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城市道桥与防洪



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——《城市道桥与防洪》——

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● 本期看点

- 呼和浩特市三环快速路总体设计
- 180m跨有平衡重平转施工钢筋混凝土拱桥设计
- 青岛娄山河污泥堆肥工程设计要点总结
- 问题、目标导向下滨海地区竖向规划方法探索



万方数据

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封面介绍

本期封面工程为上海奉贤生活垃圾末端处置中心工程,由上海奉贤建设发展集团市政公路工程有限公司施工建设。

上海奉贤生活垃圾末端处置中心工程坐落于上海市奉贤区柘林镇楚华地块。项目占地面积为 52 381 m²,垃圾日处理能力 1 000 t,垃圾年处理能力 33.3 万 t。项目总建筑面积 28 561.3 m²,其中主厂房 25 424 m²,综合楼 1 313 m²。设置 2 台往复式机械炉排炉,单台焚烧炉处理能力 500 t/d;设置 1 台 18 MW 凝汽式汽轮机和 1 台 20 MW 发电机。该项目是一座用于废弃物焚烧的现代化垃圾处理中心,将生活垃圾转化为电能。每天大约近千吨垃圾被运往这里,年焚烧处理生活垃圾达 33 万 t,可节约土地 2.75 万 m²,相当于节约 4 个标准足球场,年发电上网电量约 0.7 亿度,可供 5 万户家庭一年用电,相当于节约 2.28 万 t 煤炭资源。

该工程于 2014 年 6 月 1 日开工建设,2016 年 3 月 31 日竣工。工程被评为 2015 年上海市重大工程文明示范工地和 2017 年上海市市政金奖。

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ROADS & COMMUNICATION

Overall Design of Hohhot Ring III Expressway Zeng Guangyong (1)

Abstract: With the speedup of urbanization process, the traffic problems are becoming more and more serious in the urban area of city, and the construction of expressway is becoming the important demand of perfecting the urban infrastructure. The article analyzes and introduces the Hohhot Ring III Expressway from the functional orientation, building traffic system, overall traffic organization and engineering design, innovatively puts forward the application of design idea of sharing the urban utility tunnel into the selection of line location, and points out that the attention should be paid to the construction of urban traffic system to study the preconditioning of overall design of expressway and to the study on the design of road traffic organization from the aspects of traffic levels, traffic conversion and road network coordination in order to provide the reference for the planning and design of urban expressways.

Keywords: expressway, traffic system, sharing of utility tunnel, coordination of road network

Overall Design of East of City – North Peak Fast Channel Project in Quanzhou City Zhuang Yunxiang (4)

Abstract: The East of City – North Peak Fast Channel as the important component of the "田-shaped skeleton" north radiation line in Quanzhou is the main channel of connecting the East China Sea – East of City – North Peak, and is also the traffic link corridor of the north ring line in the city area of Quanzhou. The article introduces the construction conditions of this project. The main transit traffic in the north of city mainly passes Shaolin Road and Donghu Street now, and the traffic volume is oversaturated. But the lands at the both sides have been formed, and the reconstruction and widening conditions are insufficient. It is urgently to need a new channel for replacement in order to optimize the structure of road network and to upgrade the operation efficiency of road network. The article sets forth the overall design scheme of this project including the construction background, construction necessity, main technical standards, interchange node design, cross section, road engineering and bridge tunnel engineering.

Keywords: express road, overall design, functional orientation, technical standard, interchange node

Discussion on Line Selection of Dongguan-Panyu Expressway Crossing Urban Area Yang Lizhen (9)

Abstract: This paper sets forth the line selection scheme of Dongguan-Panyu Expressway crossing the urban area in the preliminary design stage, analyzes the advantages and disadvantages of K-line corridor, B5-line corridor, B3-line corridor and ring-line schemes in detail, and studies and demonstrates the different corridors from many aspects of road network planning, road functions, scheme land, technical economy and environmental influence.

Keywords: expressway, urban area, line selection, scheme study

Discussion on Upgrading Reconstruction of Urban Fast Ring Road in New Era Huang Tao (14)

Abstract: With the continuous expansion of urban scale, how to reconstruct and upgrade the existing urban expressways has become a major issue in the current urban construction. Taking Nanning City of Guangxi province as an example, this paper discusses how to upgrade the status quo of expressways in the light of the current situation and development demand of urban road network.

Keywords: urban fast ring road, underground expressway, ground expressway, elevated expressway, reconstruction

Practice of Human-centered Quality Improvement in Urban Road Reconstruction Project Chen Yijian (18)

Abstract: The road is the important component of a city and witnesses the development process of a city. The functions of road are different in the different times and the different stages. Some functions emphasize the traffic function, some pay attention to the environmental landscape, and some place extra emphasis on the integrated service. Taking the quality improvement of Dongfeng Road in Guangzhou as an example, and adhering to the "human-centered" concept, the road is divided into the major and minor functions, the space is strengthened, the red line is diluted, more attention is paid to the pedestrians and the "humanity" is highlighted. A series of reconstruction of sidewalk pavement, guardrail, urban furniture and shrinking space will greatly improve the walking space, improve the comfort and enhance the safety of the pedestrians.

Keywords: urban road, quality improvement, human-centered

Study on Type Selection and Reconstruction of Existing Interchanges in Upgrading of Trunk Road to Expressway Chen Chao (21)

Abstract: In the upgrading and reconstruction of trunk roads to expressways in the urban built-up areas, the

difficulties often lie in the reconstruction of the original key interchange nodes, which can reflect the reconstruction effect of expressway. According to the analysis and summarization of the reconstruction modes of the existing interchanges in the reconstruction of road to expressway, this paper studies the characteristics of the type selection of interchange reconstruction, and summarizes the relative application conditions.

Keywords: type selection of interchange, transportation hub, construction mode, reconstruction of expressway

Road Design of Shanghai Puxing Highway (Fengnan Road ~ North Huancheng Road) Reconstruction Project . . .

..... Fu Feng (24)

Abstract: The article introduces the relative background, construction condition, design thinking, overall and road engineering scheme of Puxing Highway (Fengnan Road ~ North Huancheng Road) Reconstruction Project, and summarizes the design characteristics and design experience of this engineering project, which can be referred for the similar projects.

Keywords: highway, town section, reconstruction project, road design

Elementary Discussion on Regulation Engineering of New City Avenue Huang Weiming (28)

Abstract: According to the comparison of New City Avenue before and after its regulation, the article points out the problems existing in the present design of urban roads, puts forward the reference for the construction of new projects, and at same time points out some new projects have to be constructed again sometime because of the planning and management.

Keywords: regulation engineering, setback, do it again, coordinative design

Design of Interchange Reconstruction Scheme for Bijie Toll Station in Biyang Road II ... Xu Jiahui, Lv Zunan (31)

Abstract: Abstract: With the rapid development of cities, the urban rapid road network is gradually perfected. In order to further improve the road traffic capacity, it is extremely urgent to carry out the reasonable reconstruction of the existing traffic nodes. This article introduces the design of interchange reconstruction scheme for Bijie Toll station of Bijie City, discusses the selection of interchange type under the complex conditions, and puts forward the design methods and thinking of the interchange limited by many complex terrain and construction conditions.

Keywords: construction conditions, forecast of traffic volume, reconstruction of interchange, comparison and selection of scheme

Research and Practice on Reconstruction Scheme of Urban Road Deformed Grade Intersection Li Chen (35)

Abstract: Due to various reasons, many cities in China have accumulated a large number of deformed grade intersections, which have seriously affected the road capacity and safety. Therefore, the reconstruction of deformed intersections also becomes one of the important contents in the present municipal road projects. This article expounds the classification, existing problems and reconstruction ideas of urban road deformed intersections, and introduces the practical tests on the basis of specific projects. The good achieved effects can be referred for the design of the similar projects.

Keywords: urban road, deformity, grade intersection, reconstruction

Comparative Analysis of Key Technical Indicators between Highway Interchange and Urban Road Interchange
..... Xiao Yefeng (40)

Abstract: Aiming at the difference of highway and urban road in the technical standards and design standards of the specifications, the article compares the key technical indicators between highway interchange and urban road interchange in detail from the horizontal and longitudinal alignments of the main line, the horizontal and longitudinal alignments of ramp, and the cross sections of ramp, points out the causes of the difference between the both, analyzes the imperfect or unreasonable regulations, and puts forward the reference suggestions.

Keywords: highway interchange, urban road interchange, technical indicator, horizontal, longitudinal and transversal design, interconnecting pieces

Study on Model Selection of Kunming Lianda Interchange Scheme Liao Zuxing (44)

Abstract: The interchange intersected with expressway and urban road is a difficulty in the design of interchange. Based on the scheme design of Kunming Lianda Interchange, this paper completely considers the influences of planning roads, surrounding community architecture, planning land situation, land occupation size, toll station layout and engineering cost in the design of interchange, and puts forward five design schemes. After fully comparison of five schemes, the final design scheme is achieved.

Keywords: interchange, urban road, interchange, design scheme

Study on Organization Optimization of Road Traffic Flow Surrounding Railway Passenger Terminal
..... Peng Qunjie (48)

Abstract: In order to guarantee the normal operation of railway passenger terminal, the article studies the organization optimization of the road traffic flow surrounding the railway passenger terminal. This study

brings the relative roads surrounding the terminal into the study range. The article studies the small zone control method for the road traffic flow surrounding the terminal by the mode of small zone coordinated control and traffic flow induction. Taking the road traffic surrounding Wuchang Railway Station as an example, the article analyzes and studies this case, and carries out the simulation study on this case by the VISSIM simulation software.

Keywords: railway passenger terminal, intersection, traffic organization, traffic induction, congestion

Study on Improving Scheme for Traffic of External Collector-distributor Roads of Container Terminal

..... Zhao Wei, Xu Hanqing, Song Chaoqun (51)

Abstract: Taking the external collector-distributor roads of container terminal as the study object, this paper summarizes and analyzes the traffic characteristics of these roads. Based on the present problems, this paper puts forward the traffic improvement strategy. As the example of Linhai Road in Beijiang Harbor District of Tianjin Port, this paper proposes two traffic improvement schemes in order to provide the new thought for improvement and optimization of road traffic in the harbor district.

Keywords: container terminal, collector-distributor roads, traffic organization, improvement scheme

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Abstract: According to the background of Donghu Lake Greenway Project, the analysis of traffic system and the layout planning of parking lot in Wuhan, the article summarizes and concludes the largest scale of parking lot scheme at the south entrance of the forest park, which provides the experience for the construction of the traffic facilities supported for the urban greenways.

Keywords: greenway, parking lot, layout planning

Study and Application of Miscellaneous Fill Roadbed Treatment Method for Urban Road

..... Zhang Xin, Yi Lei (57)

Abstract: The article analyzes and compares many miscellaneous fill treatment methods in the construction process of urban road. According to the survey data and site practice, the mode of lime-soil compaction pile is used to treat the miscellaneous fill within the range of about 110 m long roadbed in the planning road at the north side of Qingliang Temple in Xian City, and the bearing capacity of roadbed after treated is detected. The key parameter detection result shows that this lime-soil compaction pile can effectively improve the bearing capacity of miscellaneous fill roadbed, eliminate the deep collapsibility and ensure the stability of roadbed. Relative to the other treatment measures, its effect and economy are better.

Keywords: roadbed, miscellaneous fill, lime-soil compaction pile

Study on Technologies of Pavement Structure in Road Reconstruction Li Ming (61)

Abstract: Taking the Zibo City Century Road Reconstruction Project as an example, the article analyzes and studies the structure methods of old pavement disease treatment, reflection crack prevention and asphalt concrete overlaying layer in the reconstruction process of old cement concrete pavement overlaying the asphalt concrete reinforced layer.

Keywords: old cement concrete pavement, asphalt concrete overlaying layer, disease treatment, reflection crack prevention

Common Crack Disease and Prevention Measures for Concrete or Asphalt Pavements

..... Wang Zhi, Wang Jinbin, Guan Minjie, Yin Rui, Hu Haoran (64)

Abstract: With the fast development of highway construction in China, the disease problems of road are growing. The crack is one of the most common harms in the road disease, and seriously damages the road safety. The article concludes and analyzes the common crack harms and causes of cement concrete pavement and asphalt pavement, and summarizes the preventive and treatment measures taken for the different cracks.

Keywords: road disease, cement concrete pavement, asphalt pavement, crack harm, preventive measures

BRIDGES & STRUCTURES

Design of Wuhan Nijiang Lake Bridge Song Xianjin, Wei Shunbo (69)

Abstract: Nijiang Lake Bridge is a landscape bridge in Lake Road of East West Lake District in Wuhan, spans the branch of Jinyin Lake, and is a three-span through bowstring compound steel-arch concrete-beam composite bridge. Its total length is 167.24 m and its span layout is 31 m+90 m+31 m. Its main arch is extroversive, and its sub arch is introversive. The steel box is used for the main arch and sub arch. The main beam is a pre-stressed concrete box beam. The bridge deck is widening. The bridge width at the abutment is 43.492 m. The maximum width of bridge in the spans is 54.5 m. This bridge is the symbolic landscape bridge in East West Lake District of Wuhan.

Keywords: landscape bridge, arch beam composite bridge, suspender, steel arch, concrete box beam

Design of 180-m Steel Reinforced Concrete Arch Bridge with Construction of Balanced Weight and Horizontal Rotation Liu Zhongren, Cheng Maofang (73)

Abstract: Sichuan Province Bazhong City Huahu Lake Bridge No.1 is a 180 m span deck steel reinforced concrete box arch bridge. The arching technology of the main arch ring is designed on the arch bridge with

"construction of balanced weight and horizontal rotation". The rotated-out half-span bridge body is the small-diameter concrete-filled steel tube stiff skeleton with the concrete bedplate. The article introduces the detailed design methods and contents of overall design, span layout, superstructure of main bridge, substructure of main bridge and rotating system structure. At present, the operation situation of this bridge is good and reaches the expected goal.

Keywords: rotation, horizontal rotating, balanced weight, steel reinforced concrete arch bridge

Design of City Ring Road West Ring Interchange Scheme in Lhasa City Li Yangze (75)

Abstract: The article sets forth the design concept of City Ring Road West Ring Interchange Scheme in Lhasa City from its design principle, type scheme, recommended scheme, traffic organization, functions and landscape effect. According to the comparison and selection of the technologies and economy of its structural type, the optimum design scheme is determined and provides the reliable basis for the subsequent design. The final practice has proved that its design scheme is economic and reasonable.

Keywords: vehicular bridge, scheme design, urban interchange

Analysis on Cable Force and Dynamic Property of Long-span Concrete Filled Steel Tube Arch Trestle Bridge in Wharf Jiang Lu (78)

Abstract: The through concrete filled steel tube arch bridge is one of the main long-span trestle bridges in wharf. Owing to the particularity of wharf construction, its load form and dynamic property are different from the general highway and municipal bridges. Based on the 300 000 t-class crude oil berth trestle bridge project of Hengli Petrification (Dalian) Refinery Limited Company, the spatial member system finite element model is used to calculate and optimize the reasonable cable force of long-span through concrete filled steel tube bowstring arch bridge by the minimum bending energy method, and to analyze the dynamic properties of the trestle bridge at the different loading states.

Keywords: concrete filled steel tube bowstring arch trestle bridge, cable force of suspender, minimum bending energy method, dynamic property

Design and Construction of Main Pylon Pier Foundation of Newly Built Anqing - Jiujiang Railway Changjiang River Bridge Luo Huaying, Zhang Xiaochuan (81)

Abstract: The newly built Anqing - Jiujiang Railway Changjiang River Bridge is an important part of Jiujiang to Anqing Railway. The main channel bridge is a double-pylon cross cable plane cable-stayed bridge with a main span 672 m. In the area of bridge location, the water is deep and the current is fast, the

scouring is serious, and the ship collision force is large. At the bridge location, the embedded depth of bedrock is deep, the karst is developed and the rock face is very undulating. In order to meet the navigational requirement, and to accommodate the deep water condition and the enormous horizontal force load, the foundation of the main pylon piers of this bridge is used of 45 cast-in-situ piles with 3.0 m diameter, and is supported by the weakly weathered limestone or argillaceous limestone. Based on the background of main channel bridge foundation, this paper discusses the guiding principles of design and construction of deep water foundation, and the treatment measures of karst of the long-span large-diameter cast-in-situ piles in the karst region. This paper puts forward the guiding principles and proposal measures of the preliminary treatment and emergency treatment in the design scheme in order to guarantee the smooth drilling of pile foundation and decrease the construction accidents, which provide the guarantee for the next safe construction in order and the control of whole construction period.

Keywords: cross cable plane, cable-stayed bridge, deep water foundation, cast-in-situ pile, karst area, karst treatment measures

Design of Double-column Pier in Highly Seismic Area Zhao Xionghui, Wang Hanwei (85)

Abstract: Taking the elevated bridge at the south exit of Tunnel No.2 in East City Road of North Ring Line in Lhasa as an example, according to the comparison and analysis on the relative calculation formulas from the current *Earthquake Resistance Design Code for Urban Bridge* (CJJ 166-2011) and the finite element calculation result, the article discusses the anti-seismic calculation of the double-column beam bridge by the response spectrum method, the vertical and horizontal, and longitudinal displacement calculation methods of pier, and the shearing resistance checking calculation of plastic hinge zone during the E2 response spectrum calculation. The prevention of pier from the shear failure ensures the bridge engineering to have the sufficient earthquake resistance capacity and reasonable safety in the earthquake process.

Keywords: small-box girder, response spectrum, pier column, Pushover

Key Design Technique for Small Radius Curved Steel-concrete Composite Beam of Urban Interchange Ramp - - -

..... Wang Weichen (88)

Abstract: Based on the engineering background of an urban interchange ramp, and according to its characteristics of small curvature radius, longer span and larger longitudinal slope, the MIDAS/Civil software is used to establish the model for the calculation and analysis. This paper introduces the key design technique of small radius curved steel-concrete composite beam commonly used for the urban interchange ramps. This technique highlights the design characteristics of small radius steel-concrete composite beam and provides

the wider space and prospect for the development and application of steel-concrete composite beam.

Keywords: small radius, steel-concrete composite beam, design, key technique

Application of Variable Cross-section Pre-stressed Concrete Cast-in-situ Box Girder Bridge in Overpass Bridge

..... Dong Hong (91)

Abstract: Taking an overpass bridge in the comprehensive bonded zone as an example, this paper sets forth the application of variable cross-section pre-stressed concrete cast-in-situ box girder in the overpass bridge. Firstly based on the present and planning situations of crossroads at the bridge site, this paper compares and selects the schemes of cast-in-situ girder and steel box girder of overpass bridges. After the analysis on the advantages and disadvantages of two schemes from the structural style, construction difficulties, traffic impact of crossroad, maintenance during operation, construction period and engineering cost and so on, the variable cross-section pre-stressed concrete cast-in-situ box girder is selected as the recommended scheme. Then, this paper completely analyzes the design of cast-in-situ box girder from three aspects of structure design, structure calculation and construction essentials. The scheme design of cast-in-situ girder is reasonable and meets the design standards and requirements. The result shows that the superstructure of bridge should be the pre-stressed concrete structure with the good durability as far as possible, and shows the application and development prospect of variable cross-section pre-stressed concrete cast-in-situ box girder in the overpass bridge, which can be referred for the design of the similar bridges.

Keywords: overpass bridge, comparison and selection of scheme, cast-in-situ box girder, structure analysis

FLOOD CONTROL & DRAINAGE

Summary of Engineering Design Essentials on Sludge Composting of Loushan River in Qingdao

..... Liu Dongxu (95)

Abstract: From the actual situation of Qingdao, in order to solve the problem of sludge disposal in Qingdao fundamentally, the new sludge composting project is proposed to set up on the reserved land of the Qingdao Loushan River Wastewater Treatment Plant. The sludge aerobic fermentation technology is proposed to use in the sludge composting project. The finished products after fermentation are used for landscape greening, land improvement or landfill cover soil. Based on the Qingdao Loushan River Sludge Composting Project, this paper introduces the aerobic fermentation technology of sludge named "integrated technology of continuously operating the trough dumper plus negative pressure oxygen supply deodorization". This project adjusts measures to local condition, treats the sludge by zones and qualities, and can be referred for the

relative projects.

Keywords: aerobic fermentation of sludge, trough dumper, negative pressure oxygen supply

Analysis and Research on Reinforcement Scheme of Instability Dike Slope in Soft Soil Foundation

..... Jiang Xiaojun, Wang Jun, Yan Xunhai (98)

Abstract: Unstable accidents of soft soil foundation dike slope occur frequently. The reinforcement scheme of landslide is worthy of further discussion in engineering field. Taking the unstable dike in a section of Huangpu River as an example and on the basis of analyzing the landslide process and causes, several landslide treatment schemes are proposed. Finally, the scheme of combining the anti-slide pile and wall-front-foot method is selected. The reinforcement treatment is not carried out until the landslide section is basically stabilized and the soil strength is gradually restored. This method can reduce the engineering cost of landslide emergency, and achieve the expected effect. Some conclusions of survey, design and construction are achieved from the analysis and study of landslide reinforcement schemes, which can be referred for the similar projects.

Keywords: soft soil foundation, unstable dike slope, soil thixotropy, landslide cause, landslide reinforcement

MANAGEMENT & CONSTRUCTION

Organization Management of Non-suspend Air Construction for 06-24 Runway Maintenance Project of Nanjing

Lukou International Airport Huang Xin (102)

Abstract: Relying on the 06-24 runway maintenance project of Nanjing Lukou International Airport and on the basis of considering the operation safety, construction quality and management difficulties, the airport administration department determines to adopt the non-suspend air construction scheme of reducing the number of flights from 38 to 32 during the peak hours and shutting down 06-24 runways all day for maintenance. The article discusses the implementation method of safety management for the non-suspend air construction, which can be referred for the non-suspend air construction of the other airport runways.

Keywords: runway maintenance, non-suspend air construction, organization management

Study on Feasibility of Partial Closing Construction in Reconstruction and Extension of Hangzhou - Jinhua - Quzhou

Expressway Li Haifeng, Hu Jianping (105)

Abstract: The both-side widening method is generally the preferred widening method for the reconstruction and extension of expressway because of its outstanding advantages in the utilization of the existing resources,

saving of construction cost, saving of land and concentration efficiency of operation. But whether or not to realize it will be restricted by the possible implementation method. Taking the partial closing construction of Hangzhou - Jinhua - Quzhou Expressway Reconstruction and Extension Project as an example, the article introduces its study process, method and conclusion for reference.

Keywords: expressway, reconstruction and extension, closing construction, key technique

Comparison and Study on Evaluation Standards of Epoxy Glue Performance Used for Assembly of Bridge Structure

..... Liu Fang (110)

Abstract: The article compares and studies the evaluation standards of epoxy glue used for the assembly of pre-stressed segments in China, America and FIP (International Pre-stressing Association), and contrastively analyzes the mechanical properties of shear tensile strength and compressive strength, and the construction properties of gluing time, opening time and thixotropy in order to select FIP standard able to more completely and systematically evaluate the performances of epoxy resin glue as the basis of construction comparison, selection and test. The article puts forward the proposal for the epoxy resin glue able to play its best efficiency in the construction according to the standard.

Keywords: epoxy resin binder, segment assembly, performance index

Elementary Discussion on Several Connection Structure Forms of Urban Bridge Prefabrication Assembly Technique

..... Jiang Haixi (114)

Abstract: In recent years, with the vigorous promotion of bridge prefabrication assembly technique in China, the wet joint mode used in the prefabrication assembly technique of cross-sea bridge pier formerly has not been able to meet the actual demand of urban bridge construction because of its larger site working quantity and long hold-up time. At the same time, the mechanical property of connection part is the most important and most complex component of urban bridge. Therefore, the connection structures among the components of urban bridge have received more extensive attention, and the multiple connection forms have emerged. The article introduces several connection forms widely applied already at home and abroad including the grouting sleeve, grouting metal bellows, socket and spigot joint, and slot type. These forms have been widely used in the connection of base slab and pier, and the pier and bent cap and bridge abutment. There is no difference in the functions compared with the conventional cast-in-situ mode.

Keywords: bridge prefabrication assembly technique, connection structure, grouting material

Bracket Slipping Construction Technique for Steel Box Girder of Elevated Bridge Zeng Yisheng (118)

Abstract: In the construction of steel box girder of elevated bridge, the bracket slipping construction technique is a common construction technique. Combined with a bridge engineering case, and aiming at the practical situation of this project in the selection of the bracket slipping construction technique, the article introduces the support and adjustment, slip track technique, construction traction system and hydraulic system in the slipping system in detail. And the article introduces the construction essentials of this bracket slipping construction technique, such as assembly of steel box girder, control of elevation, transversal and longitudinal slip reversing, adjustment of slip to place and unloading in order to provide the reference for the construction of the similar projects.

Keywords: elevated bridge, steel box girder, bracket slipping construction technique

Hydration Heat Simulation and Crack Control of Mass Concrete of Pylon Base Slab of Cable-stayed bridge

..... Wang Wenxue, Li Yuanbing (121)

Abstract: Taking the mass concrete of pylon base slab of a cable-stayed bridge as the engineering background, the article studies and discusses the temperature field and stress field distribution of base slab structure in the hydration heat stage of mass concrete through the numerical simulation analysis. The study results show that the temperature variation in the hydration heat stage of mass concrete is very obvious, the temperature difference between the inside and outside of ordinary Portland cement concrete will be maximum after 4 d pouring and soon afterwards go down steadily, and the temperature difference between the inside and outside of low-heat cement concrete will be maximum after 8 d concrete pouring. The cement and fly ash contents of concrete will most obviously affect the heating effect. The higher is the cement content, and the lower is the fly ash content. The more obvious is the heating effect, the larger is the temperature difference between the inside and outside. In comparison, the maximum temperature rise, inside and outside temperature difference, and the concrete surface temperature are lower than the ordinary Portland cement under the same grading and layering pouring mode. The stress variation in the concrete hydration heating stage is extremely obvious. The maximum tension stress of ordinary Portland cement concrete will reach the peak value after 3~4 d concrete pouring. And the low heat cement concrete will reach the peak value after 7 d pouring. The concentration phenomenon of tension stress is very obvious within the chamfer of base slab and at the open space of cold water pipe, and very easily exceeds the permitted tension stress so as to cause the surface cracks. The cracks can be effectively prevented by the on-site optimization of concrete mixing proportion, control of concrete casting temperature, increment of surface concrete insulation measure, control of concrete pouring interval and layer thickness, adjustment of water running time, control of influent flow and temperature, and delay of curing time with water.

Keywords: cable-stayed bridge, base slab, mass concrete, hydration heat, crack control

Assessment of Structure Status and Design of Maintenance Reinforcement Scheme for Truss Arch Bridge on Active Service Chen Guojia (126)

Abstract: The steel reinforced concrete truss arch bridge was widely used in 70s and 80s twentieth century because of its low cost, convenient construction and other advantages. At present, all these bridges have the different degrees of diseases. Based on the background of structure status detection and maintenance reinforcement project of a truss arch bridge, the article sets forth the main contents and process of the structure status assessment of bridge. According to the actual disease situation of bridge structure and the assessment result of carrying capacity, the article makes clearly the target of maintenance reinforcement and the structural stress requirements in the reinforcement process, and puts forward the targeted reinforcement scheme, which can be referred for the structure status assessment and the maintenance reinforcement design of the similar bridges.

Keywords: truss arch bridge, detection, structural assessment, carrying capacity, maintenance, reinforcement

Elementary Discussion on Durability of Underground Engineering Concrete and Control Measures for Key Links in Construction Li Shengmei (130)

Abstract: The durability of concrete means the use performance and appearance integrity kept well for a long time to resist various environmental mediums and external destroying factors under the condition of normal service so as to maintain the safety of concrete structure and the capacity of its normal service. There are many factors influencing the durability of concrete. The different environmental mediums and external factors have the different damages to concrete. The article analyzes the factors of concrete freeze thawing, carbonization and steel bar corrosion to influence the durability of concrete, and briefly introduces the control of key links in construction.

Keywords: concrete, durability, factors, construction, links, measures

Application of Pressurized Tool Changing Technique for Cement Mortar Retaining Wall in Upper-soft Lower-hard Water-rich Composite Stratum He Changlian, Pan Dannong (133)

Abstract: Nanjing Metro Line 3 Xinzhuang Station to Jimingsi Station passes through Xuanwu Lake. The strata of the lake where the shield is located are mainly silty clay, silty clay with gravel cobble and strongly weathered hornstone mudstone. This stratum is soft upper and hard lower. Its self-stability is poor and permeability is strong. There is a high risk of shield construction. This paper introduces the application of

cement mortar retaining wall technique in detail to improve the stability and air tightness of the tunnel face soil, and to solve the problem of safe tool changing under the condition of water-rich composite stratum. This technique can be recommended.

Keywords: upper-soft and lower-hard, water-rich composite stratum, cement mortar retaining wall, pressurized tool changing

Elementary Discussion on Construction Management and Control of Municipal Design Building Project

..... Chen Ting (137)

Abstract: The municipal design building project is a new office building project of the Municipal Design Group (SMEDI). Under the conditions of many construction difficulties of limited construction period, complex surrounding environment and many protected buildings, the "reverse construction method" is used in this project. And many new technologies are applied in this project under the premise of sample first. In addition, the project is strictly contracted and planned not only to ensure the excellent quality of the project in the stipulated days for construction, but also effectively to control the deformation of the surrounding buildings and the settlement of pipelines.

Keywords: construction management, reverse construction method, risk control

STUDY ON SCIENCE & TECHNOLOGY

Experimental Study on Overall Mechanical Property of Double U-shaped and Box-shaped Continuous Girder Bridge

Structure for Rail Traffic Huang Jicheng (141)

Abstract: Based on the engineering background of Shanghai Metro Line 17, the article studies the overall mechanical properties of the segment assembly double U-shaped and box-shaped cross-section continuous girder bridge structure through the load test and theoretical analysis of the bridges. Taking three 70-m main span, one 55 m main span and one 50 m main span double U-shaped and box-shaped continuous girder bridges as the study objects, each bridge has four loading control points, two six-car full loading marshaling rail traffic trains are used to carry out the static and dynamic loading tests. The study shows that each bridge structure is at the elastic operating state under the test load amount to the design load level, the change of its deformation increment and stress increment is approximately linear with the load. The measured dynamic coefficient of the main girder is less than 1.15 during the normal operation of the train with the different speeds and the different cars. The maximum horizontal and vertical amplitudes in the measured middle span of the main girder are separately 0.47 mm and 0.42 mm, and the maximum amplitude values of horizontal and vertical accelerated

speeds are separately 0.92 m/s^2 and 0.77 m/s^2 . The measured vibrational frequency of each order of bridge is larger than the theoretical calculation value. The measured first-order horizontal natural vibration frequency is between 2.700 Hz and 5.770 Hz. The damping ratio of the first three-order vibration mode is between 1.64% and 3.47%.

Keywords: continuous girder bridge, segment assembly, double U-shaped and box-shaped, static behavior, and dynamic behavior

Calculation Method of Sectional Virtual Beam Based on Rigid-connected Beam Theory

..... Geng Tao, Zhang Liwen, Sun Zhuo, Jin Tengfei (144)

Abstract: Based on the construction features of small-box beam, the virtual beam is provided to simulate the connection of longitudinal beams. The beam is provided with five nodes along the horizontal direction and is divided into four segments. Based on the rigid-connected beam theory, the horizontal loading distribution of small-box beam is calculated. According to the horizontal distribution characteristic, it is found that the loading distribution of wing plate is different from the top plate. The beam rigidities of wing plate and top plate are respectively given to the corresponding section of beam rigidities and zero values. The example verification shows that the mentioned method has the better accuracy and applicability compared with the look-up table.

Keywords: beam grillage method, sectional virtual beam, rigid-connected beam, horizontal distribution of load

Practical Calculation Method of Single-pylon double-span Cable-stayed Bridge Hu Tao (148)

Abstract: The cable-stayed bridge belongs to a high order statically indeterminate structure. The short-pylon cable-stayed bridge is one of the more special structural forms. Assuming that the stiffness of the main pylon of the short-pylon cable-stayed bridge is infinitely large, neglecting the stiffness change of the main beam caused by the axial force of cable, assuming that the vertical force of the cable is in accordance with the membrane tension and the structure is in the elastic working stage, the article deduces the load sharing situation of the cable of single-pylon double-span short-pylon cable-stayed bridge under the action of concentrated load by the mechanical method. The establishment of MIDAS finite element model checks and calculates the deduced formula. The result of checking calculation shows that the result of the deduced formula meets the requirements of error in engineering compared with the model result. The article studies the influence of the different parameters on the cable load by changing the structural parameter values. The achieved conclusion is that the cable force increases with the increment of uniform distributed axial stiffness

ea and angle of stayed cable. But the increment value of stayed cable caused by is very small, and decreases with the decrement of second moment of area I of beam. Based on these results of parameter effect, the article puts forward the measures to decrease the cable force. The deduced formula is instructive to the load distribution of bridge test.

Keywords: bridge engineering, formula deduction, load sharing, short-pylon cable-stayed bridge

Calculation of Shearing Strength of Reinforced Soil Pile Composite Foundation and Analysis of Overall Stability of Embankment Wu Peifeng, Zhang Rudong, Yuan Guozhu (151)

Abstract: The article analyzes the shearing strength index or shearing strength achieved by the different shearing tests of the relative embankment fill, pile space soil and reinforced soil pile for the reinforced soil pile composite foundation. According to the empirical method and the relative standards, the composite shear strength or composite shear strength index of the composite foundation are calculated. And based on the conventional soil slope stability analysis theory, the expression of safety coefficient for the composite shear resistance of reinforced soil pile composite foundation is given.

Keywords: reinforced soil pile, composite foundation, unconfined compressive strength, shear strength, stability analysis

A Review on Study of Fracture in Asphalt Pavement Based on Fracture Mechanics ... Shen Xin, Hong Zhe (155)

Abstract: As one of the main distresses of asphalt concrete pavement, the crack seriously impacts the service life of road and the driving comfort. This paper mainly sets forth the study of fracture mechanics in the asphalt concrete crack, and summarizes the newly-developing methods of R-curve and digital image technologies. The fracture mechanics is from the metal industry, and goes through the development from the linear elastic theory to the nonlinear theory in the study of asphalt concrete fracture. The R-curve theory is an important means to analyze the fracture extension. The development of digital image and relative technologies is conducive to promote the study of R-curve asphalt concrete, and is hopeful to make up the crack extension analysis of asphalt concrete.

Keywords: asphalt concrete, fracture mechanics, R-curve, relative technologies of digital image

APPLICATION OF ACHIEVEMENTS

Application of FRP Composite Material in Shaped Cross-river Landscape Bridge Wu Libo (160)

Abstract: Combined with the engineering practice of Beijing Tongzhou District Beiguan Avenue North Canal

Bridge, and aiming at the operability and demands of spatial modeling, vision sense, structure stress and design construction of bridge-decorating structure, the article comprehensively studies and compares the aluminum panel and glass-fiber reinforced cement (GRC) traditionally used for the decorating structure of bridge, and the new FRP composite material gradually widely used in recent years. Finally, the FRP composite material is selected to use for this project, and has been innovated and has achieved the good effect in the links of production and installation. This action is the typical example of FRP composite material used in the decoration of shaped structural and complicated modeling bridges, and is the FRP composite material firstly used for the decorating structure of bridge in scale.

Keywords: FRP composite material, shaped structure, bridge decoration

A Brief Analysis on Application of BIM Technology in Bridge Design Zhang Yun (163)

Abstract: BIM technology has a better application in architectural sector while it is still in a developmental stage in bridge engineering sector. In light of that, based on the practical application of BIM for sludge river bridges, this paper states the workflow and applications of three-dimension design for bridge engineering. It explains some functions of three-dimension modeling, two-dimension plotting, engineering quantity statistics and three-dimension reinforcing bars etc. of bridge engineering based on Bentley platform. The practice has been proved that Bentley series software is applicable for three-dimension design of bridge engineering and can be popularized to various bridge engineering applications.

Keywords: bridge engineering, BIM, Bentley

Research and Development of Standardized Pre-stressed Pipe Based on Industrial Construction Ideas

..... Xu Qi, Shi Xuefei, Ye Jianlong (165)

Abstract: The pre-stressed pipeline is the basic component of the realization of internal pre-stressing. At present, the commonly used metal bellows and plastic bellows have exposed many problems in the process of use. From the requirements of industrial construction, a new type of intelligent pre-stressed pipeline is studied including five parts of anchor component, standard pipe component, joint component, cable force measurement component and density measurement component. After standardized design, the application of this new type of pre-stressed pipe in short and medium span bridges of T-beam bridge, plate girder bridge and small box girder bridge is studied. The new type of pre-stressed pipe saves the time and labor cost at the same time improves the construction quality, and is good for promotion of realizing the informatization, intelligentization and greenization of bridge construction and management.

Keywords: pre-stressed pipe, standardized design, structure optimization, short and medium span bridges

Study on Application of CFRP Reinforcement Method in Reinforcement of Hollow Slab Bridge ... Guo Zhijun (170)

Abstract:According to the finite element numerical simulation and the site static and dynamic test of a pre-stressed concrete hollow slab bridge reinforced by a CFRP reinforcement method, the article compares and analyzes the changing situation of the deflections, stresses and dynamic characteristics of the main girder before and after the reinforcement of this bridge to evaluate the reinforcement effect of the CFRP reinforcement method in the field of bridge reinforcement on this account. The study result shows that the tensile property of girder bottom and the bearing capacity of bridge are improved to a larger extent after the reinforcement of pre-stressed concrete hollow slab bridge by CFRP reinforcement method than before the reinforcement. It is explained that this reinforcement method has the good reinforcement effect.

Keywords: CFRP reinforcement method, finite element analysis, loading experiment, reinforcement effect

Analysis on Application of Modified Asphalt of Heavy Duty Traffic in G15 Jiading-Jinshan Expressway South Section Overhaul Project Guo Yonggang (173)

Abstract: With the rapid development of transportation, the phenomenon of pot hole, frost boiling, subsidence, rut and so on occur in the most roads of Shanghai Section of G15 Shenyang - Haikou Expressway under the action of heavy duty traffic, which will seriously influence the traffic safety of vehicles. In order to improve the service level of road, to eliminate the hidden danger of traffic safety and to ensure the good road appearance and road condition, Shanghai Road Administration Bureau started the pavement overhaul of Shanghai Section (Songpu Bridge II - S4 Xinzhuang - Fengxian - Jinshan Expressway) in G15 Shenyang - Haikou Expressway in 2017. The modified asphalt of heavy duty traffic is used as the asphalt surface mixture of this overhaul. This modified asphalt has the good properties of rutting resistance and fatigue resistance, and good durability. This modified asphalt has the important application and promotion significance in the new construction or overhaul of heavy-duty traffic road, port, wharf and so on.

Keywords: modified asphalt of heavy duty traffic, rutting resistance, pavement overhaul

Study on Application of Five-preventive Manhole Cover in Municipal Road Project
..... Tong Shujuan, Li Jiangjiang, Zhang Jun (177)

Abstract: In the municipal road projects, various traditional manholes have the phenomena of manhole crib sinking, pavement cracking and manhole cover upheaval under the vehicle load and rainwater impact, which serious influence the comfort and safety of driving. The maintenance of the traditional manhole crib needs the concrete to pour and fix the manhole crib with a long construction period. The "adjustable five-preventive

(burglary, settlement, noise, displacement and skid) snap-spring nodular cast iron manhole covers is adopted. Its advantages are the small working face and open traffic in time after construction not only ensuring the construction quality, but also keeping the vehicles open traffic all day. The engineering application effects of Ouhai Avenue, South Tangjiaqiao Road, Fuxi Road and other projects are better, and have a certain promotional value for the similar projects.

Keywords: five-preventive manhole cover, asphalt pavement, adjustable

THE RELATIVE SPECIALITIES

Discussion on Vertical Planning Method of Coastal Area under Goal Orientation Lin Yuan (180)

Abstract: Based on the typical environment characteristics of coastal area and taking the vertical planning of the core area in Coastal New City of Fuzhou as example, the article summarizes the problems faced by the vertical planning of the coastal area. According to the proper innovation and extension targeted to the key technical links of vertical planning around the planning goal of "safety, economy and beauty", the article analyzes the vertical planning method and measures for the waterlogging, puts forward the vertical control requirements of partition differentiation at the regional level, and proposes to reasonably regulate and control the fill engineering quantity combined with the underground space development and utilization in order to provide the reference for the vertical planning of coastal area.

Keywords: coastal area, vertical planning, urban waterlogging, earthwork

Study and Discussion on Design of Overseas Project Zhou Yuliang (186)

Abstract: With the gradual implementation of the "One Belt One Road" strategy of China, the overseas engineering projects of China gradually increase. Compared with the same local projects, the overseas projects have own particularities, and need attention and analysis. Combined with the examples of overseas projects, the article studies and discusses the characteristics of overseas projects, which can be referred for the design of the similar projects.

Keywords: overseas project, engineering characteristics, engineering design

Research on Reconstruction Method of Building 3D Model Based on Unmanned Aerial Vehicle Images

..... Yang Jianqiang (189)

Abstract: The unmanned aerial vehicle (UAV) aerial survey technology has many advantages of non-contact

measurement, high efficiency, plentiful information and etc., and is playing an increasingly important role in digital city construction. Taking a building as a research object, this paper puts forward a method of building 3D model reconstruction based on UAV images. Firstly, the UAV is used to shoot the roof and wall of the building, the image matching is performed to generate the dense point cloud, and then the scanner is used to scan the wall that UAV is hard to shoot. And the scanning point cloud and image generation point cloud are rectified. After preprocessing of point cloud, the triangle network is built, the refined model is built by 3D Max, and the quality of model is assessed. The result shows that this method can achieve the refined 3D model of building.

Keywords: UAV, image matching, 3D modeling, accuracy assessment

Analysis on Engineering Cost of Qujiang Avenue Jiangwan Bridge

..... Tang Cairong, Peng Shiyao, Chen Haibin (194)

Abstract: According to the introduction of bridge design and analysis of engineering cost of Qujiang Avenue Jiangwan Bridge, the article puts forward the problems existing in the engineering cost control and management of bridge, and the strategies for strengthening the management. The whole process of cost control is completed, the pre-control work is good, the errors are rectified in time in the process of project implementation, and the engineering quality is effectively controlled at the same time to reduce the engineering cost so as to improve the economic benefit and social benefit of the bridge engineering.

Keywords: Jiangwan Bridge, overall design, cost analysis, cost control

Thought to Upgrade Budget Estimate Making Quality in Preliminary Design of Metro Engineering ... Qiu Yi (198)

Abstract: The budget estimate making quality of metro engineering has the larger influence on the engineering investment. Therefore, to control engineering investment needs to upgrade the budget estimate making quality. Firstly it is required to clarify the significance of investment forms of metro engineering on upgrading the budget estimate making quality of design, the details for attention and process control in the budget estimate making of the project in order to find the effective method to reasonably control the investment. The article discusses the application of this method in the practical budget estimate making.

Keywords: metro engineering, preliminary design, process control

Elementary Discussion on Advantages and Application of Total Cost Unit Price Method

..... Gu Xin (201)

Abstract: At present, the common pricing manners of China are mainly the quota pricing and list pricing, in which the list pricing is also called comprehensive unit price method. The comprehensive unit price only

includes the prices of labor, material and machine, the management fee, profit and risk cost. The stipulated fees and taxes are the non-competitive costs. There is still trace of the planned economy age, which does not conform to the future development trend. The total cost unit price commonly adopted internationally now includes the prices of labor, material and machine, measure cost, management fee, profit, taxes and fees, does not list other any charges except the risk cost of material price difference, more obviously conforms to the present market economy, and is the development trend of the future pricing manner of China.

Keywords: total cost unit price method, comprehensive unit price method, quota pricing method

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