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城市道桥与防洪

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图为获2017年全国优秀工程勘察设计行业一等奖的北京市中心城下凹式立交桥区积水治理工程一期工程，由北京市市政工程设计研究总院有限公司设计

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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防洪排水

管理施工

编委成员单位(排列不分前后)

广告索引

封面工程

本期封面工程为北京市中心城下凹式立交桥区积水治理工程一期,由北京市市政工程设计研究总院有限公司设计。

该工程社会效益大:统一将原有泵站排水标准提高至 5 a 一遇,有效解决了北京桥区的积水问题,为首都防涝及城市运行安全提供了有效保障。

该工程内容丰富:针对北京市城市中心区一期 20 座立交进行改造,雨水泵站设计总流量从 30 m^3/s 提高到 133.7 m^3/s,新增雨水口 5 万 5 千座,新增调蓄容积 10 万 m^3。

该工程创新成果突出:一是泵站排水与雨水峰值调蓄池有机结合;二是引入初期雨水概念;三是采用一桥一策解决积水;四是施工方法多样化;五是泵站外观设计尽量与周边环境协调;六是新建雨水智能预警系统;七是对设计进行模拟验证;八是新材料和新方法;九是编制相关规范,补充规范的空缺。

该项目于 2012 年 8 月开始设计,2015 年 3 月竣工。该工程获得 2017 年全国优秀工程勘察设计行业一等奖。

Urban Roads, Bridges & Flood Control
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CONTENTS

ROADS & COMMUNICATION

Abstract: The article introduces the construction achievements and construction direction of urban roads in the recent ten years of Wuhan, and evaluates the present operation situation of road traffic facilities. On the basis of summarizing the construction experience and lessons of road in the present stage, and combined with the development goal and challenge of the future city, the article puts forward the construction direction and focus of urban roads in the future 3~5 years, which can be referred for the similar cities of China.

Keywords: road construction, short term, strategy, Wuhan City

Abstract: Based on the practical situation of city development in China, the traffic system of big cities is required to reconstruct and upgrade, and the rapid expansion of small and middle cities is also required to provide the rapid traffic system to support the growth of cities. The high-effective and convenient traffic system cannot be separated from the construction of urban rail transit and urban expressways. From the angle of microcosmic node, the article analyzes how to well handle the relationship between two systems and do the good mutual linking up and transship interchange under the condition of rail transit station and expressway interchange node compound. According to the analysis from three angles of road system, hub plane space and hub vertical space the article puts forward the relevant layout principle and method, and points out the attentions for the independent part and the transform required in the system. The article analyzes the Jimei School Village Station in Metro Line 1 of Xiamen, and determines the adaptability of this method.

Keywords: compound node, rail transit, expressway node, hub layout

Abstract: Taking the scheme design of Liuyuan Hub Interchange in Liuyuan – Dunhuang Expressway of Gansu Province as a practical case, the article analyzes the main control factors of interchange construction, puts forward two types of interchange schemes, and comprehensively compares and selects two interchange schemes from many aspects, which can be referred for the design of the similar projects.

Keywords: expressway, interchange, scheme design, comparison and selection

Abstract: The article systematically sets forth the problems before the reconstruction of Nanjing road – Xinhua Road Intersection in Tianjin and its reconstruction strategy, introduces the reconstruction scheme from the aspects of space channelization design, signal timing plan and drive-by-wire coordination, puts forward the evaluation method of analytic hierarchy process based on VISSIM simulation, and establishes the simulation and evaluation models. According to the comparison and analysis of the key indexes before and after reconstruction, the reconstruction scheme is systematically evaluated.

Keywords: intersection reconstruction, post-evaluation, traffic simulation, analytic hierarchy process (AHP)

Abstract: The rapid property of main trunk road as the new concept in the construction of urban road has been applied in the construction of many cities in China. Taking the design of the main trunk road for North Xiaoxiang Road in Changsha City as an example, the article clears up and sums up the application of the rapid concept of main trunk road in the design of projects from the cross-section design, traffic organization and design speed selection, and puts forward the relevant design proposals.

Keywords: urban road, main trunk road, rapid, design, Changsha City

Abstract: The article analyzes various traffic accidents at home and abroad, and divides the causes into two causes of subjectivity and objectivity. The former is the human factor to cause the traffic accidents, and the latter is the factors of vehicle, road, traffic and climate to cause the accidents. The article discusses the relationship between the alignment design and traffic safety in the road factors in detail, and introduces the safety evaluation of road alignment through the simulation test, which can provide the reference for efficiently decreasing the causing rate of traffic accidents.

Keywords: road traffic accident, road alignment design, easement curve

Abstract: The longitudinal slope of road is often less than the minimum drainage gradient influenced by various factors in the flat terrain of city. According to the requirement of the minimum longitudinal gradient of urban road in the standard, the article analyzes the reason of setting up the minimum longitudinal gradient and its rationality, and sets forth the application of the minimum longitudinal gradient in the design of the roads in the flat terrain of city, and the using method and the matters for attention of zigzag side ditch when not able to meet the minimum longitudinal gradient (the minimum drainage gradient) in order to solve the contradiction between the pavement drainage and the alignment beauty of urban road and to benefit the rapid discharge of the pavement rainwater.

Abstract: The article analyzes the collapse cause of a retaining wall in mountainous area, proposes the repair scheme, and puts forward the reasonable proposal for the design of retaining wall. The relative experience can be referred for the similar projects.

Keywords: retaining wall in mountainous area, collapse, repair scheme, proposal

Abstract: The article introduces the disease characteristics and types of roadbed engineering in mountainous area, analyzes the disease reasons, puts forward the countermeasures for repairing and treating the roadbed diseases of the main roadbed disease, landslide breaking and branch structure disease, discusses the prevention of roadbed diseases in mountainous area, and puts forward the relative proposals.

Keywords: highway in mountainous area, damage of roadbed, repair and reinforcement, prevention measures

Abstract: Jingshi Road as a vital traffic road in the east-west direction of Jinan City has played the important role to promote the economic and social development of Jinan City since its completion and opening for traffic in 2004. With the constant advance of urban space strategy in Jinan City, especially the rapid development of the east new city and the west new city, the traffic pressure on Jingshi Road grows with each passing day, and the road facilities continuously operate in the full load. After its service for many years, various road diseases are caused in succession on Jingshi Road, i.e. rutting, crack, net-shaped crack, pit slot and so on, in which the rutting phenomenon is the most representative, especially the rutting at the intersections and the bus transit lane. Some rutting can be up to 15 cm. the article introduces the detailed survey on the scope and depth of rutting diseases along Jingshi Road, and analyzes the cause and characteristics of rutting by Hamburg test and void ratio test, which has a certain practical guiding significance and economic value for the pavement structure and material design of heavy traffic in Jinan in the future.

Keywords: rutting, Hamburg test, pavement structure and material

Abstract: According to the survey of the common diseases in cement concrete pavements of roads practically reconstructed, the article analyzes the types and distribution characteristics of the diseases mainly including the cracking, slab corner fracture, broken slab fracture and slab bottom blank, discusses the characteristics, formation mechanisms and late damages of various diseases in detail, and finally puts forward the restoration measures and methods of diseases. The analysis, conclusion and treatment of the common diseases of cement concrete pavements can provide the references for the similar projects.

Keywords: cement concrete pavement, common diseases, cause analysis, prevention measure

BRIDGES & STRUCTURES

Abstract: The skew small-box girder is an important part of urban bridge. The seismic analysis of urban bridge is also an emphasis in the bridge design. Taking five variables of inclination, support rigidity, span, pier height and span number as the variable parameters, the article analyzes the seismic response on the skew small-box girder bridge, and discusses the influence of these parameter variables on the seismic response, which can be referred for the design of the following skew small-box girder bridges.

Keywords: small-box girder, seismic response, inclination, span, pier height, span number

Abstract: Based on the Zhichengdao Taixing Road Interchange of Tianjin, the study work is carried out on the seismic design method of girder and bridge in the high-intensity earthquake liquefaction site. The HDR high-damping seismic-isolation rubber bearing is recommended to use for the small-span and middle-span beam bridges in the high intensity area. The analytical iterative algorithm of horizontal equivalent stiffness for HDR high-damping seismic-isolation rubber bearing under E2 earthquake action is proposed. Aiming at the seismic design of Zhichengdao Taixing Road Interchange, its theoretical calculation result meets standard requirements.

Keywords: high-intensity area, earthquake liquefaction site, seismic design of girder and bridge, Zhichengdao Taixing Road Interchange

Abstract: The article summarizes the concept, the development history, and the advantages and disadvantages of three T-type rigid frames in the present bridge engineering so as to learn about the two-span steel box girder T-type rigid-frame bridge not yet applied in the highway bridge. It is very important to study its stability. The article introduces the stability theory in detail, sets forth the geometric nonlinearity calculation method in the program and describes the solving process of safety coefficients. Based on the engineering cases, the article further verifies the reliability and safety of design result of two-span T-type rigid frame, which provides the valuable reference for the stability analysis and design of the similar bridges.

Keywords: steel box girder, T-type rigid frame, stability, nonlinearity, safety coefficient

Abstract: According to the relative stipulations of high-speed railway now, the construction scheme for the newly built project to intersect with the built high-speed railway should be the newly built project underneath

FLOOD CONTROL & DRAINAGE

MANAGEMENT & CONSTRUCITON

Abstract: Taking Shenyang City North 1st Road Highway Railway Bridge as an engineering case, the article introduces the basic working mode and the disease detection content of bridge safety monitoring system in the monitoring process of old bridge diseases. The results can provide the new thinking for the structural disease monitoring, management and maintenance of the large urban bridges and the special structural bridges.

Keywords: bridge safety monitoring system, crack, deflection, bridge disease

Abstract: According to the example of Ningxia Guyuan Region Urban and Rural Drinking Water Safety Water Source Project, a treatment method is used to rapidly treat the seam leakage defect of large diameter PCCP pipe in the water treating period under the premise of guaranteeing the construction quality in order to meet the construction requirements and be referred for the similar projects.

Keywords: PCCP pipe, pier reinforcement of external seam, rigid connection of internal seam

Abstract: Combined with the practical projects, the structural style of a large bridge project is studied in detail and the construction scheme is carefully planned. The technical improvement can fully realize the cost saving of construction process to promote the construction of technical force in the project team, to improve the scientific and technological innovation consciousness of project team and to strengthen the construction cost consciousness of project team. The result can be referred for the similar projects.

Keywords: large bridge, construction of rotary drill hole, technique of gasbag to remove steel girder

Abstract: The asphalt mixing machine is the main supply equipment of asphalt concrete pavement material. The working state of combustion system plays an important role in the quality of finished mixing product. The article introduces the contents of asphalt mixing machine combustion system, puts forward the attentions easy to be ignored during its use, and based on the using experience, introduces some thinking to check the accidents, and sums up the reasonable application of this system how to use. The efficient use of this system can not only prolong the service life of mechanical equipment and shorten the construction period, but also reduce the engineering cost and save the fund and energy.

Keywords: asphalt mixing station, flame combustion, improvement measures

STUDY ON SCIENCE & TECHNOLOGY

Abstract: Based on an engineering case of a main 142 m-span pre-stressed concrete continuous rigid-frame bridge, its structure is analyzed by the help of the finite element, and is implemented of static and dynamic load test in site. The analysis of test result according to the relative standard verifies the design rationality of bridge structure, and inspects the engineering construction quality of bridge, which provide the basis for the checking and acceptance of project, and can be referred for the similar bridges.

Keywords: continuous rigid frame, finite element method, static and dynamic load test

Abstract: The load test is the most direct and efficient method to inspect the actual carrying capacity of bridge structure. But it is found that its defection measured value is often larger than the theoretical value during the test of steel temporary bridges and the partial steel truss bridges, and the strain distribution is irregularite. Its causes are the loose connection among the components of this bridge and the larger dimension error possibly existing in the components, which make the structure have the serious down deflection and partial no-stress state under the function of bearing the smaller load. In order to exactly evaluate the practical carrying capacity of this bridge, the difference value load test analysis method is proposed. Each working condition is all divided into the multistage loading in the load test, in which the first-stage loading can make the structure completely enter the working state. The test result of each stage is all subtracted from the first-stage or the former-stage test result during the analysis of load test result so as to eliminate the most error caused by the loose connection and dimension error of structure. The measured difference value result and the theoretical difference value result are compared and analyzed again so as to indirectly judge the actual carrying capacity of this bridge. The study result shows that the difference value load test analysis method can effectively solve the problem of the load test hard to exactly evaluate the carrying capacities of the steel temporary bridges and some loose connection steel truss bridges.

Keywords: difference value method, load test, carrying capacity, steel temporary bridge

Abstract: Based on the elastic mechanics solution of elastic half-space body under the action of vertical concentration, the numerical integration algorithm of foundation settlement calculation is given. The two-dimensional gird dispersion is carried out for the bottom of foundation. And the interpolation shape function of plane four-node isoparametric element is introduced. The gauss integral method is used to calculate the additional stress of substratum. The one-dimensional dispersion is carried out along the soil thickness. The interpolation shape function of two-node bar element is used to integrally calculate the foundation settlement for the additional stress. The introduced algorithm can be adaptable for the arbitrary shape of foundation type and the arbitrary distribution of load. A few of integral count can achieve the satisfied calculation accuracy. The introduction can be used for the similar projects.

Keywords: settlement calculation, additional stress, gauss numerical integration, Boussinesq solution

APPLICATION OF ACHIEVEMENTS

Abstract: Shanghai Bailonggang Underground Wastewater Treatment Plant (WWTP) has the characteristics of deep buried depth and high requirements of pile foundation bearing capacity. The flexible and rigid composite pile is a kind of composite pile combined with cement-soil mixing pile and rigid pile. This article introduces the design and construction processes of flexible and rigid composite pile, and analyzes the test results of pile foundation. The results show that strength composite pile has the advantages of high bearing capacity, small impact on construction environment and relatively high economic benefit. This kind of pile is worth promoting in the similar projects.

Keywords: stiff composite, flexible and rigid composite pile, bearing capacity

Abstract: According to the description of development status of bridges, the article puts forward the obvious advantage of assembled bridge, and describes the traditional industry practices, technical characteristics and technical advantages of assembled concrete channel technology, highway high-strength pre-stressed pier technology, small-type component factorization and standardization technology, small-span and middle-span steel plate composite beam packaged technology, pile plate-type subgrade structure technology, bridge PHC pipe pile technology and segment prefabricated assembled box girder technology in detail. The relative experience can be referred for the similar projects.

Keywords: assembly, prefabrication, standardization, industry tradition, technical advantage

Abstract: The digital map as one of the geographic information technology development achievements has a broad application prospects. This paper briefly introduces the application of digital map in the remote monitoring system of metro construction in Shanghai from two aspects of the demand analysis and implementation process. The demonstration of the system function after the completion of development fully explains that the digital map has the greater application superiority in the exhibiting information and emergency command of metro construction relatively at various positions, and well satisfies the demands of remote monitoring system, which can provide some reference for the development of the other similar systems.

Keywords: digital map, metro construction, remote monitoring system, application development

THE RELATIVE SPECIALITIES

Abstract: The ultra-large section rectangular shield is used for the underground tunnel in the Linkong Area in Shanghai, and crosses the large-diameter pipelines underneath at short range. This project is the first

rectangular shield tunnel in China, and has the characteristics of new construction technology, crossing at short range and shallow covering. In the light of the engineering characteristics, the article analyzes and discusses the design and construction of tunnel, puts forward the targeted measures, and introduces the real-time monitoring of pipeline deformation in the rectangular shield tunneling process. The result shows that the ultra-large rectangular shield crossing pipeline is feasible, and a series of measures taken in the implementation is active and effective.

Keywords: rectangular shield, ultra-large section, composite segment, settlement control

Abstract: The junction of lining structure – backfill grouting – soil exists between the shield tunnel structure and strata. The water level at the perched river section in the lower reaches of the Yellow River is higher than the ground surfaces at both sides of river. The lining structure – backfill grouting – soil junction of shield tunnel constructed under the perched river whether or not to form the seepage channel to make the water of Yellow River gushing to the both sides and thus to influence the safety of the both sides is the greatest difference of the shield tunnel project crossing the Yellow River from the other shield tunnel projects crossing the rivers, and is also the key to the feasibility of engineering construction. The lining structure – backfill grouting – soil junction of shield tunnel is theoretically simplified and numerically calculated. The seepage flows into two ends along the junction are simulated under the different working conditions. The result shows that the backfill grouting has an important action to decrease the seepage of junction. The gap thickness at the tail of shield has a little influence on the seepage safety. With the decrement of backfill grouting seepage coefficient, the water inflow at two ends is obviously decreased. The decrement of gap at the tail of shield is hardly to reduce the seepage flow at two ends. Accordingly, the relevant engineering proposal is put forward. The grouting hole is added in the lining design in order to prevent the formation of seepage channel of the lining structure – backfill grouting – soil junction. The grouting amount and grouting pressure are properly increased during construction in order to prevent the cause of no-grouting space. The reduction of seepage coefficient of backfill grouting is the first measures. The control of shield tunneling posture and the decrement of over-excavation so as to decrease the gap thickness of shield tail can be taken as the auxiliary construction measures. The implementation of backfill grouting holing leakage test within the tunnel during construction and the additional grouting according to the test result can be taken as the inspection and additional measures for the seepage safety of the junction.

Keywords: shield tunnel, the Yellow River, seepage, backfill grouting, water gushing

Abstract: The ballastless track is very sensitive to the settlement deformation. The culvert under the line will have the direct impact on the smoothness of track if the frost heave deformation occurs. The Harbin – Daqing – Qigihar Passenger Railway Line is the first high-speed railway constructed in the high-latitude severe cold

Abstract: According to the requirement of establishing the socialist market economy system, a series of reforms have been carried out in the terms of management system and valuation method for the engineering cost management of China. In order to solve these problems in the application of bill valuation and to fully play the role of the bill of quantities in the engineering management process, the composition and application method of bill-of-quantity valuation system are studied. Therefore, the bill-of-quantity valuation system has established a certain foundation for the marketization of engineering valuation. But there are some detailed problems of its application in the engineering management process. It is required to further study the foreign advanced practices of bill-of-quantity valuation system. The bill valuation norms of China are improved and perfected. Some improvement measures are proposed for reference.

Keywords: bill of quantity, valuation model, application, perfection

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集团简介

有凯泉的地方就有水

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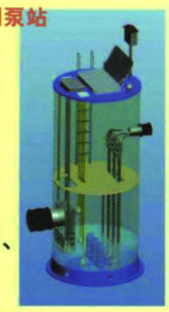

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●介质

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筒径3800mm 高度16m
配3台 Q=950m3/h H=17m
P=75kw 潜水排污泵

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