

城市道桥与防洪



主管：中华人民共和国住房和城乡建设部
主办：上海市政工程设计研究总院(集团)有限公司

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——《城市道桥与防洪》

● 本期看点

- 基于景观生态学的城市道路建设
- 公轨共建桥梁折返线道岔区轨道梁设计
- 基于InfoWorks ICM的已建排水系统海绵改造研究
- 面向农村公路的乳化沥青冷再生技术研究与应用



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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 hm²。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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Construction of Urban Road Based on Landscape Ecology Li Shiguo (1)

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

Study and Practice on Traffic Calming Design of Urban Road Zhao Qingxin (4)

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

Study on Improvement of Road Traffic System in Urban Central Business District (CBD) Li Muping (8)

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

Study on Optimization of Integrated Transportation Layout for Metropolis Area of Lanzhou

..... Tang Xianglong, Li Qian (12)

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

city has become the regional development mode and space combination form of the most competitive advantage. On the basis of *Gansu Province Urban System Planning <2013–2030>*, and aiming at the integrated transportation layout and planning within the metropolis area of Lanzhou, the article points out the existing problems, and according to the development situation and competitive potentiality of metropolis area of Lanzhou, the article specifically puts forward the new optimization scheme of transportation layout of metropolis area of Lanzhou.

Keywords: metropolis area, transportation layout, optimization, Lanzhou

Study on Optimization of Traffic Organization and Intelligence Traffic Scheme for Huxin Area of Sub CBD in Longhu of Zhengzhou Chen Shaohua (16)

Abstract: According to the present traffic planning of the sub CBD Huxin Area in Longhu of Zhengzhou, the article analyzes its existing deficiency, proposes the optimization scheme, and suggests that the PRT is cancelled from the original planning, the light rail is laid to the ground, and the original light rail space on Floor II is changed into the walking corridor. The optimization scheme for the road sections of the ground and the first underground floor is proposed. The ten one-way lanes of CBD underground ring road in the original planning scheme is changed into eight double-way lanes. The saved motored vehicle lane is used to add the bicycle lane and footpath. Also the intelligence traffic scheme is introduced to build the low carbon, environmental protection, high efficiency and safety of comprehensive transportation system.

Keywords: CBD ring road, optimization of road section, intelligence traffic organization

Analysis on Influence of Liede Avenue System on Traffic Flow in Central Area of Guangzhou Zou Jun (21)

Abstract: With the high-speed development of urbanization, motorization and marketization in China, the resource shortage of urban road, the increasing amount of vehicle, the increasing density of metropolis population and the rapid expanding of urban land scale brought from urbanization make the urban traffic faced with serious challenge. It is an efficient method to improve the urban road network by integrally studying the structure of urban road network and analyzing the traffic function of urban road from the structure of urban network. The article briefly introduces the composition and character of trunk roads in Guangzhou City. On this basis, the article analyzes the character of the road network structure in the core area of Guangzhou by a case of Liede Avenue in Guangzhou. According to the forecast models, the article forecasts the traffic flow of road network after the project completion. The article analyzes the influence of Liede Avenue after completion on the traffic of the central area of Guangzhou, and puts forward the policy proposal.

Keywords: system of Liede Avenue, central area, traffic flow, influence analysis, Guangzhou

Elementary Discussion on Design Gist of External Traffic Organization of High-speed Rail Passenger Transport Hub Zhang Qiang (25)

Abstract: The high-speed rail construction of China has entered a new period of rapid development. Under this background, the article summarizes the experience of how to solve the external road traffic organization for multiple transportation system transform hub of high-speed rail station as the core by the traffic

organization design of the surrounding roads of South Guangzhou Railway Station, which can be referred for the design of the road traffic for a new round of high-speed rail comprehensive transportation hub.

Keywords: high-speed rail, urban road, traffic organization

Optimization Concept and Method of Multilevel Public Transit Line Network Wang Jun (28)

Abstract: The optimization of conventional urban public transit line network is the important method of gradually perfecting urban public transit. Taking Xinbei District of Changzhou City as an example, the article discusses the optimization concept and method of multilevel public transit line network, and analyzes the problems existing in the conventional public transit line network in Xinbei District of Changzhou City and the problem causes. Aiming at the problems, the article puts forward the multilevel line network optimization method composed of the express line, main line, microcirculation line and special line, which includes the objective, concept and method of line network optimization. According to the evaluation, the optimized line is greatly improved in many aspects of line network density, areal accessibility, line network structure, nonlinear coefficient, average travel time of passenger and line network efficiency, which has a certain demonstrating significance for the similar regions.

Keywords: conventional public transit, multilevel, optimization of line network, Xinbei District of Changzhou City

Study on Node Design Scheme of Jixian Road and Tangkou Road in Hefei City Liu Daojun (32)

Abstract: The node project of Jixian Road and Tangkou Road in Hefei City is not only an important part of Jixian Road Project, but also depends on and influences on the node project of Tangkou Road and Hefei-Jiujiang Railway with each other. The article analyzes the combination scheme of these two nodes to achieve the precondition of node study. According to the analysis of surrounding construction condition and the traffic function demand of areal road network, the article proposes two engineering design schemes. The optimal scheme of construction is defined after the comparison and selection of technologies and economy.

Keywords: node scheme, engineering design, expressway

Design of Master Scheme for Jinwan Road – Huashan Road Interchange in Yangzhou City Peng Bin (35)

Abstract: On the basis of analyzing the planning position and construction condition, the article explains the project background and geographic location of Jinwan Road – Huashan Road Interchange in Yangzhou, demonstrates the function positioning, the line selection and the scheme comparison of the interchange, and designs and studies the short-term and long-term schemes of this hub interchange by combined with the result of the traffic volume forecast. The implementation of this project has an important significance in improving the rapid evacuation capacity of the road network in Yangzhou and in forming the future city expressway network.

Keywords: hub interchange, combined interchange, master scheme, traffic conversion

Analysis on Cross Section of Urban Road Based on Functional Requirements ... Deng Guanghui, Wang Chaoyi (40)

Abstract: Urban road as a link with the urban development is the main carrier of urban traffic, and it also

has functions of landscape, public facilities, disaster prevention and other functions. The cross section design of urban road is the integration and embodiment of various functions of urban road on each road section. The cross section arrangement of urban road should conform to the urban planning, meet the needs of road users, and improve the function of the urban road. Based on this, the article firstly studies the main contents in the cross section design of urban road, and then puts forwards the proposals for the section dimensions of the cross section of urban road by the function requirements and current norms of urban roads and the engineering experience of road users.

Keywords: cross section of urban road, road function, requirements of road user, sectional dimension

Study on Safety Evaluation Technology of Road Crossing Behavior Chen Guojia, Wei Wending (43)

Abstract: In the increasingly common case of various road crossing behaviors, the safety evaluation conclusion of road crossing behavior becomes the main basis for administrative licensing. Aiming at the road crossing behavior possibly to bring the different levels of damage to the original roadbed and pavement, and combined with the safety evaluation case of the new city area section of tourism highway of Lvliang Mountain Scenic Area underpassing Lianxu Expressway, the article studies the safety evaluation of road crossing behavior, and puts forward a set of evaluation standard able to implement, which can be referenced by the relative members.

Keywords: road crossing behavior, safety evaluation, evaluation standard, compliance inspection, structure checking calculation

Further Discussion of Urban Road Engineering Design and Urban Landscape Yang Xijiang (47)

Abstract: As the important content of urban road construction, it is very important for the urban road design to keep the coordination with urban landscape. Therefore, the article further discusses the application gist of landscape concept in the urban road engineering design from several aspects of the cross section design of urban road, the paving design of sidewalk, the design of curb, the design of greening belt and the design of lighting.

Keywords: urban road, engineering design, urban landscape, landscape design

Analysis of Basic Gist and Cautions in Design of Highway Engineering Yang Huan (49)

Abstract: The article puts forward the basic gist of line planning design, traffic design and node engineering design in the design of highway engineering, in which the line planning design is the most basic link. The article discusses the principle of line planning design, the integration of line design and node engineering, and the combined design method of plane and vertical curves, and further analyzes the design gist of traffic and node engineering. It is expected to fully utilize the promotion effect of highway engineering on the economic development of each area along this line, and to guarantee the operation safety and long service life of highway.

Keywords: highway design, line planning, design gist, cautions, node engineering

Study on Layout of "First-in and Then-out" Ramp in Urban Elevated Expressway Li Min (53)

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

Prediction on Presetting Height of Soft Soil Embankment Based on Allowable Longitudinal Slope Difference

..... Zhang Shuai, Zhang Xuan (56)

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

Study on Safety Improvement of Side Wall Driving within Long Tunnel Li Shaoshuai (59)

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

Study on Design of Urban Road in Coast Saline Soil Area of Weifang Mao Mingchun, Zhao Li (62)

Abstract: Weifang Coast Development Area is located at the coast saline soil distribution area in the central area of Bohai Sea. Its soil property is chlorine saline soil, and its salt content 2.10%~2.40% is the moderate saline soil. The saline soil will lead to the road fault repeatedly happening because of its 3-phase conversion, melt sinking, salt heaving, corrosion and other engineering characters. The improper treatment is easy to cause the huge economic loss. Relying on the practical projects in the saline soil area of the coast area in Weifang, the article puts forward the comprehensive measures of stone slag combined with dynamic compaction to treat the roadbed. The selection of drainage mode is suitable for the construction of coast water city, which conforms to the buffered drainage mode in the construction of sponge city. The anti-corrosive or antiseptically treated pipe materials are selected with the good effect.

Keywords: coast saline soil, roadbed treatment, pavement structure, drainage design

Study on Reconstruction Scheme of Beibei Beixia Road Lv Wenjie (66)

Abstract: With the continuous development of social economy and the continuous increment of car ownership, the road traffic congestion is more and more serious. The government has to try various devices to widen and reconstruct the roads. But the usable space resource is limited, the control condition is complex and the influence factors are more. The scheme design cannot take into account of traffic, parking, greening landscape and etc. It is required to comprehensively consider various factors for weighing the advantages and disadvantages, and for making a choice. Taking the study on reconstruction scheme of Beixia Road as an example, the article sets forth various influence factors focusing on the reconstruction of old roads, and introduces the relationship between each other, which can be referenced for the reconstruction of the similar old roads.

Keywords: reconstruction of old road, scheme study, Beixia Road

Ecological Design Concept and Method of Road Engineering Shen Zechun (69)

Abstract: The road engineering is the hub to connect the areal traffic and the economic and social development. Under the background of globalization and sustainable concept, the ecological design of road engineering is the important development trend. Combined with the characteristics of whole lifecycle of construction and operation of road engineering, the environmental protection, sustainable concept, green energy conservation and people oriented are the basic concept to implement the road ecologic construction. The ecological construction design, ecological operation design, ecological system sustainable design and ecological environmental landscape design are four important links to implement the road ecological design. it is required to introduce the above concept for guiding the new material, new construction method and new technology and promoting the ecological design of road engineering.

Keywords: road engineering, ecological design, sponge city, sustainable concept, design method

Design Application and Optimization Conception of Viaduct Drainage Asphalt Pavement Tong Yi (72)

Abstract: The article summarizes the design methods of America, Europe, Japan and China. Based on the international study methods and the local design standards, the article introduces the detailed mixing ration design flow and method and puts forward the detailed technical indexes of asphalt, coarse aggregate, fine

aggregate and mineral powder. Relying on the practical viaduct engineering, the article evaluates the noise reduction property, anti-slide performance and drainage capability. The result shows that the OGFC asphalt pavement performance designed by the design method in the article is better with the good durability. According to the viaduct characteristics and aiming at the problems of unsmooth pavement drainage and roadside waterlogging, the drainage layer thickness and the drainage facilities are optimized, and the detailed optimization design measures are proposed.

Keywords: viaduct, multi-pore, drainage pavement, design application, effect evaluation, design optimization

Optimal Design of Transition Section at Bridge Head of Expressway

..... Zeng Wei, Yuan Hongkai, Duan Xiaopei, Lang Ruiqing, He Xiaoqing (76)

Abstract: The bump at bridge head is a difficulty in the expressway construction. In order to the differential settlement between the bridge head section and bridge head, the article studies the design method of bridge head section, proposes the optimal design idea of changing the pile spacing of PTC pipe pile, and puts forward the length determination method of transition section at bridge head. Combined with a practical project in soft soil area of Tianjin, this idea is verified and perfected. This demonstrated project has the reference significance.

Keywords: transition section at bridge head, PTC pipe pile, differential settlement

Study on Protective Scheme for Expansive Soil Cutting Slope of Expressway Sun Xiaoxin (79)

Abstract: Aiming at the protective case of expansive soil cutting slope of Qingyuan - Lianzhou Expressway, the article analyzes its faults, revises the design scheme of original cutting slope, and puts forward the relative scheme of protective measures. The successful application in the practice projects has the good social benefit and economic benefit, which has a certain reference value for the similar projects in the future.

Keywords: expressway, cutting slope, expansive soil, protection

Further Discussion on Design of Asphalt Concrete Pavement of Airport Wei Xiaoyu (82)

Abstract: In the airport construction, the design quality of pavement will be directly related to flight safety. The article analyzes the present situation of airport pavement design. On this basis, the article further discusses the main design method of airport pavement and the design gist of airport asphalt concrete pavement.

Keywords: airport, asphalt concrete, pavement design, design method

Elementary Discussion on Application of Expressway Warm Mixed Asphalt Mixture Surface and Its Control

..... Wang Yu (84)

Abstract: The warm mixed asphalt has the advantages of low energy consumption, environmental protection and convenient construction, and is the good improvement and supplement of road engineering hot mixed asphalt technology in China. The article analyzes and summarizes the basic character of the warm mixed asphalt mixture used for expressway pavement from three aspects of the material character of asphalt mixture, the structural performance of asphalt surface and its construction performance. The study illustrates that the

low construction temperature, less energy consumption, less dust and less waste pollution are the biggest advantage of warm mixed asphalt used for the expressway pavement. The article puts forward the main application prospect of warm mixing technology in the road engineering and the existing problems. The establishment of the comprehensive design and evaluation system is the important base to widely popularize the warm mixed asphalt.

Keywords: expressway, warm mixed asphalt, mixture, application study, construction control

BRIDGES & STRUCTURES

Discussion on Seismic Design of Long-span Arch Bridge Peng Chongqian, Luo Meihui (87)

Abstract: At present, the most existing bridge engineering seismic design codes at home and abroad are only suitable for the medium span of ordinary bridges. The seismic design of long-span bridge exceeding the application scope has no code to follow. Combined with the practical cases, the article puts forward that the design is mainly to check and calculate the strength, and pay attention to the influence of high order vibration mode, and the influence of multipoint desynchrony excitation (including traveling wave effect) and vertical seismic oscillation in the seismic study and analysis of long-span arch bridge. The suitable seismic mitigation and absorption measures are taken to decrease the seismic response if necessary. At the same time, the attention is paid to the application of seismic measures. The bridge is ensured to satisfy the preventive standard requirements under the design seismic action. The article analyzes the problems met in the seismic analysis and calculation, and puts forward the relative countermeasures.

Keywords: long-span arch bridge, seismic analysis, seismic mitigation and absorption measures

Analysis and Study on Stress Distribution in Cable Beam Anchorage Zone of Long-span Steel Truss Stayed-cable Bridge Wang Tao (91)

Abstract: The stress distribution laws of cable beam anchorage zone of cable-stayed bridge are basically same under the constant load and the main force combination. The overall stress is smaller, and is larger only near the anchorage base plate. The influence range of stay cable force is smaller and its diffusion is faster. The cable beam anchorage zone of cable-stayed bridge is subject to the powerful concentrated force of stay cable. The stress status is more complex because of the weakened holes. It is necessary to carry out the local analysis of finite element mechanical model in order to completely reflect the practical working status and stress distribution of structure.

Keywords: cable beam, anchorage zone, stress, finite element, stress analysis

Suzhou Xiegang Bridge - Scheme Comparison of Double-deck Truss Arch Beam Composite Bridge Song Xin (93)

Abstract: Shuzhou Xiegang Bridge is a full steel structure of double-deck truss arch beam composite bridge, and is an important node of Suzhou East Ring Expressway South Extension Project. Its position is faced to the ancient bridge of Suzhou-Baodai Bridge. Owing to its special geographic position, the bridge not only satisfies the traffic function, but also has the better landscape effect. The span layout of this bridge is

69 m+180 m+69 m=318 m. Its upper deck is 41.6 m wide for urban expressway, and its lower deck is 48.6 m wide for main urban trunk road. Two main trusses are arranged in the transverse direction of bridge. The space between the main trusses is 36 m. There are 16 lanes in the whole bridge. The lane scale leads the lane scale at home and abroad. The article introduces the design concept of this bridge, and the comparison of design schemes and technical gist.

Keywords: double-deck, steel structural arch beam composite system, conception design, comparison of scheme

Study on Main Bridge Design and Key Technical Issues of Songyuan Tianhe River Bridge Kang Shibin (96)

Abstract: The main bridge of Songyuan Tianhe River Bridge is the space main cable composite beam self-anchorage suspension bridge. The main span of Beicha Bridge is 226 m. The article introduces the construction condition, scheme conception, overall bridge design and detailed structural design of bridge in detail. The article briefly introduces the study demonstration of the key technical issues of main cable rise span ratio, space cable rope clip positioning and structure seismic performance.

Keywords: bridge engineering, bridge design, self-anchorage suspension bridge, space main cable, seismic design

Structural Design of Central Column for Large-sized Interchange Huang Xiaobin (100)

Abstract: The design concept of a large interchange is to take the height of space and to arrange by five layers because of the land limitation. The diameter of a large 5-m circular column is arranged at the center of interchange to bear 2~5 layers of bridge structure. The safety of central column is related to the structural safety of the whole interchange. Its stress and structure are extremely complex. The article mainly introduces the structural design and stress calculation analysis of the central column.

Keywords: interchange, central column, structural design, calculation analysis, anti-seismic

Optimization of Roadside Barrier of Large-span Bridge for Huanglongdai Reservoir

..... Luo Aidao, Gong Shuai, Teng Yulu, Kang Hanjing (104)

Abstract: In order to optimize the roadside barrier of the large-span bridge for Huanglongdai Reservoir, and combined with achievements of the high-level protective steel landscape barrier researched and developed in the earlier stage, the performance of optimized structure is analyzed. The results show that the safety performance of the optimized structure is higher compared with the optimized structure of the original design scheme, its engineering applicability is strong, its construction technology is more convenient, and its material consumption is less, which greatly save the engineering cost and has the better landscape effect. Therefore, the optimization scheme can meet the demands of practical engineering applications.

Keywords: bridge guardrail, impact test, protection level, structure optimization, performance analysis

Widening Design Method and Process of Expressway Bridge Huang Xiaodong (110)

Abstract: The bridge widening design is the important method to reconstruct and extend the old bridges. It is required to fully consider the structure property of old bridge in the reconstruction and extension, and also to

satisfy the sharing effect and connection function of the newly built bridge with old bridge. The article summarizes the widening design principle of expressway bridge, concludes the different connection modes, the existing problems and the application practices according to the existing widening design experience, and analyzes the main influence factors on the widening design. The relative experience can be referenced for the similar bridges.

Keywords: expressway, bridge, widening, design method

Research and Design on Urban Interchange Top Head Structure Cai Xiantang (112)

Abstract: Based on planning and integration of road reconstruction and surrounding buildings, the construction of park green space or square on structural platform above urban interchange can make the urban land intensively utilized, and can improve the areal environment and quality. This paper introduces the top head structural engineering of urban interchange without the precedents for reference, and describes the benefit application of this concept. The scale of this project is large without the examples for reference at home and abroad. This paper further discusses and sums up the structural design concept, the relative problems and the detailed in order to provide reference for intensive utilization of urban land and design of similar structures in the urban reconstruction process.

Keywords: urban interchange, top head structure, municipal reconstruction, research and design

Design of Track Beam in Turn Line Turnout Zone of Bus and Track Co-constructed Bridge Zhu Lingzhi (116)

Abstract: Taking the track beam in turn-round zone of a station as an example, the article introduces this box beam structure, the beam arrangement design and calculation analysis. The article puts forward the reasonable and efficient treatment scheme of web continuously connected, crossbeam holing, crossbeam thickened and heightened, and orifice strengthened from the design angle, which provides the beneficial reference for the design of track beam in the similar turn line turnout zone of bus and track co-constructed bridge.

Keywords: bus and track co-construction, Line IV, turnout zone, track beam, design

Design of 32-m Simply-supported T-beam for Axle Load 35 t of Single-line Heavy Load Railway

..... Fan Yuanyuan (119)

Abstract: At present, the railway development direction of China is heavy load and high speed. This paper puts forward the live load of axle load 35-t train by the heavy load railway project in a country of Africa. The design adopts the prefabricated post-tensioned prestressed concrete T-beams. The axle load 35 t of live load is required to have the higher requirements for the bearing capacity of bridge structure. The requirements of structural bearing capacity and beam transportation are comprehensively considered in the design. The deck layout type, the beam structural dimension, the prestressed reinforcement layout and the tensile force determination are calculated, analyzed and studied. The design scheme suitable for the axle load 35 t of simple-supported T-beam is proposed. The relative experience can be referred for the serialization design of heavy load railway in the future.

Keywords: heavy load railway, axle load, simply-supported T-beam

- Application of Multipoint Assisted Jacking Method to Replace Multi-span Continuous Beam Support Liu Mei, Huang Longtian (123)
- 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
- Analysis on Mechanical Characteristics of Bridge Pile Foundations in Ultrahigh Fill Slope Chen Wei, Chen Haibin (126)
- 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
- Analysis on Fatigue Performance of Highway Steel Structural Bridge under Fatigue Load Model III Liang Weiquan (129)
- 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-rib 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
- Analysis on Space Stress of Large Cantilever Wide Flat Concrete Box Girder Ye Ru (133)
- 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
- Calculation, Analysis and Study on Crossbeam of Cast-in-situ Continuous Box Girder Cao Zhiguang (137)
- Abstract:** The space finite element of ANSYS solid finite element is used to establish the model for analysis

by the engineering background of a three-span (3 × 30 m) pre-stressed concrete continuous box girder bridge. Based on the stress characteristic of crossbeam, the article puts forward some calculation methods to be referenced for the design of the similar projects.

Keywords: continuous box girder, crossbeam, finite element

Scheme Design of Ring Road Crossing North Water Diversion Canal Bridge within Longhu of Zhengdong New District Ai Fuping, Xu Jun, Liao Chongqing (140)

Abstract: The article firstly introduces the engineering situation of the ring road crossing the north water diversion canal bridge within Longhu of Zhengdong New District in Zhengzhou City, then discusses the overall design, the structural comparison and structural design of the bridge in the preliminary design stage in detail, and finally calculates and analyzes the strength, rigidity and stress of the main structures of the bridge. The result shows that the strength, rigidity, crack width and integrated structural stability of each main structure in this design scheme can satisfy the requirements of the specifications.

Keywords: cable-stayed bridge, structural comparison and selection, structural design, structural calculation

Design of Half-through Steel Tube Truss Bridge of Yangjia River Park Highway Bridge in Jining City Wang Xiaomei, Shao Yuzhen, Fu Zuliang (144)

Abstract: According to design experience and lessons of concrete-filled steel tube bowstring arch bridge at home and abroad, the concept of the management maintenance and prolonging the service life of bridge design is introduced to improve the selection of structure, structural details and materials of Yangjia River Park Highway Bridge in Jining City, which makes up the deficiencies of this systematical bridge and improves its structure safety and reliability.

Keywords: bowstring arch bridge, suspender, hinge bearing, concrete-filled steel tube, truss arch

Summarization on Design of Bridge in West Section of Dalu Line Channel Improvement Phase II Project Yan Yuwen (147)

Abstract: Based on the engineering case of bridge crossing the channel at the west of Dalu Line Channel Improvement Phase II Project, the article completely and systematically introduces the engineering situation, main technical standards, construction conditions, main bridge span, main pier layout and bridge scheme design, analyzes the reconstruction engineering characteristics of bridge crossing channel, and gives the economic and reasonable bridge scheme, which can be referred for the reconstruction of the similar bridges crossing channel.

Keywords: Dalu Line Channel, channel improvement, bridge crossing channel, pre-stressed concrete continuous beam, bowstring arch bridge

Overall Calculation and Node Design of Truss Structure of Dingshang Bridge in Yixing City Wang Shuo (152)

Abstract: Dingshang Bridge on Wushen Canal in Yixing City is a steel landscape truss bridge. Its modeling is referenced from the famous landmark architecture old bridge - Waibaidu Bridge in Shanghai. Its span is 85 m and its width is 30 m with the simple-supported through truss structure. How to simulate the design

details and style of the historical architecture is the difficulty of this project because of the materials and technologies greatly changed. The article introduces the overall calculation and node design of this truss bridge in order to provide the reference for the similar bridges.

Keywords: steel truss bridge, riveting, overall calculation, Yixing City

KSeismic Design of Xinhui Road Bridge in Daluxian Channel Improvement Project Nian Fulong (156)

Abstract: The significance of the main bridge is different from the approach bridge and its structural style is also more different because of its particularity of the bridge crossing the channel. It is appropriate to make the different fortification target and seismic measures in the seismic design of bridge in order to ensure the safety of bridge structure and the rationality of economy. According to the seismic design of Xinhui Road Bridge in Daluxian Channel Improvement Project, the reasonable seismic design is carried out for the whole bridge by the different fortification targets and seismic measures after the comparison and demonstration of many aspects, which can be referred for the construction of the similar projects.

Keywords: bridge crossing channel, seismic design, double-curve support, cable support

Structural Design and Construction of No-backstay Cable-stayed Bridge Wu Taiguang (160)

Abstract: The no-backstay cable-stayed bridge is a new type of cable-stayed bridge. Its modeling is unique with the visual impact. It is suitable for the urban bridges with high landscape requirements. In order to fully understand its structure, mechanical behavior and dynamic characteristics, and taking a scheme design of no-backstay cable-stayed bridge as an example, this paper introduces the design of main components, such as the main pylon, main beam, stay cable and so on in detail. The 3D finite element model is established to analyze its dynamic characteristics and stability. The results show that the first-order instability mode is lateral bending of the main pylon, its stability coefficient is little high, and the section of the main pylon still has space for optimization. In addition, this paper analyzes the key technical issues of selecting the dip angle of pylon and the section of beam of no-backstay cable-stayed bridge, and introduces the construction method of no-backstay cable-stayed bridge.

Keywords: no-backstay cable-stayed bridge, leaning pylon system, dip angle of pylon, study of bridge type, landscape bridge

Evaluation Method of Bridge Reinforcement Effect Based on Structure Carrying Capacity Wei Hanfeng (163)

Abstract: Under the condition of massive construction phase of bridge gradually converted to the detection and maintenance phases, in order to adapt to the diverse performance requirements, bridge reinforcement does not get bogged down on a limited number of forms, and it has a broad development prospects. Due to mainly aiming at the bearing checking calculation or the construction quality control, the current codes and standards of China apply only to the lower limit control of reinforcement scheme. The comprehensive assessment method was lacked between the schemes to contrast the efficiencies of different reinforcement measures. Based on summarizing the existing bridge reinforcement evaluation method still not perfected, this article proposes the comprehensive evaluation method of safety degree and reinforcement efficiency, and according to this method, the bearing capacity evaluation indexes are created. Combined with the standard

and the practice experience, this article gives the limit mandatory standard that the performance indexes are required to satisfy. At last, the evaluation procedure is demonstrated by an example of bridge reinforcement.

Keywords: bridge reinforcement, scheme comparison, reinforcement efficiency, evaluation of reinforcement effect, reinforcement effect index

Analysis and Study on Reinforcement Method of Double-curve Arch Bridge Shen Jun (167)

Abstract: Taking a double-curve arch bridge built in 1970s and based on the fault characteristics of present bridges, the article describes two methods of reinforcement maintenance for this double-curve arch bridge and the its corresponding calculation results. The article mainly analyzes the influence of reinforcement measures of the section strengthening of main arch ring, lining concrete of web arch ring, and replacement of light concrete under two reinforcement schemes on the indexes of carrying capacity, crack and stability of the main components of double-curve arch bridge. The compared conclusion show that Scheme I can improve the carrying capacities of main arch ring and web arch by increment of lining steel reinforced concrete of arch ring and web arch ring, but it leads to the shear bearing capacity of pier bent cap and the stable coefficient of main arch ring is not enough because of obvious loading. Scheme II is to replace the arch stuffing as the light concrete and heighten the bent cap of abutment, which can better satisfy various mechanical properties of double-curve arch bridge after reinforcement. Scheme II has more advantages after compared with Scheme I.

Keywords: double-curve arch bridge, reinforcement of old bridge, arch ring, arch stuffing

FLOOD CONTROL & DRAINAGE

Study on Sponge Reconstruction of Built Drainage System Based on InfoWorks ICM ... Wang Hui, Zhang Liuli (170)

Abstract: As the means of InfoWorks ICN hydraulic model, the article studies and analyzes the built drainage system in the central area of Shanghai being highly urbanized region. Referring the sponge city construction concept, the article introduces the implementation of low-impact development and reconstruction according to the local conditions, the strengthening of pipeline network desilting, and the optimization of system operation scheme. The article simulates and evaluates the sponge city reconstruction to improve and upgrade the comprehensive environmental benefits of solving the primary rainwater overflow pollution and reducing the system operation cost.

Keywords: sponge city, environmental effect, drainage system, high urbanized region

Analysis and Discussion on Internal Force Calculation Method of Bedplate in Circular Water Tank

..... Zhou Jianmin (173)

Abstract: Based on the different foundation forms of circular tank, the bedplate calculation methods of the circular tank are analyzed and summarized. The paper firstly introduces the calculation principles and methods of elastic foundation method and elastic foundation beam analytical method for commonly calculating the inner force of the bedplate of large diameter circular tank under natural foundation condition, further discusses the calculation model and method used for the circular plates of pile foundation under soft soil foundation or other conditions not suitable for the use of natural foundation, gives two

examples of engineering calculation under different conditions, and demonstrates the application of the different calculation methods in practical projects.

Keywords: circular water tank, circular bedplate, elastic foundation, pile foundation, analysis of internal force

Analysis on Deformation of Rectangular Pipe Jacking Open Caisson during Sinking Process
..... Cheng Dan, Zhang Dongyan (177)

Abstract: As a supporting structure of foundation pit, the deformation of open caisson is an important safety indexes. There are no the deformation calculation methods of open caisson in the current state and local standards. Combined with a municipal pipe jacking project in Tianjin, the MIDAS finite element software is used to analyze the stress and deformation of open caisson during sinking process under the worse operating condition. The proposed formula of calculating the deformation of open caisson is given.

Keywords: rectangular open caisson, finite element analysis, deformation analysis

Gist of Comprehensive Improvement Project of Outer Ring Canal River Bian Lixing (181)

Abstract: With the upgrade of the national economic level, the water conservancy engineering becomes a content of important urban construction. As the important functional water channel of city, the canal has the important meaning to the city transportation and the whole environmental construction, and is required to ensure the application function by the scientific improvement mode.

Keywords: outer ring canal, comprehensive improvement of river, gist

MANAGEMENT & CONSTRUCTION

Elementary Analysis on Key Express Construction Technology of Urban Complete Interchange
..... Chi Fei, Lin Yinxin, Chen Jianjie (183)

Abstract: In the construction process of city, the linear structure of complete interchange is complex, the influence factors are more, the construction period is long, and easy congestion of areal traffic is the most prominent problem. How to do the rapid and high-efficient implementation, to effectively shorten the construction period, to furthest decrease the influence on the urban traffic capacity and to decrease the disturbance to the resident travel near the construction area is an increasingly prominent problem under the keynote of stressing “to build a harmonious and benefit people's livelihood” city construction. Taking Ningbo City Dongyuan Interchange Express Reconstruction Phase I Project as the background, the article elementarily analyzes various key construction technologies used for solving the express construction demand, which can be referred for the implementation of the similar urban complete interchanges.

Keywords: complete interchange, express construction, prefabricated small-box beam hoisting, steel box beam hoisting

Application and Construction Gist of External Pre-stressing Technology in Bridge Reinforcement
..... Yu Xihong (186)

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

Study on Optimization of Prestressed Engineering Construction Process of Bent Cap

..... Wang Qiong, Niu Wangfen (190)

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

Key Design and Construction Technologies of Pile Foundation in Karst Area

..... Tang Mingpei, Liang Xiaocong, Ning Pinghua (195)

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

Enlarged-section Reinforcement Construction Technology of Underwater Drilled Pile

..... Chen Jun, Zhou Songguo, Zhou Yongfu (199)

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

Discussion on Application of High-pier Construction Technology in Highway Bridge Construction

..... Ni Xiaojun (202)

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

and technologies in the high-pier bridge construction process.

Keywords: expressway, high-pier bridge construction, construction technology

Discussion on Fault Mechanism of Modulus Expansion Joint of a Bridge Liu Zhijun (205)

Abstract: The expansion joint is an important component of bridge structure. The bridge expansion joint if damaged will bring the important influence on the driving safety and the service life of bridge structure. The article introduces the investigation of the cracking faults of longitudinal beam and crossbeam with modulus expansion joints of a bridge, and calculates, analyzes and discusses the fault causes specially from the technical standards of expansion joint material, geometry section dimension and stress load, which can be referenced for the construction, curing and management of bridge.

Keywords: modulus, expansion joint, fault, discusses

Study on Cast-in-situ Beam Steel Tube Support Construction Method of Soft Foundation Ren Lingling (209)

Abstract: The construction methods of full support, portal scaffold and steel tube upright are mainly used in the construction process of cast-in-situ box beam. Under the construction condition of poor subgrade bearing capacity, there are problems hard and complex to treat the foundations of full support and portal scaffold, but the steel tube upright scheme is feasible. For the soft soil subgrade of Pearl River Delta, the steel tube upright foundation treatment is required to consume a certain quantity of concrete or steel tube. Its cost is higher. According to this problem, a construction scheme of using the pre-stressed pipe pile and steel tube column as the foundation is provided, which can efficiently solve the practical demands.

Keywords: soft foundation, construction, cast-in-situ box beam, steel tube upright, pre-stressed pipe column

Analysis on Construction Control and Monitoring of Abnormal-shaped Single-pylon Cable-stayed Bridge

..... Wu Kaijun (212)

Abstract: Taking an abnormal-shaped single-ylon cable-stayed bridge as the engineering background, and according to the theoretical forecast, field real-time monitoring and feedback analysis, the article focuses discussion on the key technology of construction health of single-ylon cable-stayed bridge. The result shows that the stayed cable force, deck alignment and structural inner force are controlled well. The measured cable force of stayed cable after bridge completion is relatively different from the theoretical cable force within $\pm 5.0\%$, the measured alignment is relatively different from the theoretical result within ± 3.0 cm, and the measured stresses of the main beam and the pylon body are identical with the forecast result.

Keywords: single-ylon cable-stayed bridge, construction monitoring, cable force of stayed cable, deck alignment, inner force

Elementary Discussion on Deformation Joint Recovery Technology of Large Drainage Culvert Wang Fei (216)

Abstract: In the operation process of large drainage culvert, the water and soil loss of the subgrade caused by the uneven earthing or overloading, and local damage and leakage of culvert as well as its corrosion and aging of water stop will cause the cracking and malposition of culvert deformation joint, and the leakage of water

stop, which are required to recover the deformation joint of culvert. The article introduces the recovery technologies of deformation joint by a recovery case of drainage culvert deformation joint in Shanghai, which can be referred for the similar projects.

Keywords: drainage culvert, deformation joint, attached with water stop

Selection and Practice of Construction Method for Large Underground Road Pit Supporting and Subgrade Treatment Zhao Weihong (218)

Abstract: The foundation pit supporting and subgrade treatment have much influence on the engineering safety, quality and construction cost. How to correctively select the construction method is the key to guarantee the construction safety and quality, and to reduce the engineering construction cost. According to the practical conditions of project, the article analyzes and studies the construction method of a large underground road pit supporting and subgrade treatment. The practice proves that the safe, suitable and economic pit supporting and subgrade treatment method according to circumstances can effectively support the construction and management of this project. The relative experience can be referred.

Keywords: underground road, foundation pit supporting, subgrade treatment, construction method

Application of Flood Control Wall Engineering Construction Technology Wang Jian (221)

Abstract: In the river construction, the flood control wall is an important construction content, and has the protective function for the rivers. The article studies the application of flood control wall engineering construction technology.

Keywords: flood control wall engineering, construction technology, application

Elementary Analysis on Technology Gist of Construction of Flood Control Tunnel Xing Qiao (223)

Abstract: According to the practical condition of the flood control tunnels in Tushi County and Xinglong Town, and based on the relative construction principle, the article discusses the construction gist of construction measurement, tunnel excavation, auxiliary construction measures and construction ventilation in the construction process, which can be referenced for the construction of the similar projects.

Keywords: elementary analysis, flood control tunnel, construction, technical gist

Study on Pipe Jacking Engineering Construction Technology of Jinnan Wastewater Treatment Plant Liu Yan (226)

Abstract: Relying on the pipe jacking project of the supporting pipe network for Tianjin Jinnan Wastewater Treatment Plant, the article further discusses the large-diameter pipe jacking, long-distance jacking, double-row jacking, crossing expressway and new pipe material construction. The article studies the selection of pipe jacking construction equipment and method, the control technology of construction and the technical difficulty of construction.

Keywords: wastewater treatment plant, pipe jacking, construction technology

Application of Penstock Construction Technology in Water Supply Engineering Wu Chao, Wu Zhuo (229)

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

Study on Construction Influence Factor of Tunnel Floating by Overlarge-diameter Slurry Balance Shield

..... Tan Xiaoliang (232)

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

Elementary Discussion on Application of Underground Diaphragm Wall in Urban Bridge Crossing River Protection Project Chi Limin, Zhang Qian, Hu Zhengrong (235)

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

Construction Technology of Underground Diaphragm Wall in Dense Sand Layer of Tianjin Yao Jiajie (238)

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

Study on Supporting Technology of Complex Foundation Pit Crossing Existing Pipelines Guo Li (242)

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

Study on Pretension Steel Wire Rope Reinforcement Technology of Hollow Slab Girder ... Xu Yizhuo, Liu Bo (246)

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

Analysis of Influence of Low-temperature Construction on Foamed Bitumen Concrete

..... Sheng Tao, Tian Jin, Zhou Chao (248)

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

Discussion of Quality Control in Construction of Cement Stabilized Macadam Base Chen Guochun (250)

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

construction quality control of cement stabilized macadam base must be done well so as to ensure the driving safety of highway engineering. The article analyzes the characteristics of cement stabilized macadam base, studies the main influence factors on its quality, and discusses the main measures to strengthen the construction quality.

Keywords: cement, stabilized macadam, base, construction, quality control

Study of Paver Automatic Leveling Control System Wang Ying (252)

Abstract: In the road construction, the pavement evenness mainly depends on the automatic leveling control system of paver, and the automatic leveling controller is also an important component of the paver automatic leveling system. Its structural type and working principle play a decisive role to operate the control system of paver. The article briefly discusses and analyzes the development trend and design mode of paver automatic leveling system, and analyzes its application in the relative projects.

Keywords: paver, automatic leveling, control system, study

Analysis on Construction Cost Index of Urban Elevated Bridge Dong Youliang (255)

Abstract: The elevated bridge is the necessary selection to ease the urban traffic congestion. The pre-stressed concrete continuous beam structure of elevated bridge is the main selection for the viaduct by its outstanding advantages. Taking the Tongning Avenue Express Reconstruction Project as an example, the article analyzes the construction cost indexes of the urban elevated bridges with the pre-stressed concrete continuous beam structure so as to find some change rules in order to provide the study result and the reference for the estimation of the similar projects.

Keywords: elevated bridge, pre-stressed concrete continuous beam structure, construction cost index, estimation

Analysis on Construction Cost and Management of Water Supply and Drainage Pipe Engineering - - - Cao Lei (258)

Abstract: The water supply and drainage pipe engineering is an important component of water supply and drainage engineering. The article summarizes the concept of engineering technological economy, introduces various information required to prepare before the final engineering settlement of account, and analyzes and studies the problems and key points in the process of price appraisal.

Keywords: water supply and drainage pipe, engineering construction cost, management

Elementary Analysis on Several Problems to Be Avoided in Compilation of Budgetary Estimate of Road and Bridge Engineering Lou Xiaoqin (260)

Abstract: At present, the partial provincial and municipal development and reform commissions all strictly execute that the budgetary estimate of preliminary design must not exceed the approved engineering feasibility study report during the examination and approval of preliminary design documents. In order to promote the city function and improve the traffic environment, the city construction investment of each province increases year by year. The progress of major urban construction project is restricted because of its high construction cost, huge investment, long construction period, high operation cost and low profit.

Therefore, it is very important to strictly control investment, strengthen the construction cost management in the whole engineering construction process and improve the social benefit and economic benefit of the government investment in the urban construction. The article summarizes the problems existing in some participant projects in order to better complete the budgetary estimate compilation of road and bridge engineering.

Keywords: road and bridge engineering, preliminary design, budgetary estimate, budget, existing problem

Discussion on Significance of Prior Control for Financing Supervisor in Municipal Engineering Construction

..... Zhao Lili (263)

Abstract: The investment control of construction engineering is the important content of financing supervision work including the investment control of investment decision-making stage, the investment control of design stage, the investment control of construction preparation stage and the investment control of construction stage. The article analyzes many investment control dangers happened under the condition of financing supervisor not taking part in the investment control of project ahead of time, and sets forth the important role of financing supervisor in the prior control of each stage of construction project in order to realize the efficient control of investment in the whole construction engineering project.

Keywords: construction engineering, financing supervisor, prior control

STUDY ON SCIENCE & TECHNOLOGY

Study on Classification System of Urban Underground Road Liu Yi (266)

Abstract: The number of urban underground road is increasing, its scale is getting larger and larger, and its type is more and more. The different scales and types of underground road have the different functions and characteristics. It is required to consider the planning design standard, traffic organization and key index selection especially for each type. In order to solve the problems of the classification of urban underground roads now, the article systematically puts forward the classification of urban underground roads from the different angles. The purpose is to provide the guidance for the perfection of the future urban underground road engineering technological standard and the planning design of the different underground roads.

Keywords: urban underground road, classification, study

Double-way Green-wave Coordination Control Method of Urban Trunk Road Li Qi (269)

Abstract: In order to further improve the double-way green wave coordination control effect of urban trunk road, and based on a large of practical engineering experience, the article sums up the existing main problems and the application conditions in the double-way green wave coordination control of the most urban trunk roads in China, puts forward a new double-way green wave coordination control method suitable for the group traffic modes at the different intersections, and checks and analyzes this method by a practical engineering case of a large city. The result shows that the application of this new method can shorten the travel time of road section over 47%.

Keywords: intelligent transportation system engineering, traffic signal control, green wave coordination

control, phase difference, green wave belt

Study on Channelization Design of Several Typical Intersections for Urban Roads Xiao Yefeng (273)

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.

Keywords: urban road, four-roadway intersection, intersection under viaduct, intersection on sunk tunnel, channelization design

Analysis and Study on Ultimate Load of Asphalt Pavement Overhaul Structure Zhong Shanqun (278)

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.

Keywords: asphalt pavement, overhaul, stability theory, plastic failure, ultimate load

Vertical Curve Radius Value of Road Based on Drainage Factor Cao Jianxin, Zhang Hongyu (282)

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.

Keywords: profile, vertical curve, drainage longitudinal slope, gradient

Study on Stress Characteristics of New Segmental Prefabricated Assembled Bridge for Rail Traffic

..... Fang Yafei, Hong Hao, Zhang Janying, Zhu Hongxin (286)

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.

Keywords: upper-U and lower-box section, segmental prefabrication and assembly, shear, transverse stress

Fault Feature and Inspection Index of Boom Cable of Flexible Boom Arch Bridge Li Yuanbing (288)

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

Research on Evaluation Model of Cement Concrete Compression Strength Based on Multi-channel Transient Rayleigh Wave Method Shen Chenwei (291)

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

Study on Advanced Bio-drying Test of Anaerobic Digested Sludge Liu Zhanguang (294)

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 60°C and the time is 6 d and higher than 55°C 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

Analysis on Influence of Port Channel Excavation Unloading on Existing Underground Metro Shield Tunnel

..... Chen Jianbin, Guo Shaobo, Wu Lipeng, Fan Wei (299)

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 used 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

Study on Type Selection and Technological Parameter of Intense Weathering Siliceous Shale Waterproof Curtain

..... Chen Hongfei, Chen Ce (305)

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 instability 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

Study on Design and Performance of Warm-mixed High-modulus Asphalt Mixture

..... Chen Siping (308)

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

Application of Nonlinear Least Square Method Fitting in the Calculation of Consolidation Coefficient

..... Jiang Weiwei (311)

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

final values of consolidation test by preparing the fitting function module, using the fitting function of nonlinear least square method in Origin 7.5 and using the multi-group test data. The solution speed of this method is fast and its result is reasonable. This can be avoided from the human factors and can be conveniently used for the solution of consolidation coefficient.

Keywords: consolidation coefficient, Origin7.5, nonlinear least squares fitting

Study on High-temperature Performance Test of Rubber Asphalt Anti-crack Layer Sun Xiangjun, Chen Shanxiang, Liu Guang (313)

Abstract: The gyratory compactor is used to form the specimens. The improved Superpave design method is used to design the asphalt mixture of anti-crack layer. The single-deck rutting test and double-deck rutting test are used to analyze the high temperature performance of rubber asphalt anti-crack layer. The result shows that the improved Superpave design method is suitable to design the asphalt mixture of anti-crack layer. The high temperature performance of rubber asphalt anti-crack layer is not good, but the influence is limited on the high temperature performance of pavement structure. The high temperature performance of pavement structure of rubber asphalt anti-crack layer is good and there is a large space to upgrade.

Keywords: road engineering, rubber asphalt, anti-crack layer, improved Superpave design method, high temperature performance

Study on Application of Fuzzy Mathematics in Ultrasonic Testing Wu Bo (316)

Abstract: On the basis of summarizing and analyzing the judging method of the quality of cast-in-situ pile tested by the traditional ultrasonic transmission method, the fuzzy mathematic theory is used to apply the comprehensive evaluation method of fuzzy mathematics for the quality evaluation of pile foundation, and fuzzily and comprehensively to analyze the parameters of wave velocity, wave amplitude and wave shape in the testing result of ultrasonic transmission method. The multilevel fuzzy comprehensive judgment method is used to judge the whole quality of pile body for the reasonable judgment of pile quality grade. The measured data can show the detailed calculation and analysis process of fuzzy comprehensive evaluation of cast-in-situ pile quality grade. The article introduces that the study result of cast-in-situ pile quality tested by ultrasonic transmission method is applied to the engineering practices. These practical applications prove the feasibility of this study result. The application of this method can be also transformed to the computer program with the wide application prospect.

Keywords: ultrasonic transmission method, cast-in-situ pile quality, concrete strength, reliability, fuzzy mathematics, comprehensive judgment

APPLICATION OF ACHIEVEMENTS

Study on Application of High-viscosity High-elastic Asphalt in Deck Pavement of Urban Bridge Cai Shuoguo, Duan Wenzhi, Liu Xiaochen (321)

Abstract: With the continuous increment of traffic flow and axle load, and with the more and more extreme weather, the higher requirements are proposed for the material of deck pavement. The article analyzes the

service condition of bridge deck pavement in Beijing. According to the comparison and analysis of high-content SBS modified asphalt and its mixture, the article points out that the waterproof adhesive layer of high-viscosity high-elastic asphalt has the better high-temperature stability, shear resistance and tensile performance. It is applied in a bridge of Beijing. According to the laboratory test and practical engineering validation, the article puts forward that the high-viscosity high-elastic asphalt can be taken as a new material to be used in the bridge deck pavement.

Keywords: high-viscosity high-elastic asphalt, waterproof adhesive layer, urban bridge, deck pavement

Study and Applicability of Emulsified Asphalt Cold Recycling Technology for Rural Highway ... Xu Xiaohua (324)

Abstract: Based on the medium repairing and overhaul engineering of rural highways in Huzhou, the emulsified asphalt cold recycling technology is used to reconstruct the rural highways. The verification of entity project determines the construction technology of cold recycled mixture, and proves the application effect of this technology. This technology can be widely used in rural highway reconstruction engineering.

Keywords: rural highway, emulsified asphalt, cold recycled mixture, construction technology

Analysis on Engineering Application of Aerobic Granule Sludge Shen Changming (327)

Abstract: Aerobic granule sludge is a study focus in the wastewater treatment field. Its high-efficient treatment capacity and good settling property provide the opportunity for the establishment of better intensive wastewater treatment system. This paper summarizes the study achievements of aerobic granule sludge technology, introduces the cultivating and maintaining methods of aerobic granule sludge, determines the systematical application boundary conditions of aerobic granule sludge, analyzes the technical and economic feasibilities of aerobic granule sludge engineering application, and puts forward the technical difficulties of aerobic granule sludge especially considered in the engineering application of China, which can provide the support for the popularization and application of this technology in the wastewater treatment field of China.

Keywords: aerobic granule sludge, wastewater treatment, engineering application, high efficiency

THE RELATIVE SPECIALITIES

Strategy of Greening Landscape Construction in Shanghai World Expo Zhao Keping (331)

Abstract: The greening landscape construction of Shanghai World Expo bears the interpretation of the subject of the World Expo, and embodies the level of the host country to hold the World Expo. The article reviews the strategies taken for the practice of project management from the aspects of mastering the construction concept, perfecting the function layout, applying the new technique, new material and new technology, and saving the construction cost. The relative experience can be referred for the similar projects.

Keywords: greening landscape of the World Expo, overall layout strategy, implementation effect

Water Conveying Tunnel Project in Changxing Island of Qingcaosha Raw Water Project Cheng Bin (334)

Abstract: The water conveying tunnel in Changxing Island of Qingcaosha Raw Water Project is the first single

lining high internal water pressure shield tunnel of China. This tunnel goes through the clay, silty soil and sandy soil stratum, and is affected by the status of planning. This tunnel crosses the controlled structures of levee, river, interchange, subway, Shanghai–Chongming–Qidong Channel. This tunnel is constructed by shield method. After many arguments, the use of single lining concrete segment is mostly optimized in the construction period and economy.

Keywords: water conveying tunnel, shield method, single lining, Qingcaosha

Elementary Discussion on Application of Utility Tunnel in City Construction Fu Qiongge (339)

Abstract: Urban underground utility tunnel is one of the important symbols in the construction modernization of the new urban municipal management infrastructure. It plays a great demonstration and promotion role in modernized urban environment and reduction of urban road re–excavation. Taking the construction planning and scheme design of an urban utility tunnel in Hunan Province as an example, this paper introduces the overall concept of utility tunnel in urban municipal engineering construction, and sets forth the construction scheme of utility tunnel in detail, which provides a certain reference for the application of utility tunnel in the city construction.

Keywords: utility tunnel, system layout, section analysis, three–dimensional control line

Emergency Evacuation Simulation of Urban Rail Transit Station Based on VISSIM

..... Liu Wenting, Xu Naiyun (342)

Abstract: Urban rail transit station is a relatively closed space. It is difficult for the safety evacuation in the event of an emergency because of high–density flow. Under the premise of security design standard at the station, it is still required to have the perfected emergency response plans, the reasonable evacuation organization and guidance. At present, the safety design of urban rail station in the static calculation of the total evacuation time as an assessment standard is difficult to assess the distribution of pedestrian flow in the station space and the actual evacuation effect. This paper describes the use of pedestrian simulation tool to evaluate the station evacuation design. According to the pedestrian distribution in the station space, the optimization proposal of pedestrian and evacuation organization is put forward. The simulation method is illustrated by Xutugang Station in Suzhou Metro Line 2. The actual operation effect of pedestrian in the station space shows that the related optimization schemes and suggestions are feasible.

Keywords: urban rail transit station, emergency evacuation, pedestrian simulation

Discussion on Design of Stop Mark for Urban Rail Transit Fu Yizhuang (346)

Abstract: The article firstly sets forth the significance of stop mark in the operation of urban rail transit, and the basic setup type and characteristic of stop mark, then summarizes the characteristics of three stages of setting up stop mark in the development process of urban rail transit in Shanghai, and the experience and lessons in the application of stop mark, and finally puts forward the relative proposals regarding the setup density, setup position, setup type and setup length of stop mark in the design of stop mark.

Keywords: urban rail transit, auxiliary line, stop mark, setup type

Application of BIM Technology in Information Management of Power Plant Su Ling (350)

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

Gist of Anti-season Planting Technology Applied in Afforestation Xia Qingyu (354)

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

Further Analysis on Survey Method of Physical Quantity of Land Acquisition and Emigrant for Water Conservancy Engineering Xu Xin (356)

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

Study on Basic Survey Item of Uninhabited Island and Mapping Implementation Scheme of Its Topography and Landform in Shanghai Wang Hui (358)

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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新型道路预养护技术

——PRC-2000沥青路面超级抗滑封层



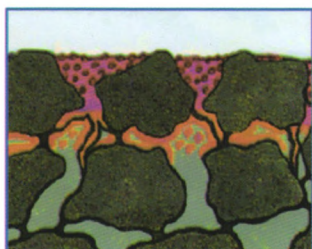
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防水：防水下渗，在多次结冻解冻后仍有防水作用，有利于或大大减少沥青路面水损害，改善道路使用性能，延长道路使用寿命。

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