

城市道桥与防洪



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图为西安市政设计研究院有限公司设计的西安市后围寨立交工程

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《城市道桥与防洪》

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● 本期看点

- 城市道路平面交叉口几何安全技术
- 西部冻融环境下隔震曲线梁桥抗震性能研究
- 全地下污水处理厂建设优势分析
- 预制装配式结构在大型市政地下工程中的施工应用



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封面工程

本期封面工程为西安市后围寨立交工程,由西安市政设计研究院有限公司设计。

西安市后围寨互通式立交地处西安市后围寨,位于三桥新街、世纪大道、天台路、尚航路、西安高架快速干道、西宝高速引道等6条道路的交叉口处,是西安主城区与沣东新城及对外交通联系的重要交通枢纽。

该立交工程跨越陇海铁路、西成高铁等多条铁路,采用大跨径顶推施工方法跨越。

该立交总体布局为三层苜蓿叶互通式立交。立交南北长约2.1 km,东西长约1.7 km。立交设置3条主线及9条匝道。立交总占地面积约66.7 hm²,桥梁总面积约90 000 m²,总投资约8.1亿元。

南北向尚航路为立交主线,位于第三层,道路红线宽60 m,双向8车道;东西向高架快速干道为立交主线,位于第二层,双向4~6车道;东西向三桥新街位于地面一层,道路红线宽80~100 m,双向10车道。尚航路南北主线跨越陇海铁路(西城高铁等),两侧辅道以箱涵形式下穿铁路。

该立交于2017年建成,目前为西北地区最大的城市立交。

Urban Roads, Bridges & Flood Control

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ROADS & COMMUNICATION

Geometric Safety Design Technology of Grade Intersection of Urban Road Ou Changbao (1)

Abstract: The plane, vertical section and cross section involved in the geometric design of urban road intersection, and the continuous surface of intersected roads are analyzed in detail, and the influence of the vehicle turn mode within intersection on the geometric design is set forth. The proposed values are given for some parameters. The deficiencies in the specification are supplemented. The complete geometric safety design technology of urban road intersection is proposed.

Keywords: urban road, grade intersection, geometric design, safety

Elementary Discussion on Design of Highway Grade Crossing Luo Kai (5)

Abstract: The article sets forth the design principle of highway grade crossing, analyzes the problems of no way right distribution of crossing, improper layout of turning lane, and improper design of crossing channelization existing in the design of highway grade crossing now, and puts forward some issues for attention in the design of highway grade crossing by the engineering practices.

Keywords: highway engineering, design of grade crossing, distribution of road right, layout of turning lane, traffic island

Discussion on Reconstruction Design of "Y-type" Grade Intersection

..... Ren Weiqiang, Li Qiangqiang, Zhang Wei (8)

Abstract: The road intersection is the node in the urban road network. The reasonable intersection arrangement and the appropriate traffic channelization not only affect the smooth flow of urban traffic, but also are closely related to the road traffic safety. Taking the reconstruction of a Y-type intersection reserved in the city development as an example, this paper analyzes the design scheme of intersection channelization, and simulates and analyzes the traffic status of intersection through the forecast result of traffic flow in order to provide the basis for the selection of schemes.

Keywords: Y-type intersection, forecast of traffic flow, traffic simulation, reconstruction

Coordination of Road Planning and Road Design in Small and Medium Sized Cities ... Pan Jibin, Li Xieyong (11)

Abstract: This paper sets forth the relationship of road planning and road design in small and medium-sized cities from two aspects of the relation and difference of road planning and road design, analyzes the problems

existing in the design process of roads, and puts forward the coordination measures of engineering design intervention in advance, "three-party and five-stage" working mechanism and advanced planning concept integration for road planning and road design in order to provide the decision-making reference for the road construction in small and medium-sized cities.

Keywords: small and medium-sized cities, urban planning, road planning, road design, coordinative measures

Further Discussion on Overall Design Gist of Urban Expressway Chen Rui (14)

Abstract: The article puts forward the concept of "urban expressway", and sets forth the influence of plain area urban form on the "urban expressway and the characteristics of "urban expressway". Based on the engineering case of Expressway (G95) Beijing Section in the ring line of the capital area, the article analyzes and studies the traffic characteristics of urban expressway, analyzes its construction conditions, and introduces its overall design in order to provide the referable viewpoints for the designers and to make the design of urban expressway more reasonable and more suitable to actual circumstances.

Keywords: urban, expressway, overall design

Study on Instability Mechanism of Highway Loess Slope in Lanzhou Area Wang Jiusheng (16)

Abstract: In the excavation process of massif, two loess hills and tableland in Lanzhou Area, it may cause the slope instability and the threats to security because of climate coupling of heavy rainfall. Therefore, it must be to study the relevant factors affecting the excavated slope. According to survey of loess slope along the highway of Lanzhou Area, the article analyzes the affecting factors of loess characteristics, topography, rainfall and temperature, and studies the instability mechanism of loess slope under the factor influences of topography, construction process and rainfall, which can provide the reliable scientific basis for the treatment of loess slope.

Keywords: loess slope, instability, mechanism study

Study on In-hole Deep Dynamic Compaction to Treat Complex Subgrade of Urban Road Tian Zize (18)

Abstract: The problems of insufficient artificial filling soil compaction degree to level the ground, the existing loess collapsibility and the lower bearing capacity will result in the greater settlement, sinking or instable fracture of subgrade. The article analyzes the geological survey data by the engineering projects, and compares and selects five schemes of in-hole deep dynamic compaction, dynamic compaction, lime-soil compaction pile, high pressure jet grouting pile and pre-stressed pipe pile of artificial filling subgrade for leveling the ground according to the relative specifications and construction experience of surrounding roads. The in-hole deep dynamic compaction method is recommended for treatment. The article introduces the technical requirements, construction procedure and construction requirements of this method in order to provide the reference for the design and construction of the similar projects.

Keywords: in-hole deep dynamic compaction, complex subgrade, compaction degree, collapsibility, bearing capacity, filling

BRIDGES & STRUCTURES

Study on Seismic Performance of Isolated Curved Girder Bridge under Freeze–thaw Environment in Western China Su Haiming, Luo Chongde, Wei Hongliang, Li Ximei, Wan Nianqing, Guo Heng (21)

Abstract: The curved girder bridge is an important bridge type in modern transportation. The coupled effect of bending and torsion caused by its plane irregularity makes the seismic response of curved girder bridge more complicated. The environment at the structure of concrete curved girder bridge in the freeze–thaw area of the western is very bad. The bridge not only bears the freeze–thaw cycle, but also suffers from the erosion of chloride ions, which lead to the durability damage of the existing bridge structure, and cause the seismic performance degradation of the existing bridge structure. Aiming at the complexity of bending and torsion coupled stress of curved girder bridge, the dynamic control differential equation of isolated curved girder bridge under earthquake is established, and the reasonable elastic modulus degradation model under the freeze–thaw environment is selected to analyze the seismic performance of the isolated curved beam bridge. The analysis results show that the dynamic response value of the curved girder bridge not only pier–top displacement but also acceleration will increase with the increase of the freeze–thaw cycle times, and the corresponding seismic performance will decrease under the action of earthquake.

Keywords: curved girder bridge, freeze–thaw environment, seismic behavior

Study on Main Bridge Structural System of Yellow River Bridge Project in Binhe of Yinchuan ... Zhang Deming (25)

Abstract: The main bridge of Yellow River Bridge in Binhe of Yinchuan is a three–pylon double–plane composite beam self–anchorage suspension bridge. Its span layout is 88 m+218 m+218 m+88 m. The bridge site is at the seismic basic intensity of VIII degrees. The basic seismic oscillation peak ground acceleration is designed by 0.26 g. In order to solve the too big responses of middle pylon and side pylon, it is required to select the reasonable vertical and horizontal structural system. Therefore, the reasonable connection method of pylon, beam and pier of the three–pylon self–anchorage suspension bridge is studied. The mechanical property of the structure is analyzed vertically aiming at the float, pylon beam fixed constraint, elastic cable constraint and damping system, and compared and analyzed horizontally aiming at the fixed constraint and damping system. After the comprehensive comparison and selection, the middle pylon is vertically installed with the viscous damper and the rest pylon piers are vertically free, and the double–way damping system of metal damper is set up at every pylon pier horizontally, which can effectively control the static and dynamic responses of the structure.

Keywords: self–anchorage suspension bridge, three–pylon, composite beam, structural system, damper

Scheme Design of Shenma Road Bridge Crossing Zhan River in Pingdingshan City

..... Xu Jun, Wang Mingye, Li Chenxiang (29)

Abstract: This bridge is located in Shenma Road of Pingdingshan City and crosses Zhan River. Its main bridge is a pre–stressed concrete continuous girder bridge with corrugated steel webs. Its span layout is 52 m+85 m+52 m, and its deck width is 40 m. The article introduces the engineering situation, the structural design

and construction scheme in the preliminary design stage of this bridge. The structural calculation and analysis results show that the performances of the main components of this design scheme all meet the standard requirements. The wrapped connection of corrugated steel web and baseplate concrete is convenient for construction with the good durability, which provides the beneficial reference for the design of pre-stressed concrete continuous girder with corrugated steel web in the future.

Keywords: box-girder bridge with corrugated steel webs, wrapped connection, cast-in-cantilever method

Analysis on Design Essentials of Urban Steel Truss Bridge Cao Feng, Feng Shaohai (34)

Abstract: The technical features of steel truss bridge are analyzed and summarized including the advantages and problems of this technology. The design structure of the main truss, the setup strategy of connection system and the type selection of deck system of the steel truss bridge are studied and discussed. The design essentials of steel truss bridge are summarized by an urban through steel truss bridge.

Keywords: city, steel truss bridge, design essentials, technical feature, landscape

Analysis on Stress of Orthotropic Steel Deck Pavement of Long-span Bridge Zhang Jicun (37)

Abstract: The most of long-span bridges is the orthotropic steel bridge. The stress deformation of this structural type is complicated. The pavement layer on it is easy to cause the early diseases of fatigue cracking, rutting, passing and delaminating, and even thus to cause the functional damage of bridge structure. The damage of steel deck pavement is required to studied and analyzed from many aspects. According to the numerical theoretical analysis of ANSYS substructure method, the article analyzes the influence of structure dimension, temperature, braking and overload on the pavement layer, which can be referred for the pavement design of orthotropic steel bridge.

Keywords: orthotropic, steel deck pavement, substructure, finite element analysis

Finite Element Calculation Method of Calculating Length Coefficient of Bridge Pier Gao Jinliang (40)

Abstract: The article considers the constraint influence of bridge superstructure and sub-pile foundation on the bridge pier, and puts forward the finite element calculation method of calculating length coefficient of pier. Based on the stability equation, the calculating length coefficient of pier is obtained. The calculation of examples shows that the calculation result agrees with the actual project. The use of finite element calculation method can more correctly obtain the calculating length coefficient, which can be referred for the engineering design application.

Keywords: pier, calculating length coefficient, finite element, displacement method

Study on Mechanical Behavior of Pulling-resistant Screw of Steel Arch Bridge Crossing Canal Based on Complex Working Conditions Lin Laiyu, Yu Chao, Chen Jiansheng (42)

Abstract: This paper sets forth the engineering situation, structural style and loading features of steel arch bridge, and introduces the layout, calculation model and relative results of arch beam support. Based on the structural loading features of steel arch bridge, this paper proposes four voiding schemes of support based on overall construction scheme. According to the comparison of structural stress and support force of support

voiding process, an optimal support voiding scheme is finally achieved, and the support voiding sequence is proposed for the similar bridges.

Keywords: steel arch bridge, finite element, steel screw, support voiding, calculation model

Study on Performance of Skew Continuous Plate for Crossing River Based on Simplified Beam Grillage

..... Yu Chao, Chen Jiansheng (45)

Abstract: In this paper, the application situation of hollow slab bridge is expounded, the characteristics of simplified single beam model of hollow slab bridge are pointed out, and the plane grillage model of continuous hollow slab bridge is derived. With an example of project, the plane grillage model and single beam model are established. Starting from the static load and dynamic load tests, the calculation results of two models are compared with the measured results so as to achieve the plane grillage model to simulate the advantages and characteristics of continuous skew hollow slab bridge, which can provide the technical support for the similar projects.

Keywords: hollow slab, static load and dynamic load tests, natural frequency, beam grillage, checkout coefficient

Modeling Analysis on Beam Unit and Plate Unit of Curved Steel Structural Pedestrian Overpass ... Cao Yuan (48)

Abstract: With the continuous development of city traffic, the steel structure is selected for more and more pedestrian overpasses because of landscape, bridge construction and topographic influence. Taking a steel structural pedestrian overpass in Kunshan City South Bus Station as an example, the finite element software is used to establish the beam unit model and plate unit model separately. Through comparison and analysis of its structural strength, stiffness and dynamic characteristics, the corresponding conclusions are obtained, which provide some reference for the related design calculation.

Keywords: steel structure, beam unit, plate unit, modeling analysis

Study on Design of Extra-high Grade Concrete Bridge Guardrail

..... Li Qince, Kang Hanjing, Lu Xuwei, Yang Fuyun (50)

Abstract: In order to improve the safety protection capability of concrete bridge guardrail, the extra-high grade concrete bridge guardrail is designed on the highest protection grade requirement in *Highway Guardrail Safety Performance Evaluation Criterion*. The yield line theoretical analysis method is used to check the reinforcement strength of the designed guardrail. The verified high precision computer simulation model is used to simulate the collision processes of four vehicle types to guardrail required by the evaluation standard, and to carry out the safety performance evaluation of extra-high grade concrete bridge guardrail. The theoretical calculation result shows that the design reinforcement strength can meet the load bearing requirement for the collision force. The simulation result shows that the resistance function, buffering function and guiding function of the design guardrail all meet the standard requirements. The safety protection performance of extra-high grade concrete bridge guardrail by the design and study is reliable, which can provide the effective safety protection for highway bridges.

Keywords: concrete guardrail, computer simulation, yield line theory

Necessity to Landscape Design of Urban Bridge Long Xiaohu (55)

Abstract: In recent years, the economy has been developing rapidly and the process of modern city construction is getting faster and faster in China. The tall buildings rise and the people are such as weaving in city. There are more and more urban bridges as an important link to solve the urban traffic function. The traditional bridge design ignores the influence on the urban landscape only from the structure and function. However, it is necessary to design the rich landscape, humanity, harmony and grace of bridges from higher and higher voices of the international metropolis.

Keywords: urban bridge, landscape design, design concept, standard

FLOOD CONTROL & DRAINAGE

Analysis on Construction Advantage of Fully Underground Wastewater Treatment Plant Fei Xiali (58)

Abstract: This paper briefly analyses the series of problems existing in the traditional wastewater treatment plants, and taking Xiamen City Maluan Bay Water Recycling Plant as an example, introduces the construction of its fully underground wastewater treatment plant in detail. The effluent water quality of this plant is based on the water quality standard of Class IV. The main technological process is the "dividual-point inflow multi-stage AAO + secondary sedimentation tank + high-efficiency sedimentation tank + denitrification deep-bed filter + ultra-filtration membrane". The fully underground intensification layout can build the green landscape of the plant area, and realize the land saving and environment friendly.

Keywords: fully underground wastewater treatment plant, Class IV water quality, dividual-point inflow multi-stage AAO, denitrification deep-bed filter, ultra-filtration technology

Desilting and Sludge Treatment Technology in Treatment of Small and Middle Rivers

..... Zhu Wenjun, Lian Yuqin, Chen Dongji (63)

Abstract: The most of small and middle rivers have the serious pollution problems in China. The water conservancy construction departments everywhere have started to further study the pollution treatment technologies of small and middle rivers, and use these technologies into the practical treatment. The article summarizes the application of the main desilting technologies of underwater desilting, main drain desilting and environmental protection desilting, analyzes its advantages, disadvantages and application scope, also sums up the relative technologies of sludge treatment, introduces and analyzes the different technologies and application scopes, and forecasts and prospects the development direction of desilting and sludge treatment disposal technologies in order to provide the reference for the river desilting and sludge treatment of China.

Keywords: river dredging, desilting technology, sludge treatment

Optimized Design of Rotary Water Decanter Fang Yaofei, Chen Jun, Sun Keqin (66)

Abstract: The technology of SBR sewage treatment process is advanced. Its performance is reliable. The treatment technological process is very simplified. Especially, its engineering land can be saved more 113% than the traditional oxidation ditch process. SBR process gives rise to the extensive attentions by its many

unique characteristics. The key equipment (rotary water decanter) of this technology is urgently required to further optimized and designed. It is important to popularize this SBR technology. Taking the rotary water decanter exported to a country in Southeast Area as an example, the article sets forth its design from the aspects of drive mechanism, gravity slag-damming device, two-end water-stop device, technological calculation, and equipment structural strength calculation. The result shows that this product can effectively relieve the situation of land tension, and greatly save the total cost, which can be referred for the relative industries.

Keywords: weir flow load, two-end water-stop device, gravity slag-damming device

Several Types of Sluice Gate Commonly Used in Jiading of Shanghai Chen Zhigen (70)

Abstract: In the water conservancy project, the pump and sluice as the controlling buildings play the crucial role to the flood control, waterlogging control, irrigation and water transfer. The gate as the main water retaining tool of pump and sluice has various types of structure. Based on the practical situation of the existing pumps and sluices in Jiading, the article summarizes several types of common sluice gates for reference.

Keywords: Jiading, sluice, sluice gate, water head, criterion

MANAGEMENT & CONSTRUCTION

Application of PDCA Circulation Method in Expressway Engineering Scheduling Management Xu Diping (73)

Abstract: Aiming at the problems existing in the scheduling management process of expressway now, the article analyzes the application situation of expressway engineering scheduling management measures by an example of practical engineering project, and puts forward the application control strategy of PDCA circulation method in order to provide some theoretical basis for the relative constructors. The result shows that it is required to combine with the practical situation of engineering projects if wanting to make PDCA circulation method highly effectively used for the expressway engineering scheduling management so as to guarantee the applicability of PDCA circulation method.

Keywords: expressway engineering, scheduling management, PDCA circulation method, trial balance

Study on Design of Traffic Organization Scheme for Highway Reconstruction and Extension Project

..... Yuan Yuan (76)

Abstract: The article analyzes the design of traffic organization scheme for highway reconstruction and extension. According to the practical reconstruction and extension conditions of a traffic highway S318 east - west in the southwest of Guizhou Province, the traffic organization principles of highway reconstruction and extension project is proposed including the safety principle, the smoothness principle, the principle to ensure construction progress and the best benefit principle. Based on these principles, the article discusses the design of traffic organization scheme in the highway engineering reconstruction and extension period, and discusses how to handle the traffic accidents.

Keywords: highway reconstruction and extension, traffic organization, scheme design

Economical Attribute Analysis and Practical Application of Expressway Management and Maintenance

..... Yin Feng (79)

Abstract: Aiming at the difficulties of fine management and expenditure allocation in the management and maintenance work, the article points out it is necessary to discuss and study the economical attribute of highway management and maintenance in order to find the source. After the analysis to find the orientation of its public service, the article points out the value of management and maintenance includes the service capacity and efficiency. The article points out that the public rating is a beneficial measure in the mechanism analysis. Focusing on the practical problems, the article proposes that the prices of management and maintenance are different on the different service capacities of enterprises. The article points out the feasibility of calculating the amount of work according to the historical data, puts forward two supervision situations of work amount, and analyzes the causes and solving method of fine maintenance problem.

Keywords: highway management and maintenance, economical attribute, public service, service capacity

Analysis on Application of "Pre-beam and Post-arch" Method in Nanmenguan Bridge

..... Zhou Yuanyuan (82)

Abstract: In recent years, the concrete-filled steel tube arch bridge is an important bridge, and is widely used in the construction of modern bridge, in which the through concrete-filled steel tube arch bridge is especially suitable for the poor geology. The poor geological phenomenon at the location of Nanmenguan Bridge is the local collapse caused by the debris flow and left shore ice water accumulation body after the debris flow washes the foot of slope. The comprehensive consideration determines to use the through concrete-filled steel tube simple-supported bowstring arch bridge. The "per-beam and post-arch" construction method is analyzed in detail for reference.

Keywords: concrete-filled steel tube arch bridge, per-beam and post-arch, long-span bridge

Longitudinal Shift Construction Technique of Lateral Formwork for Cast-in-situ Simple-supported Box Girder ...

..... Li Yunqi (84)

Abstract: The 21-hole double-line cast-in-situ simple-supported box girder of Huaian Bridge in Lianyungang - Zhenjiang Railway changes the conventional construction technology. According to the engineering characteristics and on the basis of demonstration after full comparison and selection, the bowl button support method is selected for the cast-in-situ construction. In order to reduce the safety risk of lateral formwork of box girder in the assembling and disassembling process, to decrease the hidden danger of safety, to save the resources, to reduce the cost, to speed up the construction progress and to improve the economic benefit and social benefit, the longitudinal shift construction technique of lateral formwork is used. The successful application of longitudinal shift construction technology of lateral formwork for the cast-in-situ simple-supported box girder by the bowl button support method solves many difficulties of safety, quality, progress and cost in the construction of box girder. The expected goal is achieved.

Keywords: bowl button support, cast-in-situ box girder, lateral formwork, longitudinal shift

Construction Technology of Overpass Bridge Demolition during Expressway Widening in Uninterrupted Traffic ...

..... Wu Jian, Yang Yong, Chen Jianjun, Zhu Wenxi, Yao Lei (88)

Abstract: The expressway widening will certainly involve the demolition and reconstruction of overpass

bridges. Under the complex environmental condition of expressway widening project to be required to construct while open to traffic, a safe and effective undamaged static demolition method of overpass simple-supported beam bridge is proposed. Based on the uninterrupted traffic requirement and the detailed overpass bridge structure, the scheme of determining the bridge demolition sequence by spans, cutting the crash barrier by segments and cutting and hoisting the main beam is proposed. At the same time, based on the sequence of bridge demolition, it is necessary to implement the traffic limitation for the expressway under the overpass bridge. The traffic conversion of closing the right and left lanes and tailgating traffic can guarantee the both safety of traffic under bridge and construction, which can be referred for the similar projects.

Keywords: interrupted traffic, expressway widening, overpass bridge, static, demolition

Monitoring and Analysis on Hydration Heat of Long-cantilever Concrete Capping Beams Jiang Yong (92)

Abstract: In order to avoid the temperature cracks caused by hydration heat during the construction of long-cantilever capping beam, the real-time monitoring of hydration heat is carried out for two long-cantilever capping beams, and also the relevant stress sensors are installed in the capping beams to synchronously measure the mechanical property of concrete early age of capping beams. The finite element software Midas FEA is used to establish the time-varying model of the beam sections, to study the temperature field and stress field of the hydration heat of concrete capping beam, and analyzes the parameters of adiabatic temperature rise. The results show that the long-cantilever capping beams will produce the hydration heat for 10 days during the construction of long-cantilever capping beam, and the peak temperature will rapidly reach after concrete pouring. At the moment, the external concrete of capping beam is at the tensile stress state. It is easy to cause the temperature cracks if the internal and external temperature difference is too big. So it is very necessary to monitor and control the hydration heat of long-cantilever capping beam in the real time.

Keywords: long-cantilever concrete capping beam, hydration heat, temperature field, stress field, numerical analysis

Construction Inspection and Monitoring Management of Long-span Steel Structure Pedestrian Overpass

..... Sun Buqin (97)

Abstract: The pedestrian overpass is often located in the prosperous part of a city, mostly spans the main urban roads, and its modeling is generally novel and will become the landmark landscape of city after completed. There is often the elevated interchange above, and there are the metros and tunnels below around with the dense underground pipelines so that it is hard to construct the supporting piers sometimes. Therefore, the span of pedestrian overpass is generally longer and its modeling is peculiar. Owing to large traffic flow and complex surrounding environment, the construction of pedestrian overpass is more difficult, the quality safety is high required, and the inspection and monitoring requirements are also higher in the construction process. Taking a long-span steel structure pedestrian overpass as an example, the article systematically describes the construction inspection and monitoring management of pedestrian overpass, which can be referred for the similar projects.

Keywords: pedestrian overpass, long span, steel structure, inspection, monitoring, management

Elementary Analysis on Design and Construction of Directional Drilling through G327 National Highway in South-to-north Water Transfer East Route Phase I Jining Continued Construction Auxiliary Project Wang Yafeng, An Yuelan, Huang Xuefen (101)

Abstract: Taking the South-to-north Water Transfer East Route Phase I Jining Continued Construction Auxiliary Project as an example, the article elementarily analyzes the design and construction of directional drilling through G327 National Highway. The relative experience can be referred for the relative specialized persons.

Keywords: directional drilling, National Highway G327, construction, method

Discussion on Construction Method of Juye County Continued Construction Auxiliary Project in South-to-north Water Transfer East Route Phase I Project Wang Xiaomei (104)

Abstract: Taking the Juye County Continued Construction Auxiliary Project in South-to-north Water Transfer East Route Phase I Project as an example, the article discusses the key technical measures in the engineering construction process, which can be referred for the construction of the similar projects.

Keywords: continued construction auxiliary project, engineering construction, method, discussion

Control of Quality in Construction of Underground Diaphragm Wall Jiang Feng (106)

Abstract: With the rapid urbanization process year by year, the index of construction land is not enough. The further development and utilization of underground space are the effective way to relieve this contradiction. The promotion of underground diaphragm wall is the effective way to further develop and utilize the underground space, and relieve the insufficient index of construction land. The underground diaphragm wall has been widely used in the construction field of China now. But speaking the construction technique of underground diaphragm wall in China now, there are many problems and deficiencies. The article further discusses the quality control methods of guide wall construction, slurry preparation construction, grooving construction, reinforcement cage manufacture and concrete pouring construction in order to improve the construction quality of underground diaphragm wall and able to provide the referring materials.

Keywords: underground diaphragm wall, quality control, construction

Analysis on Deformation of Deep Foundation Pit Project nearby Subway Xu Xiaoyong (109)

Abstract: A historical building in Shanghai is closely adjacent to a deep foundation pit project. The effective protection measures are taken to the historical building including the use of a new type of composite pile for the comprehensive base shift reinforcement of the old building. The supporting scheme combined with the adjacent deep foundation pit project and the main underground structure is used. The settlement of the historical building is monitored in the whole engineering construction. The result shows that the settlement of the surrounding historic buildings has been effectively controlled in the excavation stage of the foundation pit. The monitoring result also shows that the settlement caused in the construction stage of underground diaphragm wall is not to be ignored. The successful experience of protection measures and monitoring of historical buildings close to the deep foundation pit can provide a useful reference for the similar projects.

Keywords: historical building, deep foundation pit, settlement, base shift reinforcement

Cause Analysis and Treatment Measures for Asphalt Pavement Crack of Semi-rigid Base Wang Feng (112)

Abstract: After half-a-year operation of the new built project of T219# Road in Pengjiaping of Lanzhou City, there are more cracks on its asphalt pavement. Combined with the design characteristics of road pavement structure and according to the field survey, the article analyzes and studies the forming causes of the different cracks on the asphalt pavement of semi-rigid base, and puts forward the relative treatment measures and proposals of core-bit sampling and slicing the disease part of asphalt pavement from three aspects of design, construction and new technical application. The engineering experience is proposed for preventing the similar quality diseases existing in the construction of semi-rigid base asphalt pavement in the future. The article summarizes the crack cause of semi-rigid base asphalt pavement, analyzes the kind and forming mechanism of cracks, and puts forward the control measures to prevent the crack forming of semi-rigid base asphalt pavement.

Keywords: asphalt pavement, semi-rigid base, crack, cause, treatment, prevention, measures

Analysis and Prevention of Concrete Cracks in Construction of Municipal Bridge Jiang Wei (115)

Abstract: In the bridge engineering construction, the concrete crack is a common disease, which will not only cause a certain influence on the bridge beauty, but also affect the structure safety of bridge. The article firstly introduces some kinds of concrete cracks commonly in the construction of municipal bridges, then analyzes the causes of crack cracks from some aspects of cement, steel bar corrosion, sunlight, contraction crack and differential settlement, and finally sets forth the preventive measures of strictly controlling the material quality, preventing the corrosion and crack of steel bar, and controlling the concrete pouring taken for the causes of concrete cracks, which can be referred for the similar projects.

Keywords: bridge construction, concrete crack, bridge load

Discussion on Mechanized Construction Technology of Highway Maintenance Jiang Haiyang (118)

Abstract: In order to ensure the highway engineering quality and to realize the rapid, high-effective and safe construction, it must be to pay attention to the mechanized construction and management of highway maintenance, to appoint the relevant technical experts and equipment, and to use the modern mechanized construction method. The selection of suitable machinery, strict operation and careful standard strives to make the whole highway engineering quality optimized.

Keywords: highway maintenance, mechanization, construction technology

Discussion on Reasonable Allocation and Application of Energy Saving Construction of Highway Machinery
..... Chen Mingliang (121)

Abstract: With the continuous development of transportation industry in China, the construction scope of highway engineering is getting bigger and bigger, the fund investment is getting more and more, and the construction period is getting longer and longer. In result, the importance of mechanical equipment allocation and management has also become increasingly prominent. The highway engineering construction management can not only ensure the smooth implementation of construction, reduce the construction cost, guarantee the operation stability and safety of construction mechanical equipment, but also directly ensure the construction safety of highway engineering. Therefore, it should be to realize the significance of mechanical equipment

allocation, and actively explore the feasible management method.

Keywords: highway engineering, mechanical equipment, reasonable allocation

Analysis on Application of GPS Technique in Survey Control of Long-sized Bridge Wang Jian (124)

Abstract: With the rapid development of economy in China, the road traffic is also more and more perfected, and the construction of large-sized bridge is also increased. The GPS technique is often used to implement the survey control in the construction of large-sized bridge. In recent years, the GPS technique has been rapidly developed, and is widely used in the industry. The article analyzes the various principles and the existing problems of GPS technique in the survey control of large-sized bridge from the practical working experience, and hopes the study of GPS technique able to optimize this technology so as to meet the higher survey requirement, and also to promote the research and development of GPS technique in China.

Keywords: GPS technique, construction of large-sized bridge, survey control

Anticorrosion Coating in Limited Space Li Weiping, Jiang Zhijiu (126)

Abstract: In order to avoid the safety danger of hazardous operation in the limited space, the technical support is provided to effectively control and decrease the operation risk of limited space, and to protect the health and safety of the operation people in the limited space. Based on the relative law and administrative regulations of safety production, the article sets forth the construction application of anticorrosion coating in the limited space.

Keywords: limited space, steel structure, anticorrosion, ventilation equipment, steel coating

STUDY ON SCIENCE & TECHNOLOGY

Analysis on Seismic Response to Urban Deep Rainwater Regulating Storage System Yan Xiao (130)

Abstract: In recent years, the flood waterlogging disasters of city are frequent. In order to solve this problem, the state strongly promotes the construction of "sponge city" and the construction of urban deep rainwater regulating storage system. The rainwater regulating storage system is generally composed of regulating storage tunnel, pumping station and rainwater treatment plant. The type of vertical shaft - integrated facilities - regulating storage tunnel structural system is mostly complex. This structural system includes the circular shaft structure, multilayer frame integrated facilities and deep shield tunnel structure. The appearances vary. The connection difference among the structures is bigger. Therefore, it is necessary to carry out the anti-seismic study of this structural system. Taking the vertical shaft - integrated facilities - regulating storage tunnel structural system as the study object, the structure - soil layer 3D finite element model is established to examine the seismic response of the structure system under the design intensity earthquake and the rare occurrence earthquake. The calculation shows that the seismic response at the connection of vertical shaft and shield tunnel is larger, and the stress concentration is present. Based on *Standard for Anti-seismic Design of Building*, it is to check and calculate the inner force under the design intensity earthquake and the deformation under the rare occurrence earthquake at this connection, and to find all less than the design static condition. The result shows that the earthquake does not play the control role to this structure system, and this structure system is at the safe status under the earthquake.

Keywords: urban rainwater regulating storage tunnel, shaft structure, integrated facilities, shield tunnel,

seismic response, dynamic time course

Study on Discriminant Method of Passenger Flow Corridor Based on Large Data Analysis ··· Wang Xiaojun (134)

Abstract: In rail transport planning and public transport planning projects, the key challenge is judgment on the existing bus corridors and survey of passenger flow in the corridors. The article briefly introduces the conventional public traffic survey and analyzes its survey result. The result shows that the conventional public traffic survey means is used only, the overall sampling rate is lower, and it is difficult to achieve a relatively comprehensive passenger flow survey of a city. Therefore, on the basis of routine survey, the article introduces the data analysis by the means of signaling data via mobile phones. After fitting of many modes, the article judges and studies the main passenger corridors of city. The result can provide the adequate basis for the follow-up planning and design.

Keywords: mobile phone signaling, traffic survey, passenger corridor, large data

Study on Influence of Different Modified Asphalts and Fibers on Performance of Large-voidage Asphalt Pavement Zhang Bo (137)

Abstract: Compared with the common asphalt pavement, the large-voidage asphalt pavement has higher requirements for the modified asphalt and aggregate. According to analysis and comparison of the performances of SBS, rubber powder, SBS and rubber powder recombination, TPS modified asphalt, and the different kinds of fiber, and study on the influences of the different modified asphalt and fibers on the performance of large-voidage asphalt pavement, it is concluded that the performance of SBS and rubber powder recombined modified asphalt is close to the performance of TPS modified asphalt, and the different kinds of fiber have the different effects on the mixture, which can be referred for the relative projects.

Keywords: asphalt, SBS, rubber powder, fiber

Calculation Model of Cement Hydration Extent under Influence of Water Cement Ratio in -3°C Curing Bai Jiafeng (141)

Abstract: Aiming at the problem of the concrete hydration of bridge in the low-temperature areas at high altitudes or high latitudes, the hydration heat of the 0.24, 0.31 and 0.38 water cement ratios of cement paste is tested under the curing condition of -3°C constant temperature, and the hydration extents of cement at each age are calculated. Considering the influence of age and water cement ratio on the hydration extent of cement paste, the calculation model of cement hydration extent is established by the form of sum of quadratic function and logarithm function. The results show that the hydration extent of cement will increase under -3°C constant temperature curing with the increase of water cement ratio, but the effect of water cement ratio on the hydration extent of cement will decrease with the age. The cement hydration extent of 0.27 water cement ratio cement pastes at the different ages is calculated by the established model. Compared with the measured values, the deviation value of calculation value is less. The accuracy of the model forecast will be higher.

Keywords: curing condition, hydration extent, water cement ratio, age, calculation model

Elementary Analysis on Optimization and Economy of Pavement Structure Yin Wei, Feng Pei (145)

Abstract: The asphalt concrete pavement is widely used in the highway and urban road. The reasonable

pavement structural composition is the key in the design of asphalt concrete pavement. The article focuses on the study of the influence of the same traffic conditions, the different surface materials and base material composition on the pavement performance and price. According to the analysis process, the article puts forward the feasible optimization proposal of pavement structure.

Keywords: asphalt concrete, using performance of pavement structure, economic analysis

Study on Preventive Maintenance Technology of Micro-covered Asphalt Pavement Based on Optimization of Adhesive Property He Wenji (147)

Abstract: The preventive maintenance technique can not only improve the service quality of asphalt pavement, but also effectively lengthen the whole service life of asphalt pavement. The micro-cover technique is one of preventive maintenance techniques for the ultra-thin wearing course. The thickness is only about 1.2 cm. Compared with the traditional ultra-thin wearing course technique, its economy and applicability are better. As the pavement functional layer, the service property of micro-cover technique depends on the adhesive strength of asphalt mixture, and the adhesive strength of micro cover and original pavement to a great extent. The article introduces the special optimization from the selection of raw material, design of mixture and construction of pavement, selects two micro-covered technical asphalt mixtures for the test and study, and introduces three kinds of unconventional asphalt mixture tests – indoor pull-out test, indoor inclined shear test and indoor cycle rutting test in order to evaluate the practical pavement performance of micro cover. The study result shows that the adhesive properties of micro-covered mixture itself and with the raw pavement are good through the special optimization. And it is a new economically and effectively preventive maintenance technique.

Keywords: micro cover, preventive maintenance, adhesive strength, pull-out test, inclined shear test, cycle rutting test

Comparison and Study on Static Lateral Pressure Coefficient of Deep Soft Soil in Ningbo Area - - - Liu Yong (152)

Abstract: The static lateral pressure coefficient (K_0) is an important mechanical property index of soil mass, and is widely used in the geotechnical design. Three methods of empirical formula, laboratory soil tests and in-situ tests are used to compare and study the K_0 value of deep soft soil in Ningbo Area. And various empirical methods are analyzed and compared. Based on the engineering characteristics of soft soil, the statistical empirical formula of static lateral pressure coefficient (K_0) and plasticity index (I_p) is proposed. Its result can better estimate the K_0 value of soft soil in this area. The calculation empirical formula conforming to the K_0 value for soft soil in Ningbo Area is also proposed by using the flat dilatometer test result. The recommended value of K_0 for soft soil layer is presented, which can provide the reference for the soft soil engineering design of this area.

Keywords: soft soil, static lateral pressure coefficient, flat dilatometer test (DMT)

Study of Influence Factors on Construction Quality of Low-dose Cement Modified Graded Gravel Jiang Shaoxi (156)

Abstract: The low-dose cement modified graded gravel is a material between the graded gravel and traditional cement stabilized macadam. There are many factors to influence the performance of low-dose cement modified graded gravel. The orthogonal experimental method and the variance analysis method are used to study the influence of four factors of cement dosage, gradation, compactness and water content on the unconfined

compressive strength and CBR of low-dose cement modified graded gravel. It is concluded that the cement dosage and degree of compaction are the main factors to influence the quality of low-dose cement modified graded gravel, which provides a basis for the quality control of this construction.

Keywords: orthogonal experimental method, low-dose cement modified graded gravel, cement dose, control of construction quality

Study on High and Low Temperature Performances of Color Binder Material Wang Tengfei (160)

Abstract: Color binder material has the same asphalt index as petroleum modified asphalt, but it has poor stability of high and low temperature performances because of the kinds of raw materials. In order to analyze the effect of different types of raw materials on the color binder performance, this paper studies the effect of resin with different molecular weight, and rubber oil with different aromatics content on the high and low temperature performances and the temperature sensitivity of the color binder in laboratory. The results show that the resin with high softening point will cause the attenuation of high and low temperature performances in different degrees, but have the significant effect of viscosity for the binder material, the high aromatic content of rubber oil can significantly improve the low temperature performance of binder, and improve the temperature sensitivity of binder to a certain extent, but the high temperature properties of binder will cause the inevitable attenuation. The conclusion shows that the different technical indexes of color binder materials are prepared by the optimized resin and rubber oil raw material.

Keywords: binder material, rubber oil, aromatics content, resin

APPLICATION OF ACHIEVEMENTS

Application Example in Calculation of Roadbed Working Area Tang Fenghua, An Yongfu, Wu Zude (163)

Abstract: After the roadbed working area is defined in *Highway Roadbed Design Standard* plus the use of the layered system theory to compile the Shell design software BISAR3.0 of asphalt pavement, the original Boussinesq equation is replaced to calculate the roadbed working area. The software BISAR3.0 is more applied in the practices. The relative experience can be referred for the relative specialized persons.

Keywords: calculation of roadbed working area, software BISAR3.0, application example

Production Technology Process and Product Quality Control of SBS Modified Asphalt Zhou Anjin (168)

Abstract: The modified asphalt has been gradually accepted by the highway construction industry because of its outstanding pavement performance, and is continuously used widely. Therefore, it is very necessary to strengthen the attention to the production technology of SBS modified asphalt. The production technology process and product quality control of SBS modified asphalt are studied. The relative experience can be referred for the similar projects.

Keywords: SBS modified asphalt, basic requirement, production technology, quality control

Application of Pre-stressing Carbon Fiber Plate Reinforcement Technique in Reinforcement of Old Bridge

..... Guo Jixiang (171)

Abstract: Many bridges are under service for a long time. The structural components of bridge have the corrosive

aging after the repetitive rolling of vehicles. At the same time, the influence of external environment, the man-made sabotage and the gradually increasing of vehicle traffic make the partial components seriously damaged. In result, many bridges do not conform to the safety requirement of driving. Therefore, it is necessary to carry out the reinforcement of bridges. Taking the pre-stressing carbon fiber plate reinforcement technique as an example, the article sets forth the principle of pre-stressing carbon fiber plate reinforcement technique, analyzes the application of this technique by the practical cases, and summarizes its application effect, which can be referred for the similar projects.

Keywords: pre-stressing, carbon fiber, reinforcement of old bridge

THE RELATIVE SPECIALITIES

Analysis on Influence Factor and Control Countermeasures for Construction Cost of Municipal Road

..... Huang Ling (174)

Abstract: With the continuous extension of cities in China, the municipal road engineering number will continuously increase. The most of these projects are constructed by the government investment. Reasonable control of engineering construction cost and the use of state funds well can really realize the sustainable development of city in China. Based on the valuation mode of quantities bill, the article sets forth the cost composition of municipal roads in China, analyzes the influence factor on the cost of municipal roads, and discusses the control countermeasures for the cost of municipal roads by the engineering examples.

Keywords: municipal road, valuation with bill quantity, construction cost, influence factor, contro

Application of Prefabricated Structure in Construction of Large-sized Municipal Underground Project

..... Ren Tianye (177)

Abstract: The aging of population in China makes the staffing more difficult in the construction industry. At present, the engineering personnel working on the construction industry obviously feel the staffing difficulty in every engineering construction site. In the face of the prospect of industrializing and standardizing transition urgently in the construction industry, it is very important to study the application of prefabricated structure in the large-sized municipal engineering. The article discusses the significance for the application of prefabricated structure in the large-sized municipal engineering. Relying on the construction of prefabricated structure in the 2-floor underground island station of the rail traffic in Pudong of Shanghai, the article discusses the construction technology of prefabricated structure in a large-sized municipal underground project, and analyzes the problems existing in the construction of prefabricated stairway in the underground station of rail traffic.

Keywords: prefabrication, rail traffic, municipal engineering, construction technology

Discussion on Environmental Characteristics and Potential Safety Hazard in Utility Tunnel

..... Li Shuangfeng, Wang Hengdong, Zhang Hao, Lu Jicheng (181)

Abstract: This paper summarizes the characteristics of the utility tunnel relative to the conventional underground directly-burying mode of pipelines, analyzes the layout of the main body, the structural features,

the subdivision principle and ventilation form of the utility tunnel, and analyzes and discusses the operation characteristics, potential safety hazard and interaction of the professional pipelines into the utility tunnel. Taking into account the protection of the safety of inspectors and the safety of pipeline operation, this paper gives some proposals to the monitoring design and safety operation management of the ancillary facilities of the utility tunnel.

Keywords: utility tunnel, underground pipeline, environmental characteristics, potential safety hazard

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集团简介
有凯泉的地方就有水

上海凯泉泵业（集团）有限公司（简称“上海凯泉”）是集设计、生产、销售泵、给水设备及泵用控制设备于一体的大型综合性泵业公司，总资产达28亿元，是中国泵行业的龙头企业。其年销售额超过30亿元，销售设备超过30万台套，连续12年排名全国泵行业销量第一。集团现有员工5200多人，其中工程技术人员750多名，主要由全国知名水泵专家教授、博士硕士、中高级工程师构成，形成了具有创新思维的梯队人才结构。在上海、浙江、河北、辽宁、安徽等省市拥有7家企业、5个工业园区，总占地面积近1000亩，生产性建筑面积35万m²。上海凯泉集团获得了“上海市质量金奖”、“上海市私营企业百强第四名”、“上海市科技百强企业”、“上海市名牌产品”、“上海市著名商标”、“中国驰名商标”、“中国质量信用AAA级”、“全国合同信用等级AAA级”、“质量、信誉、服务三优企业”、“中国最具竞争力的商品商标”、“全国企业文化建设先进单位”等光荣称号。2011年上海凯泉入选全国机械企业500强，目前名列国内泵行业之首。

凯泉产品种类过百 广泛用于多个领域

水利

集团强大的技术实力及装备制造能力已为南水北调提供了亚洲最大的立式全调节轴流泵机组。在南水北调、引黄工程等国家重点水利工程上发挥着作用。

天然气、石化

凯泉工业用泵主要执行国家GB标准、美国石油协会AP1610标准、美国ANSI标准、国际ISO标准等，应用于石油天然气输送、炼化、化工、化纤等行业。

核电、电力

通过二、三代核电设备样机研发及大量合同执行，具备了核电重大产品研发、生产、测试能力。三代样机研发、制造已经基本完成，为三代核电全面国产化做好了准备。

建筑

到2012年，上海凯泉在建筑、供热系统用泵市场占有率达35%，广泛应用于各类住宅区、酒店、商务楼、地铁、机场、消防、排水和供热空调等系统。

矿山、煤炭

各项性能优异，质量结构可靠，完全满足现代矿山、煤炭等行业大规模采掘洗选全部工艺过程要求。

供水、污水

完全满足日处理量40万吨以内的各种污水处理和提升泵站的要求，并已成为上百家污水处理厂提供优异产品。

钢铁、冶金

为钢铁、冶金等行业提供了从工艺水输送循环再到处理全过程的产品和服务。

★重点推荐：上海凯泉智能一体化预制泵站

一种智能化、集成化的污水预处理和提升系统。它集水泵、泵站设备、除污格栅设备、控制系统及远程监控为一体，具有智能化、集成化，以及安全性高、机动灵活、建设周期短、易维护等特点。

★省时、省地、省心、防盗、防堵、防爆

★模块化、高集成化：高配置高集成高智能，自清洁底部

★专业远程控制和管理：凯泉远程智能监测控制系统实现远程管理或数据采集，从远程位置对泵站设施进行管理监控。在发生警报或警告时，会直接通知相关人员。

●适用场合

市政工程、工业、建筑或其他室内、室外、地面上或地地下等类似场所，如高速公路、立交桥下、工业厂区、大型生活住宅区、高档别墅区、体育馆等。

●介质

生活污水、雨水、雨水与污水混合、业废水及农业用水国内单筒排量最大的一体化预制泵站。



济南二环南路提升泵站
日排水量6850m³/d
筒径3800mm 高度16m
配2台 Q=950m³/h H=17m
P=75kw 潜水排污泵