Urban Roads Bridges & Flood Control

城市道桥与防洪

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图为广东省建筑设计研究院有限公司设计的广州南沙新区明珠湾区起步区——灵山岛尖配套道路工程

因为我们专心，所以我们专业！
——《城市道桥与防洪》

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● 本期看点

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成果应用

相关专业

政策规范

广告索引

封面工程

本期封面工程为广州南沙新区明珠湾区起步区——灵山岛尖配套道路工程,由广东省建筑设计研究院有限公司设计。

该项目共建设主、次干路及支路 27 条,路网总长度约 23.2 km,包括 18 座景观性中桥和 2.3 km 综合管廊。项目主要体现了路水交融、一桥一景的设计特点。(1)城市道路与滨水景观浑然一体的生态滨水新城。依托滨水元素,通过路、桥、水的统筹布局,采用一桥一景、路水衔接等精细化设计,打造亲水、生态、景观优美,与滨水元素不分彼此的城市道路。(2)平安智慧、互联互通的骨架路网。“一环一轴”的骨架路网满足交通互联互通,同时依托安全平稳的道路系统设计及预留,为智能驾驶示范段的搭建提供支撑,实现“聪明路”配“智慧车”。(3)以人为本、景观优美的亲水街道。服务型道路按“小街区、密路网”的设计理念,紧密结合亲水化、立体化、人性化的步行网络,采用小转弯半径、衔接坡道等设计手法,建设亲水街道。(4)一桥一景的桥梁博览馆。根据“湾区明珠,钻石水乡”的定位,结合传统岭南特色文化,打造 18 座富有现代水乡特色的景观桥。(5)南沙自贸区首个智慧综合管廊项目,构建主次分明、经济实用、功能完善的管线综合系统。(6)约 47 万 m^2 的大规模真空预压法在南沙道路工程施工中首次应用,具有重要的实践意义。

该工程总投资约 27 亿元,建安费约 15.3 亿元。2012 年 9 月开始设计,2014 年 12 月设计完成,2020 年 3 月项目竣工。

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CONTENTS

ROADS & COMMUNICATION

Abstract: How to build an integrated above-ground and underground slow traffic system is specially studied under the relatively tight condition of urban spatial resources when the integrated development and construction of road and rail transit are combined. Taking Maizhuang Road passing through Ciqunan Parking Lot of Metro Line 17 as an engineering case, three schemes of the node design of passing through the slow traffic system of the parking lot are analyzed and compared one by one. At the same time, the connections to bus and taxi, and the over-crossing road scheme are introduced and determined.

Keywords: rail transit, parking lot, slow traffic system, integration development

Abstract: In order to fully play the traffic functions of radial expressway, it is very necessary to carry out the preliminary study on the roadways, nodes and related construction conditions of radial expressway channel to city. Taking the study on the scheme of Chongqing - Hunan Double-line Expressway Channel to city as an example, on the basis of the project functional orientation and the traffic demand prediction and analysis, the conception and design of overall scheme are expounded. The lane number, roadway type, plane and vertical designs, and node type of radial expressway channel to city are compared, analyzed and demonstrated. The viaduct main and auxiliary road scheme + ground main and auxiliary road scheme are analyzed and compared. Scheme I has been selected. The present situations, functional orientations and types of two interchanges involved to this project are analyzed and expounded. Finally, the conclusion shows that with the urban construction and development, the construction conditions of urban area are getting more complicated. The good preliminary study of radial expressway channel to city can ensure the construction conditions and implementablity of radial expressway channel to city in the later period.

Keywords: scheme study, channel to city, radial expressway, inner ring expressway, quick turning to interchange

Abstract: Aiming at the general route selection and the river-crossing method of the first traffic river-crossing channel of Guangzhou - Foshan Co-construction Demonstration Pilot Area, many schemes are further compared and selected. On the basis of analyzing the key control factors of the river-crossing channel project, four alignments of Line A, Line B, Line C and Line K are compared. Two river-crossing schemes of bridge and tunnel are compared and selected from whether or not to meet the urban planning development, to

BRIDGES & STRUCTURES

Abstract: The project of Fuxing Avenue Bridge across Jianghan Canal is an important project connecting Chengbei Expressway in the east of the main urban area and the west extension line of Fuxing Avenue in west of the main urban area in Jingzhou City. The total length of the project line is 700 m, the design speed is 80 km/h, and the two-way six lanes are used. The whole line includes a single-pylon cable-stayed landscape bridge with the main 183-m span pier across Jianghan Canal.

Keywords: landscape bridge, cable-stayed bridge, single-cable plane, widening bridge, steel bridge pylon, steel box girder

Abstract: The terrain conditions in the southwest mountainous area are complex. The design of bridges across river is influenced by many factors. Taking Qujiang Bridge as an example, the multiple schemes are compared and selected for the overall design of this extra-large bridge from the perspective of topography, hydrology, bridge type and cost. Finally, a (126+240+126)-m continuous rigid frame bridge is determined. The spans of this bridge are long and are appropriate for the complex terrain construction, which has a certain reference value for the selection of bridge structures in the mountainous areas.

Keywords: continuous rigid frame, short-pylon cable-stayed bridge, cable-stayed bridge, stress

Abstract: For the structure of super long-span self-anchored cable-stayed bridge, the main girder at the bridge pylon bears the huge axial force. The integral stability of the main girder becomes the key factor to control the structural stress. Five main factors of the height of main girder, the number of auxiliary piers, the constraint of pylon and beam, the height of pylon and the anchorage distance on the pylon which affect the integral stability of cable-stayed bridge structure are analyzed to determine the reasonable value of each parameter.

Keywords: cable-stayed bridge, structural stability, elastic stability coefficient

Abstract: In order to study the dynamic characteristics of lattice steel pylon cable-stayed bridge, taking Baoji Lugang Bridge as the background, the dynamic characteristics of the bridge are measured by pulsation test method, and compared and analyzed with the finite element model value. On this basis, the influences of the parametric change of the main pylon stiffness, main girder stiffness, side span auxiliary piers, main pylon height and other parameters are analyzed. The results show that the measured modal vibrating shape is basically consistent with the theoretical modal vibrating shape, and the measured frequency value is slightly larger than the theoretical value. The vibrating modes of the pylon and girder of lattice steel pylon cable-stayed bridge are easy to be excited at the same time, coupled with each other and affected each other, which are not conducive to earthquake resistance. The whole torsional stiffness of bridge pylon is big enough to improve the wind resistant capability of structure. The side span auxiliary piers can greatly improve the longitudinal rigidity and vertical rigidity of the bridge, which can enhance the wind resistance of the structure and improve the driving comfort. For its dynamic characteristics, the best pylon-to-span ratio of this type of bridge is between 1/3 and 1/2.5.

FLOOD CONTROL & DRAINAGE

MANAGEMENT & CONSTRUCITON

Abstract: The two-span pre-stressed concrete variable height T-rigid frame box girder is adopted for the bridge across Guangzhou-Shenzhen Railway in Shenzhen Outer-Ring Expressway. The span is 2 × 82.5 m and the deck width is 33 m. The plane swivel method is used in the construction. The swivel angle is 72.342° . The cantilever length of the swivel structure is 2 × 73.5 m, and the swivel weight is 24 000 tons, which refreshes the width and weight records of swivel bridges within the jurisdiction of China Railway Guangzhou Bureau Group. In the trial swiveling stage of this bridge, the technical parameters are provided for the formal swivel through weighing test, trial swiveling test and inch-moving test, which ensure the smooth swivelling. The completion of the bridge ensures the smooth opening of Shenzhen Outer-Ring Expressway according to the plan, and accumulates the valuable experience for the design and construction of large tonnage swivel bridges in China.

Keywords: T-rigid frame box girder bridge, swivel construction, bridge across railway, spherical hinge, trial swivelling test

Abstract: The continuous beam steel tube arch bridge is the main bridge structure in China, has many advantages of convenient, safe and reliable construction, and low construction cost, and is widely used in the bridge construction. Taking the construction of 90 m+200 m+90 m continuous rigid-frame steel tube arch bridge of Fuhe River Bridge as an example, the construction technologies of long-span continuous rigid-frame steel tube arch bridge are expounded and analyzed in detail, which can be referred for the similar projects.

Keywords: continuous rigid frame, steel tube arch bridge, key construction technology, study and analysis

Abstract: Based on the construction of the cable-stayed bridge of Guangxin Bridge in Huaiyang Expressway, the monitoring and measuring technologies of long-span cable-stayed bridge are mainly expounded. The main contents include the establishment of plane and elevation datum, the displacement measurement of main pylon, the observation of main beam alignment, the selection of the relationship curve between the temperature and time and the elevation of main beam, and the selection of observation period, etc.

Keywords: cable-stayed bridge, construction monitoring, alignment control.

Abstract: After more than 10 years of development in recently, the aluminum alloy footbridges have gradually become a new branch of municipal engineering footbridges. In the existing engineering practices, the method of factory prefabrication and on-site assembling is mostly used for the construction of aluminum alloy footbridge superstructure. But the lower foundation is still used of the traditional drilling/digging piles or cast-in-place enlarged foundation, which leads to the long in-site construction

Abstract: Aiming at the areal tunnel of Danyang Road Station – Changyi Road Station of Shanghai Metro Line 18, the reasons of the segment floating to cause the segment crazing and segment leakage during the shield tunneling in the confined water-bearing stratum are analyzed. The technical measures and methods to solve the above problems are put forward, which can provide some reference and experience for the shield tunneling in the confined water-bearing stratum.

Keywords: shield, confined water-bearing stratum, segment floating, segment crazing

Abstract: Aiming at the problems existing in the practice of EPC now, combined with the pilot situation of EPC project in Zhejiang Province, the problems of difficult bidding, difficult tendering and difficult settlement of construction units, and insufficient matured markets and insufficient perfected supporting policies are analyzed and studied. The experience and lessons are summarized, and the solutions are put forward. On this basis, the suggestions are proposed for the difference between EPC mode and expected target in order to create a good environment for the promotion of EPC mode.

Keywords: EPC, difficulties, countermeasures

STUDY ON SCIENCE & TECHNOLOGY

Abstract: Road is a comprehensive system composed of people, road, vehicle, etc. Vehicle driving is greatly affected by road geometric parameters. Firstly, the influences of straight line, circular curve, slope length, slope and other parameters on vehicle driving are analyzed. Then the vehicle model, road model and comprehensive simulation model of man-vehicle-road are established by using Carsim software, and the reliability of the model is analyzed by using double line shifting method. Finally, based on an urban expressway, the variation law of vehicle driving characteristics is analyzed by using speed variation coefficient Kv and sideslip safety coefficient Ks. The research results can provide certain theoretical guidance for the geometric design of the similar urban roads.

Keywords: road alignment, geometric parameter, vehicle driving, influence mechanism

Abstract: The current society attaches great importance to environmental protection engineering, and highway pavement engineering is also no exception. In order to explore the influence and effect of warm-mixed agent on the modified asphalt and mixture, through the laboratory test analysis, the results shows that the warm-mixed asphalt becomes more stable because of its production principle and process, and has the advantages of lower energy consumption, lower cost, etc. The addition of RH warm agent has a relatively obvious improvement on the temperature of modified asphalt, which indicates that RH warm agent has a good cooling effect. The larger the dosage of RH warm agent is, the greater the amount of temperature change is. The addition of RH warm agent will not reduce the rutting performances of asphalt pavement, which belongs to the modified agent with no effect on pavement performance.

Keywords: warm-mixed asphalt, cooling effect, rutting performance, RH warm agent

Abstract: In order to improve the treatment effect of void at the bottom of cement concrete pavement, the analytic hierarchy process (AHP) and the fuzzy mathematics theory are used to establish a multi-level fuzzy comprehensive evaluation model for the optimal scheme of cement pavement grouting material. The fly ash and desulfurized gypsum are selected to replace the cement in an appropriate proportion to prepare the cement pavement grouting material. And the established comprehensive evaluation model is used to comprehensively evaluate the selection schemes of cement pavement grouting materials. The superiorities of 10 compared schemes are obtained. The maximum superiority is 71.61%, and the minimum superiority is 21.75%. In order to verify the rationality of the model, the corresponding schemes with the superiorities of 71.16%, 70.92%, 70.83% and 21.75% are selected to repeat the experiments. The results show that the model has good repeatability, can accurately reflect the effect of grouting material in the treatment of slab bottom void, and has the good engineering application value.

Keywords: cement concrete pavement, slab bottom void, grouting material, fuzzy mathematics, analytic hierarchy process (AHP)

Abstract: In order to analyze the main influencing factors of the traffic delay at the entrance and exit of the underground circular tunnel and improve the traffic efficiency of the entrance and exit, based on the characteristics of the entrance and exit of the underground circular tunnel, the influencing factor system of the traffic delay at the entrance and exit of the underground circular tunnel is established from the aspects of people, vehicles, roads, environment and the attraction rate of garage. Then from the perspective of the system, the influencing factors are analyzed by using the model of decision-making and trial evaluation laboratory (DEMATEL). The results show that the main influencing factors of the traffic delay at the entrance and exit of the underground circular tunnel are the slope of the entrance and exit, the length of the entrance and exit lane and the attraction rate of the underground garage. The most vulnerable factors are the vehicle speed and the driver's reflective judgment. The research effects can provide a certain theoretical basis for improving the accessibility of underground circular tunnel and underground garage, and reducing the traffic delay at the entrance and exit of underground circular tunnel.

Keywords: underground circular tunnel, entrance and exit, traffic delay, influence factor, DEMATEL model

Abstract: By introducing the basic theory of structural topology optimization, the principle and optimizing process of the evolutionary structural optimization algorithm are expounded in detail. By compiling ANSYS topology optimization program based on the evolutionary structural optimization algorithm, 2D plane topology optimization problems are solved. The study result indicates that the evolutionary structural optimization algorithm can help the designers to choose a reasonable and enlightening bridge structure, and has a good application prospect.

Keywords: topology optimization, evolutionary structural optimization

Abstract: Due to the traditional parameter optimization methods hard to realizing the effective improvement of the overall performance of the bridge structure after optimizing the bridge structure parameters, a research on the optimal design of bridge structure parameters based on multi-level neural networks is carried out. By establishing a finite element model of bridge structure, based on the multi-level neural network, the optimization goal of the bridge structure parameters is determined, the sample data for the optimization of the bridge structure parameters are collected, and the multi-level neural network parameters of the bridge structure are optimized and solved. A new parameter optimization method is proposed. The experiments have further proved that the new parameter optimization method can effectively improve the comprehensive performance of the bridge structure compared with the traditional parameter optimization method, which provides a new optimization idea for increasing the efficiency and reducing the consumption of bridge construction.
Keywords: multi-level neural network, bridge structure, parameter optimization

Abstract: At present, the research and analysis on the influencing factors of the chloride ion concentration on concrete surface show that the main influencing factors are time, material and environment. With the prolonging of exposure time, the surface chloride ion concentration will increase. With the prolonging of curing time, the concrete structure will gradually become dense and the surface chloride ion concentration will decrease. With the increase of water binder ratio, the surface chloride ion concentration will gradually increase after stabilized and the stable state will reach faster. After the mineral admixtures are added, the cumulative rate of chloride ion will increase significantly, that is the surface chloride ion concentration will reach the stable state faster, and the stable surface chloride ion concentration will also increase accordingly after stabilized. The higher is the chloride ion concentration in the exposed environment medium, the higher is the surface chloride ion concentration. The distance from the concrete structure to the coast and the speed of sea wind to the concrete structure will also have a certain impact on the free chloride ion concentration on the surface of the concrete structure. There are many factors affecting the chloride ion concentration on the surface of concrete structure. It is very difficult to accurately calculate and predict the chloride ion concentration on the surface of concrete structure. At present, the empirical formula can only be used to calculate and predict the chloride ion concentration at home and abroad. Therefore, the calculation of chloride ion concentration needs to be further studied.
Keywords: concrete, chloride ion concentration, time, material, environment

Abstract: Aiming at the current unmanned aerial vehicle (UAV) tilt photogrammetry in-house data processing, the error rate of the aerial triangulation is high in the large-area weak texture region, and its precision is hard to guarantee the present situation. The aerial triangulation calculation is carried out for the large-area weak texture region by using Virtuoso3D. Firstly, the operating sequence of aerial triangulation based on Virtuoso3D is introduced. Taking an actual project in Rongdong Area as an example, there are the unapparent feature points or deficiency phenomenon in multiple continuous images during the aerial photo because of this region covered by large-area vegetation and dust screen. In the process of aerial triangulation calculation, the method of calculating and extracting the feature points based on multi-view images is easy to appear the problem that the continuous weak texture image does not participate in the operation. And Virtuoso3D adopts the universality algorithm of machine vision to match

APPLICATION OF ACHIEVEMENTS

THE RELATIVE SPECIALITIES

Abstract: Combined with the heaped load project of landscape terrain around an expressway bridge in Hangzhou, the numerical finite element method is used to study the deformation of piers caused by the large-area heaped load. Considering the effective stress and excess pore water pressure, the factors related to the height of heaped load, the slope rate of heaped load, and the distance between the heaped load and the existing pier are analyzed. The appropriate height and distance of the heaped load are determined according to the control standard of the pile foundation displacement in the design code, which can provide the relevant experience for the similar projects.

Keywords: large-area heaped load, existing piers, finite element analysis, pile foundation deformation

Abstract: With the rapid development of social economy and the overall progress of technology, the people have the higher and higher requirements for the living environment and the natural environment. The rise of the green building industry has become the overwhelming tendency. According to various management methods and stipulations of green building industry gradually issued, the development conditions of green building industry are maturing. The control of engineering cost is an important component in the management of green building construction, and is a role not to be ignored in its development. The relevant conception and essential features of the green building are briefly summarized. The main contents of green building in regard to the control of engineering cost and how to control the engineering cost of green building better are further studied, which can control the engineering cost of green building better in order to make the green building engineering vigorously developed.

Keywords: engineering cost, control, green building

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