio is a very important and complex parameter. By the field test of pile top stress, soil stress among piles on the soil-cement compacted pile composite foundation of Zhengzhou-Xi'an Passenger Railway, the article analyzes the change rule of the pile top stress, soil stress among piles and pile-soil stress ratio of the tamped cement-soil pile under embankment with the difference of the load level and loading time, and discusses the inhesion mechanism of its change.

**Keywords:** embankment, soil-cement compacted pile, pile top stress, soil stress among piles, pile-soil stress ratio, experimental study

Study of Municipal Channel CAD .....

..... Liu Hui, Fang Xiaoliang(181)

**Abstract:** CAD has been popularized in China, and some achievements of CAD have been developed at home and abroad from "throw-off drawing board" stage to the professional and intelligentized study development stage. But there are many problems, i.e. the plane desing, vertical section design and transect design have not formed the organic relation with each other. Accoridng to the characteristics of the municipal channels, the article studies the resolving scheme how to form an orgnaic integrality of the plane design, vertical section design and cross section design as well as effect drawing.

**Keywords:** municipal engineering, channel design, CAD

## APPLICATION OF ACHIEVEMENTS

Application of New Single-cement Slurry in Construction of Metro Tunnel and Its Adaptability Analysis

..... Li Gang, Yang Chao, Wu Jiaqi, Huang Jun(184)

**Abstract:** An new material of the shear synchronized grouting single-cement slurry has been developed in Shangzhong Road Crossing-river Tunnel Project of Shanghai. This new single-cement slurry has the characteristics of high specific gravity, low consistency and high shear resistance. The use of this new sdf in the construction of overlarge-diameter shield tunnel in Shangzhong Road Tunnel and Shanghai Changjiang Tunnel has very obvious effect to control the deformation of the surrounding soil and the stability of the tunnel. The article describes the application of this new single-cement slurry in the shield construction of the metro tunnel in Shanghai, and analyzes its adaptability in the construction of the metro tunnel.

**Keywords:** metro tunnel, shield synchronized grouting, new single-cement slurry, Shangzhong Road Crossing-river Tunnel, Shanghai

Elementary Analysis on Application of Large-diameter Plastic Pipe in Municipal Engineering .....

..... Shi Wei(187)

**Abstract:** With the enhancement of the national environmental protection requirement and the greatly calling for building the resource friendly society, various plastic pipes are widely applied in the municipal engineering. The article compares the stress structures and the suitable environments of the

common different large-diameter plastic pipes to expect the help for the comparison and selection of the pipe materials.

**Keywords:** high-density polyethylene coil hose, metal reinforced Polyethylene spirally corrugated pipe, stress calculation, application comparison

Ultrasonic Inspection and Test Technology ..... Chen Qingdong(190)

**Abstract:** The ultrasonic inspection and test technology is widely used in the quality inspection and test of the cast-in-site pile and pavement because of its inspection and test having the portable and agility advantages with the large range of application. The article focuses introduction on its basic principle and its application in the inspection and test of cast-in-site pile.

**Keywords:** ultrasonic inspection and test, basic principle, cast-in-site pile

## THE RELATIVE SPECIALITIES

Analysis and Study of Numerical Model Set up in Crossing-river Tunnel Jiangbei Shaft Dewatering Engineering Practice of Hangzhou Metro No.1 Line ..... Shen Min(193)

**Abstract:** The excavating depth of the foundation pit for Jiangbei Shaft in Hangzhou Metro No.1 Line is 26.266 m with six bolsters. The pit is one of the deepest pits in Hangzhou now. The pressure water carrier of the round gravel layer at the bottom of pit is one of the important factors to threaten the pit safety. The three-dimensional seepage theory and the deep-shaft point dewatering are used to resolve the pressure problem of the round gravel layer in the project. The article furtherly analyzes and studies the numerical model set up in the course of engineering dewatering.

**Keywords:** non-full-shaft, water carrier thickness, decompression of pressure water

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Excellent Journal of the Ministry of Housing and Urban-Rural Development of PRC

## Urban Roads, Bridges & Flood Control

Monthly

Number 10, 2010 (Total Number 135)

Publication on October 15th, 2010

<http://www.roadbridgeflood.com>

Start publication in 1984    Scope of issue: Issue at home and abroad

**Department responsible for the work:** the Construction Ministry in PRC

**Sponsor:** Shanghai Municipal Engineering Design & Research Institute

**Editor & issue:** Editorial department of "Urban Roads, Bridges & Flood Control"

**Editor-in-chief:** Li Fen

Address: No.901 Zhongshan Bei Er Road, Shanghai

P.C.: 200092

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E-mail: yang\_jh.fz@smedi.com

ISSN 1009-7716

CN 31-1602/U

Domestic price: 15 yuan RMB

Journal of Municipal Engineering Branch of China Society of Civil Engineering  
and Municipal Design Branch of China Society of Prospecting Design