

城市道桥与防洪

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(集团)有限公司



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深圳外环高速公路沙井北互通立交方案研究
跻身世界先进水平的上海跨海大桥建设技术
隧道盾构穿越码头及防洪水工建筑物设计
基于组合权重的灰色关联投影法的立交方案
综合评价



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封面工程

本期封面工程为南昌朝阳大桥,由隧道股份上海城建市政工程(集团)有限公司施工建设。

南昌朝阳大桥工程是南昌城市快速路网络格局中重要的跨江通道,是一座技术先进、造型美观、功能齐全的大型城市桥梁。该工程于2012年11月17日开工建设,是南昌当地首个设计、投资、施工一体化项目。

朝阳大桥全长约3.1 km,由东岸接线、西岸接线和跨越赣江的主桥组成。主桥主跨采用六塔七孔单索面斜拉桥方案,跨越赣江范围全长约1 560 m。主桥采用塔梁固结、塔墩分离的支承型式。塔和墩为混凝土材质。施工采用波形钢腹板PC箱梁新技术,在施工过程中可以减少大量的模板、支架和混凝土浇注工程,免除在混凝土腹板内预埋管道的繁杂工艺,方便施工,缩短工期,降低了工程造价。

朝阳大桥功能实用性更强——设人非系统与机动车系统相互分流,减轻通行压力;造型更美观——6个“合”字形桥塔设计使得上塔的线形弧度各不相同。

该工程深水浅覆盖层基础难度大,双臂钢围堰施工风险高,波形钢腹板体系技术新,宽幅波形钢腹板PC组合梁斜拉桥工艺复杂。朝阳大桥项目团队精心组织,严格管理,统筹安排,确保了朝阳大桥在进度、质量、安全等方面均能有效控制。大桥于2015年5月18日顺利实现通车。

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ROADS & COMMUNICATION

Road Design of Jingmi Road(Jingcheng Expressway – Kaifang Ring Island) Yang Simin (1)

Abstract: The article introduces the engineering background and construction conditions of Jingmi Road (Jingcheng Expressway – Kaifang Ring Island). According to the collection of present situation and the interpretation of planning scheme, the article further analyzes the project function and design scheme, and summarizes the design scheme of this project, which can be referred for the similar projects.

Keywords: Jingmi Road, construction condition, road function, road design

Study of Shajingbei Interchange Scheme in Shenzhen Outer Ring Expressway Chen Jiongzhao (7)

Abstract: With the rapid development of city, it is required to consider the relationship between the road and the local economic development during the construction of new interchange. And the route alignment and the scheme selection should take account of the short-term development and long-term planning of city. As an important part of the expressway, the interchange is required to reduce the land occupation and acquisition as far as possible during the design. According to the comparison and selection of the functions, restricting factors and schemes of Shajingbei Interchange in Shenzhen Outer Ring Expressway, the article sets forth and analyze to determine how to select the reasonable interchange and flexibly to layout the ramps under the premise of satisfying the requirements of traffic capacity so as to make the interchange coordinated with the current terrain.

Keywords: expressway, interchange, comparison and selection of scheme

Study on Design Scheme of Beijing – Shanghai Expressway and Ring Road V Interchange Reconstruction project Chen Hongliang, Ding Liya (10)

Abstract: As only one expressway radiation within the development area, Beijing –Shanghai Expressway has been hard to satisfy the linking-up demand of the development area and the city area of Beijing with the development construction of Yizhuang Development Area and with the increasing traffic volume. According to the reconstruction of Beijing Expressway and Ring Road V Interchange, a ramp is newly constructed in Beijing – Shanghai Expressway to link up with Yizhuang Development Area so as to strengthen the connection of the city area of Beijing and Yizhuang Development Area and to relieve the traffic congestion.

The article introduces the present construction condition and comprehensive joint planning of the project, analyzes the joint design, and briefly introduces the guiding traffic scheme in construction, local road scheme, and bridge engineering of project.

Keywords: interchange reconstruction, newly built ramp, traffic function, engineering quantity

Design of Beijing Yizhuang North Ring Road Reconstruction and Extension Engineering Scheme ... Li Zhijie (14)

Abstract: With the continuous development of economy and society of China, and aiming at the overall transformation and integration needs of city, the partial trunk roads planned to implement early have been unable to satisfy the new traffic demands, and are required to reconstruct and upgrade. According to the analysis on the regional development and the construction condition of Beijing Yizhuang North Ring Road Reconstruction and Extension Project, the article puts forward the reconstruction design principle and objective. The article introduces the detailed technical standards and road reconstruction design scheme, which can be referred for the design of the similar urban reconstruction and extension projects.

Keywords: reconstruction and extension, design scheme, environmental protection, pavement structure

Comparison and Selection of Excavated Section Design Scheme in Wenyi Road Underground Tunnel Project Qiu Yuhua (17)

Abstract: Aiming at the characteristic of Wenyi Road Underground Tunnel located at the downtown area of city, the article analyzes and compares two design schemes of the excavated section in Wenyi Road Underground Tunnel Project, and determines Scheme II as the design scheme because of its better functions and less influence on the surrounding environment.

Keywords: underground tunnel, excavated section, design scheme, comparison and selection

Present Situation, Countermeasures and Analysis on Operation of Accessible Facilities for Pedestrian Crossings in Wuhan City Chen Jianbin, Tan Wei, Huang Yanyan, Zou Shuangzhao, Wang Jun, Xing Yue (21)

Abstract: The change of urban population structure will bring about the upgrading of urban accessible demands. Taking three main representative crossing facilities of urban pedestrian crossing, pedestrian underground tunnel and pedestrian overpass as the investigation and study objects, the article introduces the operation status of 24 accessible facilities in Wuhan City by field survey, and investigates and studies the main management units of facilities. The article further analyzes the problems existing in the accessible facilities of urban pedestrian crossings, and elementarily puts forward the countermeasures for the construction management of the accessible facilities of pedestrian crossings in Wuhan City.

Keywords: pedestrian crossing, accessible facilities, pedestrian crossing, pedestrian underground tunnel, pedestrian overpass

Further Study on Layout and Planning of Regional National and Province Trunk Highways Li Xiulin, Yao Yan (27)

Abstract: The article further discusses the relative contents of the regional national and province trunk highways from the layout, planning, procedure and improvement of regional national and province trunk

highways, and puts forward the attentions for the layout of regional national and province trunk highways so as to improve the layout performance level of regional national and province trunk highways, to satisfy the requirements of traffic construction, and more importantly to defend the scientificity and rationality of layout and planning of regional national and province trunk highways, and to prevent the traffic problems.

Keywords: regional national and province trunk highways, traffic layout, highway planning

Selection and Design of Mountain Expressway Route Zhu Jianping (30)

Abstract: Along with the perfection of road network system in China, the construction of mountain expressway is increasingly wide under the complex topography and geological conditions. This paper further discusses the methods and principles of route selection of mountain expressways, analyzes the main contents and critical points of route design including the plane alignment, vertical alignment and route intersections, and analyzes the key problems existing in the route design of expressways located in the mountain environment by the practical engineering cases.

Keywords: mountain area, expressway, route design, route selection

Analysis on Design Gist of Traffic Capacity of urban Road Chen Yan (33)

Abstract: The article analyzes the design traffic capacity and related calculation method of urban road, and defines the relationship between the design traffic function and the road section traffic volume. The article comprehensively analyzes the basic influencing factors on the road traffic capacity, summarizes the relative design gist, and puts forward the design measures to improve the road traffic capacity in order to improve the urban traffic efficiency.

Keywords: urban road, traffic volume, traffic capacity, design gist

Elementary Discussion on Application of Oval Curve in Design of Road Alignment Li Dan (36)

Abstract: In the design of road alignment, a variety of complex curve is applied, but the oval complex curve uses less, and the specific form of ovate complex curve will be selected by a variety of terrain, ground features, technical standards and requirements. Taking the alignment design of Jihui Road as an example, the article analyzes the use of the oval compound curve to design if limited by the terrain and ground features.

Keywords: road design, oval curve, roundabout, application

Analysis and Design of Pavement Structure of BRT Lane in Urumqi Fan Hui (39)

Abstract: The article analyzes the operation status and characteristic of BRT system in Urumqi. According to the investigation and study of BRT lane in Urumqi, the article analyzes its pavement structure stress. And by the design scheme of Urumqi BRT Line IV Phase I Project, the article analyzes and discusses the pavement structure design of BRT lane.

Keywords: BRT lane, operation characteristic, pavement structure design

Overall Design of Nanchang Aixi Lake Bridge Wang yangzhen, Zheng Yongyang (42)

Abstract: Aixi Lake Bridge is the important structure on the eastward extension axle in the urban traffic

network of Nanchang City, is the important urban bridge in Beijing Road of Nanchang City, and also is the main channel connecting the east and the west of Aixi Lake. The present situation and the traffic condition of this channel are complex, and there are many restrictive factors of current surface features. According to the analysis, it is to determine that the main line of bridge spans the intersections of South Aixi Lake Road and Changdong Avenue by the elevated bridges. The article introduces the main engineering background, scheme design idea and engineering design of this bridge. The relative experience can be referred for the similar projects.

Keywords: Aixi Lake Bridge, design scheme, municipal road, elevated bridge

Analysis, Prevention and Countermeasures on Water Damage Factor of Asphalt Pavement
..... Zhang Weiguo, Du Huirong (46)

Abstract: The article analyzes the main water damage type and feature of asphalt pavement, and summarizes the main mechanical mechanism and influence factors of water damage on the asphalt pavement. The result shows that the rainfall is the direct cause to water damage, the material properties of bituminous mixture is the inherit factor, and the vehicle load effect is the direct incentive to cause the fault. In order to further reduce the cause of water damage on asphalt pavement, and to improve the long-term service life and driving safety of asphalt pavement structure, there are two aspects of optimizing the pavement drainage design and improving the asphalt mixture materials for prevention.

Keywords: asphalt, pavement engineering, water damage, factor analysis, prevention countermeasures

Design and Construction Essentials for Asphalt Pavement Thermal Regeneration Technique
..... Xiao Jin, Wu Peng (49)

Abstract: The mechanism, technological type and main features of thermal regeneration technique of asphalt pavement are summarized. The related thermal regeneration technique is determined by the disease degree and repair requirement of pavement. The design essentials for the thermal regeneration technique of asphalt pavement are analyzed. It is not only to evaluate the materials properties of the severed asphalt pavement, but also to optimize the external mixing materials and mix proportion. Finally, the field construction essential and the quality control method of pavement regeneration technique are discussed.

Keywords: road engineering, asphalt pavement, regeneration technique, design essential, construction essential

Analysis on Monitoring Application Effect of Sand Bag Well to Treat Soft Soil Subgrade
..... Tian Chuanjiang, Gao Yuan (52)

Abstract: The subgrade treatment quality is very important to the post-construction settlement, road quality and driving safety of subgrade. In order to ensure the road quality, it is required to carry out the whole process monitoring in the construction of soft soil subgrade. According to the whole process monitoring of soft subgrade treatment of the partial subgrade widened in the engineering cases, the detailed measured data is collected and analyzed, which can provide the reliable treatment method and design idea for the construction and design of the old road reconstruction projects in the future and aiming at the weak link of the sand bag well to treat the

soft subgrade projects.

Keywords: monitoring, soft subgrade treatment, post-construction settlement, consolidation degree

Numerical Analysis of Geotechnical Grid in Widening Treatment of Urban Road Roadbed

..... Chen Jianzhong, Wang Meng, Wang Cheng (54)

Abstract: The geotechnical grids are often used to treat the difference settlements of old and new roadbeds at the widening and overlapped sections in urban road reconstruction extension projects. The relevant design specification defines the control technology and control standard of difference settlements of old and new roadbeds. But there are no corresponding design methods and guidelines empirically for the optimum layout layer, vertical spacing and position of geotechnical grids in the roadbed widening treatment section with the economic waste or poor result now. By the study object of the widening overlap section of Jingmen South High Speed Entrance and Exit Comprehensive Treatment Project, the finite element calculation model of roadbed widening is established. The finite element numerical analysis is used to study the effect of the different geotechnical grid widened roadbeds on pavement vertical displacement and pavement cross slope ratio. According to the calculation results, the reasonable vertical spacing and laying scheme of grids are determined. This study result can provide a reference for the widening treatment scheme of urban road roadbed.

Keywords: urban road, roadbed widening, difference settlement, finite element, geotechnical grid

Elementary Discussion of Plastic Drainage Plate Surcharge Preloading Method to Treat Deep Soft Soil Subgrade ...

..... Zheng Chaowei (57)

Abstract: This paper introduces the design of plastic drainage plate surcharge method to treat the deep soft soil subgrade, sets forth the elements and the principle of surcharge preloading method and the design gist of vertical drainage body, and discusses the design of plastic drainage plate and preloading load as well as the calculation of subgrade consolidation degree by the engineering cases. The calculation results show that the plastic drainage plate surcharge preloading method to treat the deep soft soil subgrade has a good effect, but the influence of smearing and well resistance on the soil consolidation is more obvious.

Keywords: deep soft soil, plastic drainage plate, surcharge preloading, drainage consolidation, consolidation degree, design

Elementary Analysis on Engineering Design of Deep Mixing Pile in Soft Soil Subgrade Zhang Wei (60)

Abstract: According to the characteristics of the composite subgrade of deep mixing pile, this paper briefly introduces the calculation method of bearing capacity and settlement of composite subgrade. According to the general design method of deep mixing pile introduced in the case of Hefei City Binhe Road Project, and on the basis of checking the bearing capacity of composite subgrade to meet the subgrade requirement by the subgrade settlement after construction as the control factor, the optimal pile length is selected and can be referred for the similar projects:

Keywords: deep-mixing pile, soft soil subgrade, composite subgrade, subgrade settlement

Analysis on Stability of Dam Subgrade Zhang Futian (63)

Abstract: The article puts forward the stability calculation of the protection and reloading of existing dam, and quantitatively studies and analyzes the stability and deformation of the dam protection along sea to achieve the relative experienced model for providing the basis of the stability and safety of the similar projects. The relative experience has the important guidance for the implementation of highway and urban road reconstruction projects along sea, river and lake in China.

Keywords: dam subgrade, displacement, settlement, stability

Design of Deep Cutting Slope of Municipal Road (North Jiaojiang Road) in Zhangzhou City Yang Qiong (67)

Abstract: With the fast development of cities in China, the construction development speed of municipal road is further improved. However, it is hard to completely avoid the natural terrain of present mountains and rivers in the road network planning of municipal road. Therefore, the safety and stability of slopes in the road construction cannot be ignored. The article further discusses the safety and stability of municipal road slope by the design case of the K3+640 ~ K3+980 cutting slope work of North Jiaojiang Road (Jiaojiang Road Extension) Road Section A Project in Zhangzhou Jiamei Special Steel Advanced Processing Industrial Zone.

Keywords: municipal road, deep cutting slope, slope protection

BRIDGES & STRUCTURES

Construction Technology of Shanghai Crossing-sea Bridge among the World Advanced Level Mu Xiangchun (71)

Abstract: The article systematically introduces the development history of the urban bridge construction in Shanghai – the largest economic center, financial center and cosmopolitan city of China, focuses introduction on the technical innovation of three crossing-sea bridges of Donghai Bridge, Shanghai Changjiang Bridge and Ningbo Daxie Bridge, and introduces the relative enlightenment.

Keywords: Shanghai, crossing-sea bridge, technical innovation

Analysis on Calculation Length Coefficient of High Pier in Finished Stage of Bridge Based on Energy Method - - - Yuan Deren, Zhong Ming (75)

Abstract: The pier top boundary condition of high pier in the finished stage of bridge is between the hinge and consolidation. Its calculation length coefficient is often difficult to take. By constructing the shape function of high pier in finished stage of bridge, the energy method is used to solve the instability force critical force of high pier in the rigidity subgrade in the finished stage of bridge. Also the Euler's formula is used to achieve its calculation length coefficient. Combined with the example, the finite element method and energy method are used to calculate, compare and analyze the calculation results of the both. The results show that it is required to calculate the non-ideal boundary effect of pier top during the calculation of high pier calculation length. In addition, the calculation result of the recommended energy method formula is close to the finite element program with the higher precision, which can be referred for the designs.

Keywords: finished stage of bridge, high pier, calculation length coefficient, energy method

Stress Analysis and Structural Optimization Design of Anchorage Zone of Sail-shaped Steel Pylon Meng Xudong (78)

Abstract: In order to study the stress distribution and force transfer mechanism of anchorage zone of sail-shaped steel pylon, by the engineering background of the Ningbo Binhai Road V Bridge (single-plane single-pylon cable-stayed bridge) crossing Luzhongwan River, and based on the finite element software MIDAS FEA 3.6.0, the complete solid finite element model for GT8# segment of steel pylon is set up by the equivalent plate thickness method to analyze the stress distribution and force transfer mechanism of the main stressed plates. The results show that the Von Mises stress of the different plates of the steel anchor box is all less than 200 MPa and can meet the relevant requirements in the codes. The stress concentration occur at the connection among the shear plates of the steel anchor box and the inside-outside webs of the steel pylon, but this area is limited and the stress diffuses more fast. By comparing three different cross-section forms of the horizontal steel tension member, the Feng-shape form is determined not only to meet the needs of bearing loads, but also to simplify the node construction and to reduce the processing and manufacturing difficulties of steel structure. In the meantime, by analyzing the influences of the different lengths of the flange inserting the pylon on the stress distribution of anchorage zone, the twice height of steel tension member is proposed for the optimal design scheme.

Keywords: cable-pylon anchorage zone, force transfer mechanism, stress analysis, steel tension member, node design

Analysis of Local Stress and Application of Strut-and-tie Model in Prestressed Strand Anchorage Zone Zhao Yang (82)

Abstract: The steel strand anchorage zone as the critical stress node of prestressed component is always the dead zone of quantization calculation of prestressed concrete bridge for a long time. There is no the known design theory. In order to seek a more accurate and general design method, the article analyzes the stress characters of many anchorage zones, clears up the calculation process of strut-and-tie theory by horizontally comparing many relative literatures, summarizes the design methods and design gist of strut-and-tie model, discusses and amends some critical parameters, and forms a practical and feasible strut-and-tie design idea so as to provide the basis for the following design of D-zone concrete.

Keywords: D zone, steel strand anchorage zone, triangular tooth piece, strut-and-tie model, stress analysis

Static and Dynamic Analysis on Improvement Design of Rigid-Frame Arch Bridge Luo Fei (88)

Abstract: Most of old rigid frame arch bridges in service have been seriously damaged. Aiming at the fault characteristics and combined with the practical projects, the rigid-frame arch bridge is improved and designed. The spatial finite element software is established to analyze its static and dynamic performances. The beam and plate combination model is used to reflect the structural stiffness more accurately during analysis. The analysis result shows that the beam and plate combination model can be used for the engineering design of the similar structures and improve the design efficiency. The controlling conditions of the main section stress of

rigid-frame arch are the shrinkage creep and the arch angel displacement, which should be concerned during design. After the improvement design, the torsional rigidity of structure is improved, and the disadvantage of lower integrated rigidity of original designed rigid-frame arch is overcome, which provides a new idea for the application of the similar rigid-frame arch.

Keywords: rigid-frame arch bridge, finite element, beam and plate combination model, plane section assumption

Analysis on Mechanical Characteristic of Z-type Exposed Cable Girder Anchorage Zone of Steel Cable-stayed Bridge Zhao Yuxian, He Wei, Lu Sining (91)

Abstract: Taking the front anchor structure of Yiyi Bridge under the construction in Hengqin New Area of Zhuhai City as the study object, the article studies the visual design method of the Z-type exposed cable girder anchoring structure, the force transmission route of the structure and the stress distribution of the main structures. The study shows that the stress concentration phenomena exists in the cable girder anchoring structure, but the stress intensity is within the relative specification limits and can satisfy the function demand of steel girder cable-stayed bridge. The design of this special cable girder anchoring structure can be referred for the design of the similar bridges.

Keywords: steel cable-stayed bridge, cable girder anchoring, force transmission route, visual design

Stress Analysis of Steel-concrete Composite Section of Bridge Pylon of Shele Bridge Wan Jielong, Zeng Minggen, Wu Chong, Sun Xuxia (97)

Abstract: It is hard to clarify the stress situation of the steel-concrete composite section of cable-stayed bridge pylon because of various components and complex structures, especially the special-shaped section of bridge pylon. Taking the steel-concrete composite section of the special-shaped section pylon of Shele Bridge in Taiyuan as the study object, the article establishes the spatial linkage model of the whole bridge by the software of ANSYS to analyze and clarify the inner force of steel-concrete composite section. On this basis, the article again establishes the spatial shell solid model of steel-concrete composite section by the large general finite element software of ANSYS to analyze and clarify the stress situation of steel plate, concrete and anchor steel bars of this section. The analysis result shows that the inner force transmission is smooth, the safety reserve is good and the structure is more reasonable in the steel-concrete composite section of this bridge pylon. To further improve the technical and economic rationalities of design, the measures can be taken to improve the force transferring ratio of lower bearing plate, and also the anchor steel bars can be suitably decrease.

Keywords: special-shaped bridge pylon, steel-concrete composite section, finite element, local analysis

Analysis on Influence Factor of Pulling Cable Anchor Parameter of Long-span Cable-stayed Bridge Lin Mao (102)

Abstract: According to analysis on two pulling cable installation accidents of long-span cable-stayed bridge, the article summarizes the influence factors of blanking length and anchor parameters of stayed cable, and points out the shortcomings existing in the present design so as to provide the reference for the design, construction and supervision of long-span cable-stayed bridge.

Keywords: cable-stayed bridge, parameters of pulling cable anchor, long span, influence factor, no-stress cable length calculation

Study on Anti-overturning Design of Curved Ramp Bridge and Reinforcement Measures of Built Bridge

Li Ai (105)

Abstract: In recent years, the construction of urban interchanges has produced a large number of minor radius curved ramp bridges. The torsion of the main beam of curved bridge will lead to the uneven stress of the bearing at the end of beam. To avoid the edge bearing separation and to ensure the anti-overturning capacity of bridge will become the increasingly prominent focus of bridge design. From the relationship between the lower bearing setup and the bridge bearing separation prevention, and taking a design case of ramp bridge as the basis, the article puts forward the bearing setup mode recommended in the design of ramp bridge by the spatial finite element analysis. According to the design cases combined with the safety accidents frequently in recent years, the article summarizes the feasible and effective reinforcement measures to improve the anti-overturning capacity of built ramp bridges.

Keywords: curved ramp bridge, anti-overturning design, bearing separation, reinforcement measures

Design of Variable Cross-section Prestressed Continuous Rigid Frame Bridge Yang Feng (108)

Abstract: Based on the research background of a 60 m+100 m+60 m-span continuous rigid frame bridge in Nansha District of Guangzhou, and the research object of variable cross-section prestressed continuous rigid frame bridge, the article introduces the static calculation result of this bridge under the conventional load function. The relative experience can be taken as the reference for the corresponding professional.

Keywords: variable cross-section, continuous rigid frame bridge, structural design, structural calculation, stress analysis

Design of Zhongxing Road Off-ramp Bridge in South-North Elevated Bridge of Shanghai

Li Jianzhong, Yin Zhen (112)

Abstract: In order to relieve the traffic pressure of Jingan District during the reconstruction of Tianmu Road Interchange in North Cross Channel, the article puts forward the construction scheme of Zhongxing Road Off-ramp Bridge in South-North Elevated Bridge to improve the usage rate of the north square of New Passenger Railway Station and relieve the traffic pressure during the reconstruction of Tianmu Road Interchange. The article introduces the contents of span layout, main girder selection, section layout and substructure selection of this interchange only referred for the similar projects in detail.

Keywords: ramp bridge, span layout, comparison and selection of pile foundation, to widen longitudinal joint of bridge, steel deck pavement

Analysis of Local stress and Discussion of Reinforcement of Special-shaped Plate Beam in Urban Interchange

Widening Project Li Wenzhi, Cao Dongguo, Wang Xiaojun, Zhang Fangtu (117)

Abstract: By the solid simulation model, the article analyzes the stress characteristic at the special-shaped end of a steel reinforced concrete plate beam in Zhujiang Road Interchange Assembling Widening Project, and

preliminarily discusses the reasonable layout of its reinforcement in order to optimize the structure design.

Keywords: assembling and widening, special shape, solid analysis

Numerical Analysis on Influence of Shrinkage Creep on Spliced and Widened Bridge

..... Lin Tianran, Wang Xiaojun, Chai Chunfeng, Huang Shengtao (121)

Abstract: Owing to many influence factors of concrete shrinkage creep with high complexity, in order to study the influence of shrinkage creep on the spliced widened bridge, and by the study background of a small-box beam spliced widened bridge on Zhujiang Road, the spatial beam grillage finite element model is set up to simulate the stress influence of shrinkage creep on the old and new bridges from the different splicing modes and the different splicing opportunities. The result shows that the internal force of the old and new beams near the splice is the maximum, and decreases in the both directions under the shrinkage creep, but with the extension of time, the shrinkage creep effect is weakened, which can be referred for the selection of splicing mode and splicing opportunity of the similar widened bridges from the angle of stress.

Keywords: spliced widened bridge, shrinkage creep, splicing mode, splicing opportunity, stress analysis

Design and Application of U-shaped Groove Structure in a Tunnel Undercrossing Railway ... Wang Yakun (124)

Abstract: As a newer structure type, U-shaped groove is widely used in the construction of urban metro, road, railway and expressway with the good economic benefit and social benefit. Combined with the practical engineering cases, the article analyzes and discusses the structural waterproof anti permeability, anti-floating design, side wall and bedplate stress of U-shaped groove. Aiming at the geological and hydrological conditions of the project, the article discusses the design method and gist, and the problems paid attention in the design, which can be referred for the design of the similar structures.

Keywords: U-shaped groove, anti-floating design, structure design, waterproofing design

Fault Cause Analysis and Reinforcement Design of Urban Single-column Ramp Curved Bridge

..... Hao Haifeng (127)

Abstract: Aiming at the faults of high and low slab staggering between the urban interchange ramp and the main line bridge, the cracking of box girder web bedplate and the easy overturn of single-column pier, the article studies the reinforcement technology. Taking an interchange ramp reconstruction reinforcement project as an example, the article puts forward the relative fault causing analysis and reinforcement design measures.

Keywords: single-column ramp curved bridge, fault analysis, reinforcement design, pull-rod structure, stiffening rib

Analysis of Earthquake Response on Huaihe River Highway Bridge Zhang Huanan, Chen Lin (131)

Abstract: According to the engineering background of highway bridge crossing Huaihe River in Daqing Road of Bengbu City and based on the response spectrum and the time history analysis theory, the numerical simulation method is used to further study the anti-seismic performance of this bridge. The study idea of the article is to use ANSYS to establish the whole bridge model and to analyze its natural vibration characteristic.

The response spectrum analysis method and time history analysis method are separately used to carry out the

earthquake dynamic response analysis, to take the displacement peak value of each key section, and to judge the danger section of this bridge. The calculation results of the above analysis methods are compared by the relative standards.

Keywords: self-anchored suspension bridge, dynamic feature, response spectrum analysis, time history analysis, earthquake response

Calculation and Analysis on Replacement of Bridge Bearing Hou Na (135)

Abstract: With the growth of the bridge operating year, the bridge bearing disease is serious. The replacement of bridge bearing is an important maintenance task of bridge. Through engineering examples, this paper analyzes and calculates the influence of the bearing replacement on main girder and bent cap. The relative experience can be referred for the related projects.

Keywords: single beam, beam grillage, transverse distribution system

FLOOD CONTROL & DRAINAGE

Planning Emphases and Difficulties of Flood Control in Park of 2014 Qingdao International Horticultural Exposition Li Zhongmin, Zhang Yuzheng, Hou Lianghao, Sun Yongbin (138)

Abstract: Qingdao City is a coastal hill city, and its terrain is high in the east and low in the west, is uplifted at the south and north sides, and is low-lying in the middle. There are many status gullies within the location of 2014 Qingdao International Horticultural Exposition. The most of gullies are deep and steep, and belong to the typical mountainous rivers. The reservoirs and dams within the drainage basin, where the gullies flow into, discharge into the main channel of Licun River at the downstream after flood regulation. According the present drainage basin, flood cause and flood character of the exposition, and aiming at the comprehensive treatment of small drainage basin and several technical problems existing in the flood control planning now, the article puts forward the measures to solve the flood control and safety of the exposition.

Keywords: 2014 Qingdao International Horticultural Exposition, flood control standard, flood regulating calculation, flood control planning

Design of Tunnel Shield Crossing Wharf and Flood Control Hydraulic Structure Wang Jue (142)

Abstract: The article introduces the design of tunnel shield crossing the wharf and flood control hydraulic structure by the relative reconstruction project of Shanghai Metro Line 10 Phase II crossing the anchorage space wharf of The Yangtze River Waterway Bureau. According to the comparison and analysis of schemes, the article demonstrates the reliability and economy of reconstruction scheme, and summarizes the gist in the design and construction processes, which can be referred for the design and construction of the similar projects.

Keywords: tunnel shield, high-pile wharf, flood prevention wall

Transformation of Drainage Idea Zhang Yanguang, Liu Peng (147)

Abstract: Taking *Integrated Planning of Drainage (Rainwater) Waterlogging in Central City Area and*

Huantai County of Zibo as an example, the article introduces the application of the planning ideas of sponge city construction, low impact development and large drainage system in the central city area and Huantai County of Zibo. On the basis to plan the reconstruction and utilization of the present drainage system, the traditional single measure is transformed to the composite measures so as to realize the multiple objectives of improving the drainage waterlogging level, transforming the drainage idea and implementing the rainwater flood utilization, which can provide some data and reference for the similar planning.

Keywords: sponge city. Low-impact development, traditional drainage system, large drainage system

Elementary Discussion on Idea and Method of Landscape Design for Sponge Residence Zhao Jinmei (152)

Abstract: The speeding up of urbanization development brings many environmental problems. The urban waterlogging has become one of main urban water ecological environmental problems. The ecological civilization construction is clearly required to place in a prominent position, and it is greatly to construct the natural stockpile, natural permeation and natural purification of "sponge city" for solving the rainwater and flood management problems of urban ecological environment in China. However, in the process of "sponge city" construction, the residential area is one of the most close to the objects of people's life. The sponge type residential area strive to create the high harmony of the nature and living, and the people and environment by the technological means of landscape design in order to achieve the harmonious beauty of the internal and external landscapes. The development direction of landscape design for the sponge type residential area is to realize the harmony of health landscape and living environment, to recover the regeneration and self-renewal capacity of the damaged landscape, to organically harmonize the human traditional culture and the natural system knowledge, and to find and prevent the potential environmental crisis by the landscape interfacial analysis, planning and design.

Keywords: sponge city, residence landscape, ecology, water resource utilization

Study on Deformation Law of High-pile Base Slab Flood Control Wall under Surcharge Load behind Wall Zhang Linlin, Shi Yongehao, Yuan Hao (156)

Abstract: There is objective problem of surcharge load behind flood control wall in Shanghai, which causes the damage of flood control wall in recent years. How to solve the hidden safety danger caused by the surcharge load behind wall is the urgent problem for the water administration department of Shanghai. According to the theoretical analysis, the article studies and puts forward the deformation law of high-pile base slab flood control wall under surcharge load behind wall, which provides the theoretical principle for developing the limiting requirements of surcharge load behind flood control wall of Shanghai.

Keywords: surcharge Load, high-pile base slab, flood control wall, deformation

MANAGEMENT & CONSTRUCITON

Elementary Analysis of Problems and Countermeasures for Construction Development of Rural Highway Ci Weichao (160)

Abstract: The rural highway network system, as the important component of highway system in China, has

been fast developed with the rapid promotion of new rural construction process in China in recent years. At the same time, many problems are also exposed and restrict the sustainable development of rural highway. Aiming at these problems, the article analyzes the problem causes and puts forward the relative proposals and countermeasures from policy and management mechanism.

Keywords: rural highway, highway construction, new rural area

Study on Design, Construction Parameters and Treatment Effect of Dynamic Consolidation ··· Chang Yuying (163)

Abstract: On the basis of fully studying the principle of dynamic compaction and the present situation of project, and combining with the characteristics and construction procedure of dynamic compaction, the article puts forward two selectable design and construction schemes of dynamic compaction, and introduces the design of effect monitoring scheme to build the dynamic consolidation test work. According to the test results of the compaction settlement, post-construction settlement, pore water pressure, standard penetration, vane shear test and static cone penetration, the consolidation effect of dynamic consolidation test work is analyzed. It can be concluded that the distance between compaction points is suitably close to influence depth under the condition of close to compaction energy. The impact depth of the dynamic compaction test on the subgrade is about 75m. The conclusion shows that the compaction effect of Scheme II is more optimized than Scheme I by the settlement, pore water pressure and other in-situ tests.

Keywords: dynamic compaction, consolidation, design, construction, monitoring treatment effect

Optimization of Steel Truss Arch Erection Scheme of Zhihu Harbor Bridge in Antai Road ····· Wu Yingen (167)

Abstract: The superstructure of the main bridge of Zhihu Harbor Bridge is the calculated span 80 m of single-span steel truss beam. The existing channel does not have the whole lifting capacity of single truss beam. After optimized, the whole truss beam is divided into segments. The side segment is erected at the bridge place, and the middle segment is assembled in the assembling field, and then hoisted and erected by floating crane. The article checks the erection method, which can be referred for the similar projects.

Keywords: steel truss beam, erection scheme, optimization

Summarization on Construction Technology of Cast-in-situ Pile for Hengnan Road Bridge
..... Wang Chen, Zhang Chuanqing, Yu Hualing (170)

Abstract: Taking the construction of the cast-in-situ pile for the main pier of Hengnan Road Bridge in Dalu Linem Waterway Improvement Project Phase II as an example, the article briefly sets forth the construction technology of cast-in-situ pile, and summarizes the key technical measures to construct the cast-in-site pile. The engineering practice shows that the construction quality of cast-in-situ pile can satisfy the relative requirements of this project. The relative experience can be referred for the construction of cast-in-situ pile for the similar projects.

Keywords: cast-in-situ pile, construction technology, key technical measures

Application of Double-steel Pile Casing in Pile Foundation Construction of Haojiang Road Bridge
..... Hu Xin, Peng Wei (174)

Abstract: The soft subgrade of Hengqin Birdge in Zhuhai is thicker, and its mud flow is in plastic state. The

bad phenomenon of neck down exists in the construction of bridge pile subgrade. Starting from three factors of solving the finished high-quality pile of pile subgrade, improving the durability of pile subgrade and reducing the construction cost, the double-steel pile casing is proposed for construction.

Keywords: pile subgrade, double-steel pile casing, construction

Analysis on GPS Monitor Data for Main Shipping Channel Bridge of Shanghai Changjiang River Bridge Zha Zhengjun (177)

Abstract: Based on the GPS monitor data of the main shipping channel bridge of Shanghai Changjiang River Bridge, the article analyzes the secular variation of displacements at the pylon top and in the middle of span, and the structural deformation in the sudden events of traffic congestion. The result shows that the displacement of pylon top along the bridge periodically changes obviously associated to the temperature. The sudden event of traffic congestion obviously influences the structural displacement of bridge.

Keywords: GPS monitor, structural displacement, periodic tendency, associative analysis, condition of traffic congestion

Study on Maintenance and Reinforcement of Highway Bridge Yang Tieniu (180)

Abstract: The highway bridge is the economic lifeline of a country, and undertakes the important mission of daily transportation. The reinforcement construction technology of highway bridge is exactly to guarantee its stable and smooth operation, effectively to prolong the service life of highway bridge, and to improve the using efficiency. The article discusses the maintenance and reinforcement of highway bridge. The relative experience can be referred for the similar projects.

Keywords: highway bridge, maintenance, reinforcement

Analysis on Bridge Inspection and Information Management Gist of Expressway Cai Xingmei (183)

Abstract: The bridge inspection of expressway is the key mode to guarantee the using effect of expressway, and can efficiently improve the normal using function and service level of expressway. Based on the bridge inspection and information management of expressway, and according to the work experience and technical development in recent years, the article puts forward the expressway bridge inspection and information management mode in order to lay the foundation of expressway development.

Keywords: expressway, bridge inspection, information management, bridge maintenance

Protection of Intellectual Property Right in Bridge Engineering Technical Field You Yan (185)

Abstract: A bridge ground correction structure involved in the patent, particularly meaning a structure able to effectively eliminate the bump at bridge head, belongs to the bridge engineering technical field. According to the analysis on the composing methods of independent and dependent claims of this technology in patent application documents, the article sets forth the methods to achieve its maximum protection range and to shorten the examination process.

Keywords: civil engineering, intellectual property right, bridge structure, patent

Case Analysis in Promoting Internationalization of Project Management Fan Wei (189)

Abstract: According to the practical situation of MK Project in Uganda, the article introduces the innovation of cooperation mode, positive integration with local culture and adjustment of personnel structure in the implementation process of project. The exploration to strengthen the localization construction and to carry out the construction technology standardization provides some practical experience for greatly promoting the internationalization of project management.

Keywords: complement each other's advantages, cultural integration, localization construction, standardization technology, enterprise propaganda

STUDY ON SCIENCE & TECHNOLOGY

Comprehensive Evaluation of Interchange Scheme by Grey Relational Projection Method Based on Combination Weight Ma Yao (192)

Abstract: Aiming at the Multi-target characteristics of comprehensive evaluation of interchange scheme, the comprehensive evaluation index system is established and the combination weight of grey relational projection method is proposed. According to the combination of analytic hierarchy process and entropy weight method, the evaluation index weight is determined and the grey relational projection method is used to evaluate the interchange scheme. Combined with its validation by the engineering cases, the conclusion shows that the index weight is more scientific and reasonable with the strong authority, and is more practical.

Keywords: interchange scheme, combination weight, grey relational projection, comprehensive evaluation

Study of Cement Influence on Pavement Performance of Micro Surface Shang Zhigang (196)

Abstract: At present, the expressway network has been more perfected in China. Many expressways have also come into the maintenance period. More and more attention is also paid to the maintenance technology of asphalt pavement. The micro surface technology is widely popularized since introduced into China because of its advantages of energy conservation, environmental protection, convenient construction, low construction cost, fast traffic opening and long service life. There are many factors influencing the mixture of micro surface. A factor of additive cement is experimented in laboratory. The article analyzes and summarizes the influence law of cement on the pavement performance of emulsified asphalt mixture of micro surface from the aspects of mixable time, cohesion index, wet wheel wear value and low-temperature crack resistance, and provides the guidance basis for the construction technology of micro surface.

Keywords: micro surface, emulsified asphalt, cement, pavement performance

Analysis on Influence of Cable Melting Ice-snow Temperature Load on Mechanical Property of Bridge
..... Liu Lingzhi, Yuan Tongsen, Zheng Hui, Zhang Chunlei (199)

Abstract: The heating cable melting ice-snow technology is a method of cable heating actively to prevent and to clean up the ice and snow on road, and has been successfully applied in the road structure. However, the

study on the application of this technology in the bridge structure is less, especially the influences of the additional temperature load produced in the cable heating on the mechanical properties of bridge structure. Taking a four-pylon five-span cable-stayed bridge as the engineering background, and by the finite element numerical simulation analysis, this paper analyzes the influence of cable melting ice-snow temperature load on the mechanical property of bridge structure, and preliminarily evaluates the feasibility of cable melting ice scheme from the mechanical property of bridge structure.

Keywords: cable melting ice, temperature load, cable-stayed bridge, mechanical property

Elementary Analysis on Long-term Performance Design of Municipal Road Asphalt Concrete Pavement

..... Huang Yuanfu (204)

Abstract: Reducing the disasters of asphalt concrete pavement and improving the long-term service life of asphalt concrete pavement are always the study orientation of pavement engineering. The article further discusses the long-term performance design of asphalt concrete pavement. On the basis of analyzing the design idea of long-term performance asphalt pavement, the article summarizes its design principle, gives the long-term pavement design index based on the damage mode to form its design method, and finally puts forward the proposal measures for carrying out the design of long-term performance asphalt concrete pavement from the material selection.

Keywords: asphalt concrete, pavement, municipal road, long-term performance, design of long service life

Analysis on Vehicle Bridge Coupled Dynamic of Long-span Multi-line Railway Steel Truss Girder Bridge

..... Xiong Ying (207)

Abstract: In order to study the law of vehicle-bridge coupling vibration induced by train running on a long-span steel truss bridge with multi-line railway on the bridge deck, and taking a two-couple 2×84 m continuous steel truss bridge as the study background, the train is regarded as a multi-rigid body dynamic system, the finite element is used to establish the dispersed model of bridge. The train and the bridge are regarded as the combined dynamic system, and the vehicle-bridge coupled dynamic model of the train and the multi-line steel truss girder bridge is established. The dynamic response of the bridge and the running performance of the train are calculated and analyzed. The results show that the dynamic response of the bridge and the vehicle is significantly larger than that of the single train passing through the bridge when ICE3 high-speed passenger car and C62 general freight train are mixed to pass the bridge. The train running performance can be satisfied and the bridge dynamic performance is good when the train passes the bridge in various combination conditions.

Keywords: steel truss girder bridge, high-speed train, freight train, vehicle bridge coupling vibration, dynamic response

Study on Wind Tunnel Test of Deck Driving Wind Environment for Liyang Harbor Bridge

..... Zhou Yujuan, Chen Fangdong, Shen Xudong, Guo Zhenshan (210)

Abstract: According to the wind tunnel test, the article studies the deck wind speed distribution of Liyang

Harbor Bridge under two conditions of installing the crash barrier and windbreak. The test result shows that the deck high wind speed zone within the 2~4.5 m height range of deck is eliminated after the windbreak is installed, which efficiently reduces the lateral wind speed of deck and makes the bridge deck have the more excellent crosswind driving safety than connected with the expressway.

Keywords: deck driving wind environment, crash barrier, windbreak, wind tunnel test, deck equivalent wind speed, crosswind reduction coefficient

Study on Startup of Sludge Anaerobic Digestion Process in Wastewater Treatment Plant Huang Ming (216)

Abstract: This paper briefly introduces the technological process of sludge treatment system in a wastewater treatment plant of Zhangzhou City, and discusses the commissioning trial operation of sludge anaerobic digestion process in detail. According to the analysis of the parameters in the operation process, the conclusion shows that the sludge anaerobic digestion system of this plant has been operated successfully.

Keywords: urban sewage, sludge treatment, anaerobic digestion

Influence of Forming Temperature and Additive on Foam Warm-mixed Asphalt Mixture Gao Wenyang (219)

Abstract: The foam warm-mixed asphalt mixture is the high energy conservation and low discharge of a new pavement material. The article studies the problems existing in the laboratory test of warm-mixed asphalt mixture based on foam asphalt, discusses the influence of forming temperature, additive and other factors on the pavement performance of warm-mixed asphalt mixture, and proposes the improvement method.

Keywords: warm-mixed asphalt mixture, forming temperature, additive, void rate, pavement performance

Study on Uniform Experiment of Coarse Aggregate Void Based on Continuous Gradation Xie Yuanxin (222)

Abstract: In order to further understand the effect of gradation change on the void of coarse aggregate (VCA), and based on the vibration compaction method, the continuous dense gradation of coarse aggregate is experimented and studied by the vibration frequency and vibration time as the experimental parameters. 3 factors and 15 level uniform design schemes are used in the experiment. The experiment and the regression analysis show that the void size of continuous dense gradation of mineral aggregate mainly depends on its properties (particle size, geometrical shape and surface properties), the maximum effect amplitude of gradation change effect on the void is less than 3%. It is hard to make the voids of mineral aggregate or the asphalt mixture mineral aggregate change more greatly by adjusting the gradation. The result proves that it is feasible to use the vibration compaction experiment method for the study on the void of coarse aggregate.

Keywords: road engineering, experiment, uniform design, void of coarse aggregate VCA

APPLICATION OF ACHIEVEMENTS

Manufacture and Application of Mineral Powder Heating Device of Pouring Asphalt Material Production Equipment

..... Shen Zhiguo (225)

Abstract: The article introduces the manufacture and application of mineral powder heating device of

pouring asphalt material production equipment by an engineering case. The relative experience can be referred for the similar projects.

Keywords: pouring asphalt, mineral powder, heating device

Study on Application of Crushed Pebble Asphalt Concrete in High Altitude Area of Tibet Liu Runxi (228)

Abstract: Based on the contracted section B of the new reconstruction project of accommodation highway for the airport from Nyingchi to Millin of Tibet, the pebble of local river shoal is applied to the asphalt pavement after crushed. The article studies its applicability in this area. In this project, the AC-13C asphalt mixture is used for the upper layer, the AC-20F mixture is used for the middle layer and the AC-25F mixture is used for the lower layer. The mixing ratio designs and the pavement performances of these mixtures are experimented. The experimental results show that the crushed pebble aggregate can completely satisfy the asphalt pavement performance of this area. In addition, the application of crushed pebble in the asphalt pavement surface has the higher social, economic and environmental benefits.

Keywords: asphalt pavement, crushed pebble, mixing ratio design, pavement performance, high altitude area

Popularization and Application of ATB-30 Asphalt Macadam to Treat Pavement Base Zeng Shujun (232)

Abstract: According to the analysis and study of design and specification requirements, actual composite gradation and material ratio, and the optimum asphalt aggregate ratio, the ATB-30 mixing ratio is determined. Aiming at the pavement roadbed fault of the tested road section, the article sets forth the construction method and effect of ATB-30 asphalt macadam to treat roadbed.

Keywords: pavement roadbed fault, ATB-30 mixing ratio, effect analysis

THE RELATIVE SPECIALITIES

Analysis and Study on Structure Stress of Underground Fan Room Qian Wenfei (234)

Abstract: The exhaust ventilation of longitudinal ventilation shaft is the mainstream ventilation mode of the current and future super-long tunnel. According to the analysis on the stress and deformation of underground fan room – core constituent part of tunnel group structure system in underground fan room, the conclusion shows that the structure design should be strengthened under the condition of III –level surrounding rock and unfavorable stress at junction of end wall. There is a certain constraint support function within 5–m range of end wall to arch and side wall. The overall displacement value of underground fan room is smaller. The above conclusion can provide a certain referring value for the structure design of underground fan room.

Keywords: super-long tunnel, exhaust ventilation of longitudinal ventilation shaft, underground fan room, end wall

Elementary Analysis of Intelligent System for Tunnel Lighting Yao Kejong (237)

Abstract: With the increasing development of lighting technology and more attentions to energy saving, the design of tunnel lighting with huge energy consumption has also changed greatly in the road lighting. The

selection of LED lamps with the obvious energy saving effect to replace the traditional lamps and the setting up of intelligent lighting control system to control the tunnel lighting in real time can make the tunnel lighting ensure the traffic safety in different environments and achieve the most reasonable energy-saving effect also.

Keywords: LED, intelligent lighting control system, illuminance, energy saving

Study on Optimization of Steel Wire Extrusion Anchor Clamping Structure
..... Zhu Yuan, Qin Hao, Wei Yaolin, Su Han (241)

Abstract: The article studies the optimization and upgrading of projects in order to satisfy some anchorage structures designed for the special suspender with the limited height demand of anchor head exposure. According to the optimized design of anchor head structure and also by satisfying its reliable anchorage performance, it can realize the cost saving of project, improve the production quality, can even lift the cables to satisfy the load bearing requirements under the condition of high stress amplitude, and in addition can also solve the special engineering demand of cable in the arch bridge suspender.

Keywords: optimized design, anchor head structure, anchorage performance, high stress amplitude, special suspender

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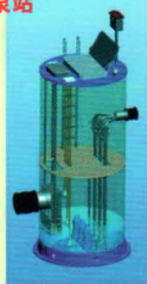
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配3台 Q=950m³/h H=17m
P=75kw 潜水排污泵