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城市道桥与防洪

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图为武汉市城市防洪勘测设计院设计的武青堤堤防江滩综合整治工程

因为我们专心，所以我们专业！

——《城市道桥与防洪》

● 本期看点

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万方数据

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广告索引

封面工程

本期封面工程为武青堤堤防江滩综合整治工程，由武汉市城市防洪勘测设计院设计。

武青堤原为梯形断面土堤，属武汉市1级堤防。武青堤堤防江滩综合整治工程由罗家港至武丰闸，长7.5 km，滩地总面积110 hm^2。设计秉承“城、滩、江三位一体”及“似堤非堤”的设计原则，在满足防洪安全要求的基础上，土堤一改以往标准梯形的传统方式，通过缓坡式堤防地形的营造，将原来的工程坡改为了坡比为1:6～1:15不等的自然起伏缓坡，使城市、江滩、长江完美地融为一体。平直的堤顶变为了蜿蜒曲折的弧线，通过两侧植物景观的营造，打造出一条变化丰富的堤顶绿道。

滩地景观在保留原有景观特色的基础上，将多个复合功能节点与滨江生态旅游相结合，引入海绵城市理念，营造“自然、质朴、大气、生态”的滨水区域景观。同时利用不同的高程设置观水、亲水、戏水的场所，充分强调人水和谐的亲密关系。

该工程于2013年底开工兴建，2015年6月一期工程建成开园，总投资18.7亿元。

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CONTENTS

ROADS & COMMUNICATION

Abstract: The planning and construction of urban road is related to the health and sustainable development of city. Based on the theory and practice of landscape and ecology, the article sets forth the ecological environmental problems possibly existing in the construction of urban road, discusses the ecological evaluation scheme of urban road and analyzes several problems to be considered in the construction of urban ecological roads.

Keywords: landscape and ecology, urban road, evaluation, sponge city

Abstract: Traffic Calming is a design conception that the soft and hard facilities of system are used to reduce the adverse effect of the motored vehicle travel on the traffic environment so as to improve the comfort and safety of pedestrian and non-motorized vehicle. According to the further analysis on the development course, applicability scale and engineering cases of traffic calming facilities, the article further discusses the standardized application of calming measures.

Keywords: urban road, traffic calming, applicability, slow traffic, safe traffic

Abstract: The road traffic congestion of CBD as the core area of urban social and economic development is increasingly serious. According to the comprehensive analysis of land utilization mode and road traffic characteristics of CBD and aiming at various traffic problems existing in the road system of CBD, the article puts forward the systematical improvement measures. Taking Shenzhen Dongmen CBD as an example, the article analyzes of the present problems and puts forward the road traffic improvement measures and scheme from the angle of planning and engineering reconstruction.

Keywords: CBD, road traffic, traffic improvement

Abstract: With the increasingly speeding up of urbanization in China, the metropolis area as the core of big

Abstract: The "first-in and then-out" passages of urban elevated expressway are the main factor influencing the traffic capacity of the main line in expressway. In order to link up with the ground road network in the engineering practices, the upper and lower ramps are generally arranged at the main intersections, which leads to the problems of the shorter weaving section at the passages of elevated expressway, and the in and out vehicle flows seriously influencing the traffic of the main line. Aiming at these problems, the article analyzes the advantages, disadvantages and applicability of the conventional layout method, the auxiliary lane layout method, collection and distribution lane layout method, and the "scissors ramp" layout method so as to use the reasonable expense to decrease the weaving influence of elevated expressway. Taking the design of Shijiazhuang Heping Road Elevated Expressway Project as an example, the article analyzes the different ramp layout schemes. The result shows that the traffic operation and engineering cost of this project by the "scissors ramp" layout scheme are comprehensively considered better. This ramp layout scheme creates the advantage of ramp layout for the passage spacing of elevated expressway hard to satisfy the standard requirement and the needs of traffic collection and distribution in the surrounding areas.

Keywords: elevated expressway, passage ramp, auxiliary lane, collection and distribution lane, scissors ramp, operation evaluation

Abstract: Presetting height has been more and more widely used in highway engineering. In view of the present specification of no clear presetting height in the soft soil embankment treatment design standard, the consolidation theory is used to study the stress and deformation characteristics in the filling process of embankment. According to the definition of allowable longitudinal slope value, aiming at the different thicknesses of soft soil, filling heights of embankment and stability time of post-construction settlement, through the construction process of loading settlement, the presetting height value can be calculated, and the calculation formula of embankment presetting height is derived. Combined with engineering cases, the article compares and analyzes the calculated post-construction settlement and presetting height. This method can be used in the presetting height prediction of general road sections.

Keywords: presetting height, embankment, grey theory, soft soil

Abstract: The most accidents happening in long tunnel are caused by the speed judgment error of drivers. The important influence factor on the driving speed perception and control of drivers in long tunnel is the side wall environment within tunnel. According to the simulating driving test, the article analyzes the speed perception, speed selection and speed control, and puts forward the efficient safety improvement scheme of side wall in tunnel.

Keywords: long tunnel, side wall, safety improvement

BRIDGES & STRUCTURES

Abstract: The article introduces the "multipoint assisting, single-point replacement, transverse synchronization and jacking by piers" of continuous beam support replacement method. On the basis of able to ensure the safety of bridge structure, this method can not only save the equipment investment, but also reduce the requirement of jacking foundation in order to save the construction cost. The practice proves that this method is feasible.

Keywords: continuous beam, jacking, support replacement

Abstract: According to the analysis on the mechanical characteristics of bridge pile foundation in the ultrahigh fill slope of Guangzhou East Solid Resource Recycling Center, the article summarizes the design method of bridge pile foundation in the ultrahigh fill slope in order to accumulate the experience for the design of pile foundation in the special geological condition.

Keywords: Midas/GTS, ultrahigh fill slope, pile foundation, analysis of mechanical characteristic

Abstract: Based on the fatigue load model III of *Highway Steel Structural Bridge Design Code* (JTG D64-2015), and taking orthotropic bridge deck of elevated separated double-box steel box beam as the study object, the refined analysis model of orthotropic bridge deck is established. The finite element method is used to obtain the stress distribution of fatigue sensitive details of U ribs under the fatigue load model III to check and calculate its fatigue strength. The analysis result shows that the fatigue strength of orthotropic steel deck meets the anti-fatigue design requirements. Under the fatigue load model III, the equivalent stress amplitude of U-rib fatigue details at the cantilever plate is larger than it in the box and at crossbeam. The U-rid structural details at the cantilever plate more easily suffer fatigue damage than the other positions, which are the control positions in the checking and calculation of anti-fatigue design of steel box girder. Meanwhile, the attention should be paid to the lower flange of large cantilever of steel box girder because of larger fatigue stress amplitude.

Keywords: fatigue load model III, highway, steel structure, bridge, fatigue performance

Abstract: Taking the large cantilever wide flat section scheme commonly in the present urban viaduct as the main study object, the finite element analysis is carried out for the whole sectional distribution of longitudinal normal stress and the normal stress distribution law is achieved so as to guide the engineering design.

Keywords: large cantilever, wide flat, concrete box girder, stress analysis

Abstract: The space finite element of ANSYS solid finite element is used to establish the model for analysis

FLOOD CONTROL & DRAINAGE

MANAGEMENT & CONSTRUCITON

Abstract: With the development of pre-stressing technology, the external pre-stressing reinforcement technology is more and more valued by the engineering field. Combined with the external pre-stressing reinforcement technology of Dongpu Reservoir Bridge in Hefei-Huainan-Fuyang Expressway, the article sets forth the application of external pre-stressing technology in China, the control gist of external pre-stressing construction, and the advantages and development direction of external pre-stressing reinforcement.

Keywords: bridge engineering, external pre-stressing technology, application

Abstract: The finite element analysis system Midas-FEA is used to optimize the prestressed engineering construction process of bent cap No.24 of the left main bridge for the Zhuankou Interchange Project. The study finds that the one-time tension mode used for the prestressed tendon of large-cantilever bent cap and the steel reinforced meshes added at the junction of bent cap and bridge pier cannot only guarantee the engineering quality, but also greatly shorten the construction period and the occupation time of the equipment.

Keywords: bent cap, prestressing engineering, construction process, optimization

Abstract: Taking Qingyuan North River Bridge IV in Guangdong as an example, the article puts forward the design concept of bridge pile foundation in the complex karst area, and analyzes three different karst cave pile foundations in the different construction environments, which guarantees the design of bridge pile foundation in the complex karst area to satisfy its bearing capacity requirements. Aiming at the different geological conditions, the article puts forward the key technological construction measures of pile foundation in order to provide the reference for the design and construction of the similar projects.

Keywords: karst area, pile foundation, design, key technology

Abstract: Combined with the working practice, the article introduces the enlarged-section reinforcement construction technology of underwater drilled pile. The relative technological flow, construction operation gist and technical parameters can be referred for the similar projects.

Keywords: underwater drilled pile, enlarged section reinforcement technology

Abstract: In recent years, with the fast development of social economy in China, the increment of traffic flow is very fast, in which the high-pier bridge is an important composed component in traffic line. The article discusses the application of high-pier bridge construction technology in detail, and analyzes the difficulties

Abstract: Aiming at the characteristics of a water supply project, the upper truss structure at the first part of original penstock is removed. The reasonable down sequence of penstock is from the right side hole of double-hole box culvert to the left side hole of double-hole box culvert and the new culvert in order to realize the fast and safe penstock down of culvert without the upper structure at the first part of penstock.

Keywords: water supply engineering, penstock engineering, penstock down, new culvert

Abstract: In the shallow earthing construction process of overlarge-diameter slurry balance shield, the tunnel segment just taken off the shield tail is easy to float up. If the countermeasures are not taken in the construction, the floating up of tunnel segment will be not only directly related to the quality and safety of the project, but also cause the huge influence on the surrounding environmental protection of tunnel. According to the engineering cases, the article analyzes the construction factors of causing the tunnel floating up in detail. In order to formulate the anti-floating measures, the article proposes the preliminary basis, and puts forward the detailed proposals by comprehensively considering the external factors and internal factors, which can be referred for the similar projects.

Keywords: tunnel floating up, synchronous grouting, segment

Abstract: In order to meet the city development, the transportation construction is further speeded up. There are more and more viaducts constructed in city crossing the surrounding rivers of city. The reconstruction of river at the bridge crossing should not only satisfy the bridge construction, but also meet the flood control and waterlogging drainage requirements of city. The application of underground diaphragm wall can better solve the difficulties of construction land, land acquisition and limited construction period in the reconstruction of urban river.

Keywords: bridge crossing, river reconstruction, underground diaphragm wall

Abstract: Taking the construction of deep underground diaphragm wall for West Binguan Road Station in Line 5 and Line 6 of Tianjin as the background, the article introduces the countermeasures and the key technology in the construction of underground diaphragm wall under the condition of thick steel plate sand geology in the alluvial plain of Haihe River. The control of each key process in two construction stages of the underground diaphragm wall forming into groove and the grooving completion ensures the construction quality, which can be referred for the implementation of the similar projects in the future.

Keywords: deep thick steel plate sand geology, deep underground diaphragm wall, grooving and mud control gist

Abstract: The foundation pit engineering in the municipal engineering field has the characteristics of small scale, complex depth distribution, closing to or crossing municipal pipelines. This kind of foundation pit is required to specially treat the height difference within the pit and the protection of the existing pipelines besides the conventional pit supporting to protect the surrounding environment. According to the detailed engineering cases, the article further discusses the technical measures to be taken when the complex foundation pit crosses the existing pipelines. The protection measures are mainly the design methods combined with the construction and the integrated consideration of the existing pipelines, which ideally solve the treatment problems of height difference within pit during the excavation of complex foundation pit, and also can be referred for the protection of pipelines during the foundation pit crossing the existing pipelines.

Keywords: crossing pipeline, complex foundation pit, supporting

Abstract: The pretension steel wire mesh method is a new reinforcement method. The advantage of this method is that it can actively improve the bending bearing capacity of the reinforced structure, and the reinforced layer is thinner and does not affect the clearance under bridge, and can better restrain the crack development of reinforced structure without the pollution of green environment protection. The steel wire mesh is used to reinforce the girder body. The efficiency is low and the waste is large if tension each by each. The method of synchronously jacking and installing the steel wire rope step by step is to install the adjustable height synchronous jacking support at the bed of girder. The computer control is used to realize the synchronous jacking, which not only has little damage to girder body, but also has the advantages of high efficiency, less waste and excellent effect. According to the evaluation after reinforcement and the late tracking observation, this method has the good performance.

Keywords: pretension, steel wire mesh, synchronous jacking, support

Abstract: This paper studies the influence of construction temperature on the property of foamed bitumen concrete, and the measures and suggestions to improve the property of foamed bitumen mixtures in the low temperature season of construction condition. The results show that property of foamed bitumen concrete is greatly influenced by the temperature, and is suitable to construct in higher temperature of summer. In the low temperature season, the adjustment of the gradation and the asphalt content improves the concrete property a little. It is to propose the method of lengthening the curing period and increasing the compaction energy to improve the property of foamed bitumen concrete.

Keywords: foamed bitumen, mixing forming temperature, low temperature construction, compaction times

Abstract: In the highway engineering of China, the construction of cement stabilized macadam base ha the important significance, and is the premise to guarantee the whole quality of highway engineering. The

STUDY ON SCIENCE & TECHNOLOGY

Abstract: The urban road intersection at grade is the bottleneck of urban road network. And the channelization design of intersection is one of important methods to improve the traffic capacity of intersection. On the basis of proposing the channelization concept and function, the analysis must specially consider the channelization design factors. According to the engineering practice, the article discusses several typical designs of complex intersection at grade of urban road.

Abstract: A large of roads enters into the overhaul period in China now. the overhaul design of expressway has become the important problem faced by the maintenance departments. The influence of moving load action should be considered in the overhaul design because of higher driving speed on expressway. Based on the pavement structure stability theory, the finite element is used to simulate the overhaul structure of expressway pavement to reach the ultimate load in the plastic failure under the cyclic loading action, and to calculate the influence level of the different parameters in the different driving speeds on the ultimate load of pavement overhaul structure. As a whole, the influence of pavement structural thickness on the ultimate load of overhaul structure is larger than that of modulus. The influence of old milling planer material as the overhaul structure layer on the ultimate load is larger than the other structural layers.

Abstract: The vertical curve radius in profile design has a large influence on road drainage. The greater vertical curve radius is, the smoother driving is, but bad for drainage. This paper analyzes the factors to be considered in design of vertical curve radius as well as the factor of vertical curve, and puts forward the design of vertical curve radius from the angle of drainage, which has the reference value for the profile design of urban road.

Abstract: In the elevated area of Shanghai Metro Line 17, the new section of the upper U and lower box is used for the segmental prefabricated assembled concrete continuous beam bridge with the main span of 55m. According to the solid finite element model, the article analyzes the shear distribution of each web in order to guide the anti-shear design of this bridge, and also studies its transverse stress characteristic to guide the transverse reinforcement design.

Abstract: Aiming at the degenerate behavior of flexible boom arch bridge boom cable, the article systematically sums up the safety and durability fault features of flexible boom cable, and points out that the safety faults of boom cable are mainly the rustiness, cracking and fracture of steel wire, and the deflection and bending deformation of boom, in which the cracking or fracture caused by the pitting corrosion of steel wire is the main factor. Aiming at the deficiency of the existing norms in the inspection indexes of flexible boom cable, and on the basis of summarizing the inspection indexes of boom cable safety and durability feature, the inspection index system of health condition of flexible boom cable is established.

Keywords: flexible boom arch bridge, boom cable, fault feature, inspection index, pitting corrosion

Abstract: The multi-channel transient Rayleigh wave method is adopted to collect the vibration signals of cement concrete specimens with different sizes. The time domain analysis method is used to analyze the separation of body wave and surface wave in the vibration signals and to determine the suitable specimen size and the seismic origin position. The phase transform generalized cross correlation function method and the full waveform energy method are used separately to obtain the wave velocities and energy attenuation factors of vibration signals of cement concrete specimens with different curing ages. Combined with compressive strength test values of specimens with the same curing conditions, the strength evaluation model is established based on wave velocity and energy attenuation factor, which can provide the reference for rapid and nondestructive estimation of cement concrete compressive strength.

Keywords: cement concrete, wave velocity, attenuation factor, strength evaluation model

Abstract: The anaerobic digested sludge is mixed with the returned mixture and bran in a certain proportion. The homemade bio-drying reactor is used to study the moisture removal and decrement effect of anaerobic digested sludge. The 18-d bio-drying test is to accumulate the removal of water content by 764.2 g/kg initial water content. The water content of anaerobic digested sludge is reduced from 55.1% to 27.0%, in which the time required for the water content reduced to below 30% is only 7~12 d. At the same time, the weight and volume of sludge is reduced separately by 48.7% and 35.6%. The reduction effect is obvious. The heat amount 85.94% produced from the organic matter degradation is used to evaporate and remove the sludge water content. The utilization efficiency of heat amount is higher. The average temperature of sludge is higher than 600C and the time is 6 d and higher than 550C and 10 d in the whole test process. The organic matter and nutrient content of bio-drying production are separately 58.8% and 17.82% with the potential land utilization. It can satisfy the requirement of separate incineration sludge (GB/T 24602-2009).

Keywords: anaerobic digested sludge, bio-drying, reduction, land utilization, sludge incineration

Abstract: According to the introduction on the excavation unloading engineering case at the bed of port channel of the existing underground shield tunnel, the unloading ratio and foundation pit unloading influence advanced analysis method is used to qualitatively judge the channel unloading influence depth, and to check up the tunnel anti-floating stability after unloading. The large geotechnical and tunnel finite element analysis Midas/GTS is sued to numerically calculate the upheaval and deformation caused by unloading. Based on many analysis results, it is to recommend the methods of soil reinforcing treatment, tunnel bed hardening, unloading by layers and sections, and the informationized monitoring measures. The effectiveness of measures is verified in the engineering implementation.

Keywords: excavation and unloading, shield tunnel, unloading ratio, unloading influence depth, anti-floating analysis

Abstract: The deep foundation pit engineering is a comprehensive geotechnical engineering issue. The control of underground water is one of important factors related to the safety of foundation pit. The anchor foundation pit of a bridge in Nanning City is located at the intense weathering siliceous shale layer. The excavation of anchor foundation pit is faced with the unstability risk of side slope brought by the leakage water. Taking the design and construction of waterproof curtain of foundation pit as an example, the article studies the influence factor of leakage water and introduces the type selection and technological parameter test of curtain so as to efficiently control the underground leakage problems, which can be referred for the design and construction of the similar projects.

Keywords: intense weathering, siliceous shale, grouting curtain

Abstract: A warm-mixed high-modulus asphalt mixture is developed based on warm-mixed asphalt and high-modulus asphalt technology. The optimum mixing temperature, pavement performance, dynamic and static modulus of this mixture are tested and evaluated. The test results show that the mixing temperature of the warm-mixed high-modulus asphalt mixture is lower 300C than that of conventional high-modulus asphalt mixture. Moreover, this asphalt mixture has the good high temperature rutting resistance and water stability.

Keywords: high-modulus asphalt mixture, warm-mixed asphalt, performance evaluation, dynamic modulus

Abstract: The main calculation methods of consolidation coefficient in the indoor consolidation tests are the time logarithm and the square root. These two methods belong to graphing method and are greatly influenced by human factors. It can be conveniently to determine the consolidation coefficient, and the initial values and

APPLICATION OF ACHIEVEMENTS

THE RELATIVE SPECIALITIES

Abstract: With the continuous technological improvement of Internet, big data and cloud computing, the construction of intelligent power plant construction has been the general trend of future development. As a base of intelligent power plant, the digitization and informatization construction are achieving good results on the application of part and point. Based on the study achievements of the relative industries at home and abroad, and according to the characteristics of power industry and the equipment structural characteristics of power plant, the BIM concept and the technology of the building industry are applied to the construction of the new digital / intelligent power plant. Based on the understanding of BIM, the article studies the digitized power plant. Taking digital information as the mainline, the article focuses study on the digitization modeling and information establishment of the equipment in power plant, and studies how to carry out the collection and management of equipment information in the construction of digitization power plant. It is to establish the BIM model of generating equipment, and to combine the building model with the equipment model of the plant. The equipment is managed by the space position of BIM and the function of equipment management.

Keywords: BIM technology, visual operation and maintenance, digital power plant, intelligent power plant

Abstract: Anti-season planting is a high difficult and complicated afforestation construction technology. The article analyzes and combs the technical gist in the links of planting principle, plant selection and transportation, soil treatment, plant pruning and planting so as to provide the some reference for the same trade.

Keywords: afforestation, anti-season planting, technical gist

Abstract: As more than half of the water conservancy engineering investment, the compensation of land acquisition and emigrant is very important in the early stage of engineering construction. The calculation principle of direct emigrant compensation is the product of physical quantity and compensation standard. To do a good job in physical quantity survey and statistical work is an important basic work to ensure the removal compensation of land acquisition and emigrant. According to the physical quantity survey process of land acquisition and emigrant for Nanjing Chuhe River Project, the relevant necessity is analyzed for the survey method.

Keywords: water conservancy engineering, land acquisition and emigrant, physical quantity survey, analysis

Abstract: In order to smoothly complete the basic survey items of uninhabited island in Shanghai, to master the topography and landform of the area surrounding the island, to find out the ecological environment and the key island protective situation, and to reserve the spatial resource data of uninhabited island, its implementation scheme is specially prepared. According to the survey contents, survey procedure and survey

requirements, and the norm of data processing method in the topographical measurements, prospection, the recheck of the third party, the audio and video production, and the collection of ecological environment materials, the survey quality and efficiency of the items are guaranteed. This implementation scheme is prepared based on the latest relative specifications and by fully referring the working experience of the special survey of "Compilation of Standard Directory of Uninhabited Island, Low Tide, High Land and Sunken Reef in Shanghai". The overall implementation scheme is required to prepare according to "The Second National Comprehensive Survey of Island Resource".

Keywords: uninhabited island, survey, topography and landform

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抗老化：可保护沥青表面，免受太阳紫外线和红外线的辐射。封层形成后会使沥青停止氧化和老化，同时封层中的复原成份可渗入沥青混凝土30㎜深处，形成共聚物，能还原已老化的沥青从而延长道路的使用寿命。

超级抗滑：特殊配方材料具有超强的粘结力，可以把原有路面和耐磨骨料紧紧地粘在一起而具有超强的抗滑能力。

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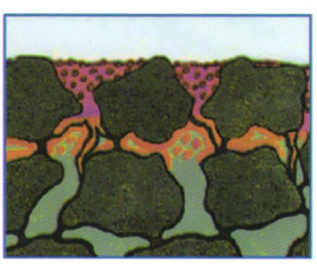
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