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城市道桥与防洪

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图为南京市水利规划设计院股份有限公司设计的南京市溧水区天生桥套闸除险加固工程

因为我们专心，所以我们专业！
——《城市道桥与防洪》

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● 本期看点

中华人民共和国住房和城乡建设部优秀期刊

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防洪排水

管理施工

广告索引

封面工程

本期封面工程为南京市溧水区天生桥套闸除险加固工程,由南京市水利规划设计院股份有限公司设计。

天生桥套闸是连接秦淮河与石臼湖水系的控制性水工建筑物,具有防洪、蓄水、引水、通航、分洪、旅游等主要功能。工程采用节制闸与套闸结合的布置形式,按防洪 50 a 一遇标准设计,节制闸设计过闸流量 276 m^3/s,套闸参照 VI 级船闸设计。该工程于 2017 年 11 月开始设计,2019 年 12 月竣工验收。

天生桥套闸建成后,节制石臼、秦淮两大流域,为保障区域防汛防旱、连接水上交通、实现水陆旅游交汇、改善河道水环境发挥着重要作用。工程通水以来,累计引水 6.9 亿 m^3、泄洪 3 400 万 m^3、灌溉补水 1 100 万 m^3,效益显著。新闸气势恢宏、环境优美,已成为周边群众休闲、锻炼的网红打卡地。

天生桥套闸除险加固工程建设全程坚持新发展理念,开展水利安全生产标准化和质量精细化管理,建设成效显著。工程施工质量被评定为优良等级,先后获得国家发明专利 2 项、外观专利 1 项、实用新型专利 6 项、水利行业工法 1 项、水利行业优秀 QC 成果 1 项,被评为江苏省优秀勘察设计、江苏省水利文明工地、江苏省水利优质工程及省建设新技术应用示范工程,获得江苏省水利科技进步二等奖、2019—2020 年度中国水利工程优质(大禹)奖。

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CONTENTS

ROADS & COMMUNICATION

Abstract: From the"increment era", the scale of road network in Xian has entered the era of "increment" and "stock". Traffic congestion and environmental pollution are becoming increasingly prominent. It is necessary to follow the green and low-carbon philosophy and plan the construction of urban road network in order to reduce the impact caused by the traffic congestion and environmental pollution. By investigating the current urban road network, the major problems existed in the road network are analyzed and summarized. The targets, strategies and requirements for planning the road network construction are proposed so as to improve the operation efficiency of road network, reduce the carbon emission, enhance the sustainable development of urban traffic and construct the more flexible livable city.

Keywords: green and low-carbon; functional orientation; road network planning; sub-branch road network

Abstract: Urban roads are the public places for the urban residents, and are also the spatial carrier and inheritance of urban history and culture. Only focus on the design of motor vehicle traffic and its service level has not in line with the requirements of the current historical background and the use demands of urban residents. The corresponding design concept should be explored. The overall space design concept of road is expounded, its design objective is resolved, and the data collected for the overall space design are summarized. Taking Baoningmen Street in Changzhi City of Shanxi Province as a design case, aiming at the existing problems of the current roads, the design scheme based on the overall space design concept is proposed. The goal is to build a people-oriented, full of vitality, complete functions, comfortable activities, open and sharing, beautiful environment, highlighting culture and low-carbon wisdom road environment.

Keywords: overall space design concept; road reconstruction; cultural inheritance; low carbon; wisdom

Abstract: In the context of the increasingly high quality requirements of urban construction, aiming at the existing problems and own characteristics of Xiangxiangshan Road in Nanchang, starting from the three parts of the traffic environment, facility environment and surrounding environment of the street, the overall space environment of the street is finely designed. The treatment schemes of setting the waiting areas of non-motor vehicles, arranging the two-way staggered pedestrian crossings, laying the multi-pole integration, integrating the street facilities into characteristic cultural symbols, invisibly treating the strong and weak electricity boxes, and refining the coordination and connection of the surrounding space of the street are put forward in order to create a people-oriented, convenient transportation, comfortable and leisure living space for the

Abstract: With the development of economy, the car ownership has increased year by year in China. The traffic of urban road is getting heavier, and the road network construction is becoming complex. In order to ease the traffic pressure of cities, various designed interchanges and tunnels are constructed in various places. But the interchanges have a greater impact on the urban landscape, especially in areas where the urban environme nt is more sensitive. Therefore, the main road subsidence will be used to achieve a three-dimensional intersection. At present, there are two types of road subsidence. One is that the crossed road crosses the underground road by bridge. The other is to set up a frame structure on the sinking road. And the road to be crossed is located above the frame structure. The application of the sinking road with sloping slope, the measures to be taken for related problems and the matters needing attention are analyzed through the actual cases.

Keywords: open type; sinking road; interchange; design; principle; application discussion

Abstract: With the further development of urbanization and the rapid construction of road engineering, the importance of some buildings is not considered in the design stage of many urban road projects, and the study of design scheme is not detailed enough, resulting in the difficulty of project implementation or extremely slow progress. First of all, the engineering overview and construction conditions of North Huancheng Road, and the related situations of Longevity Temple and Guhezhou Distillery in Linxia City are introduced. Then combined with the characteristics of the project, aiming at four schemes of viaduct, excavated channel, mined tunnel and grade crossing proposed for this section, the advantages and disadvantages of the four schemes are analyzed from the difficulties of engineering construction, the impact of the environment along the line, the later-period management, the engineering cost and the impact on Longevity Temple and Guhezhou Distillery. Finally, the viaduct scheme is recommended. The recommended scheme is being implemented after the review of the construction drawings, which can provide some references for the engineering design of similar urban roads crossing important buildings.

Keywords: urban roads; important buildings; crossing mode; scheme comparison

Abstract: In order to optimize the space distribution of urban streets, an optimization method of urban street space layout based the improved genetic algorithm is proposed. The model of urban street space layout is built. The constraints for the optimization of the street space layout are set. The improvement of genetic algorithm is completed through the optimization of coding process. By using the improved genetic algorithm, the optimization scheme of urban street space layout is formulated from four aspects of municipal, landscape, special settings and architecture. Taking the reconstruction project of Wengang Road Block in Yancheng City as an example, the reconstruction is completed according to the new layout optimization idea. From the perspective of total score, the score of urban street space layout before optimization is in the range of 0.5~0.7, which indicates that the street space layout at this time can basically meet the expectations. The score of urban street space layout after optimization is in the range of 0.9~1.0, which indicates that the urban street space layout at this time is more excellent. The optimization effect of urban street space layout by this method is good.

Keywords: improved genetic algorithm; street; optimization; layout; space; city

Abstract: Based on the specific cases encountered in the review of construction drawings, the mandatory requirement of "no object intrusion within the limits of road construction" is demonstrated, and the cross section design related to the road construction limits is specially analyzed, including the correct setting of safety belts in various engineering situations and the setting of intermediate islands required for the secondary crossing in order to serve as a reminder to designers.
Keywords: urban road; limits of road construction; review of construction drawings

Abstract: The functions of some existing first-class highways do not match the traffic demand, the grade crossings and entrances are densely arranged, and the road sections and intersections are lack of scientific and reasonable traffic organization, resulting in the low traffic efficiency and poor road safety. Taking Daye Highway as an example, the traffic organization of the trunk first-class highway is designed and studied. Based on the functional orientation of the highway, the appropriate technical indicators are selected. Through the reasonable traffic organization design of general road sections and intersections and the design of guide signs, the overall operation efficiency and traffic safety of the highway have been improved, and the certain engineering experience and design reference are provided for the subsequent construction of the trunk first-class highway.
Keywords: shared electric bikes; mountainous city; green travel; gradeability

Abstract: With the steady improvement of the accessibility of rural road traffic network, its traffic safety is still severe. In order to further improve the driving safety level of rural roads, firstly, the characteristics of traffic accidents on rural roads are analyzed, and the causes of accidents are systematically analyzed from the perspective of "people - vehicle - road - environment". Then, based on the results of accident analysis, the design requirements of rural road system are proposed from the perspective of road attributes. Finally, taking a rural road in a mountainous area of Guilin City as an example and combined with the accident data, the influencing factors on the traffic safety are analyzed, and the targeted improvement measures are proposed so as to adapt the construction requirements of "four-good rural roads" in the new era.
Keywords: rural road; traffic accident; road alignment; traffic safety device

Abstract: Subgrade design has a significant impact on the service life of pavement structure. Therefore, it is necessary to fully consider the external load, asphalt composition and other factors. Based on the parameter of different graded crushed stone layer, the parameter of asphalt layer and the load conditions, the influence of various factors on the subgrade performance is explored. And on this basis, the corresponding design points of solidified soil subgrade are proposed. The results show that the closer the reinforcement location is to the road surface, the better the reinforcement effect is. The reinforcement depth is positively related to the structural modulus. And the tensile strain equivalent of the bottom layer and the maximum strain equivalent of the structure both show an increasing trend. The reinforced subgrade can significantly affect the maximum strain of the structure.
Keywords: long-life pavement; stabilized soil subgrade; design study; subgrade reinforcement

Abstract: Taking the Jinchao Avenue Upgrading and Reconstruction Project as an example and combined

BRIDGES & STRUCTURES

Abstract: The composite girder is widely used in self-anchored suspension bridge. Its steel-concrete combined section is the key part affecting the overall mechanical behavior of the structure. Taking Shanghai Jiasong Bridge with a main span of 336 m as the engineering background, a shell-solid finite element model considering the relative slippage of steel-concrete combined section is established. The distribution law of the stress of concrete and steel structure, and the shearing force of resisting shear connector is analyzed. The mechanical behavior of the combined section is studied. And the simplified calculation method of the maximum shearing force of connector is proposed.

Keywords: self-anchored suspension bridge; steel-concrete combined section; mechanical behavior; finite element; simplified calculation method

Abstract: This article takes the example of a through type steel box tied arch bridge with a large inclination angle in Guangzhou as an example to study the application of BIM forward design and parametric modeling in bridge design. The research results indicate that BIM technology can improve the quality of construction drawings, design efficiency, optimize construction plans, avoid potential risks, save costs, and shorten construction periods. This provides a reference for the application and development of BIM in bridge engineering.

Keywords: BIM; top down design; Parameterization; Modeling; Refinement; Through steel box tied arch bridge

Abstract: The BIM forward design of node bridge is carried out by using Midas CIM bridge 3D forward design software, relying on the main line overpass project from Puyang to Liaocheng Expressway Weicheng Hub, and based on 3D reality model. The key indexes of steel box girder output by 3D model are analyzed and compared with the results output by the traditional 2D design model. The result shows that the result of 3D forward design is reliable and the digital delivery of the BIM model in the design stage to the construction stage can be realized.

Keywords: BIM technology; inclined photogrammetry; 3D reality model; forward design; highway bridge

Abstract: Based on deflection theory, the influence of rise-to-span ratio, side to mid-span ratio, vertical flexural stiffness of stiffening girder, longitudinal slope of stiffening girder and integrated temperature rise or fall on the mechanical behavior of a two-pylon, three-span self-anchored suspension bridge is analyzed. In addition, the stability of the stiffening girder under the axial compressive force and its extreme span are discussed. The analysis results show that the smaller the rise-to-span ratio, the greater the main cable tension and larger the axial compressive force of stiffening girder, but the lower the overall stiffness of the structure. The larger the side-to-mid span ratio, the smaller the overall stiffness of the structure, and the worse the transverse stability of the stiffening girder under the axial compressive force. The greater the tensile stiffness of the main cable or the larger the vertical flexural stiffness of the stiffening girder is, the larger the overall stiffness of the structure is. The influence of both the longitudinal slope of the stiffening girder and the integrated temperature rise or fall is usually small on the structure

Abstract: To solve the design problem of the pylon–girder–pier combination section of column–pylon cable–stayed bridge when the lateral dimension of the pylon column is limited, relying on Luobu River Bridge in Shanghai – Wuhan Expressway, the structural design and stress performance of the pylon–girder–pier combination section of a wide–pier narrow–pylon structure are studied through the theoretical analysis and numerical simulation. The reasonable structure and corresponding design method of the combination section of the column pylon and the main girder of the wide–pier narrow–pylon structure are studied, and the stress of this new structure is analyzed. The results show that the combination section of wide pier and narrow pylon can form a reasonable structure form by setting the reasonable connecting beams and transition structure in the connection section, which can meet the requirements of local force transmission. The rigidity transition section is set in the longitudinal direction of the bridge to increase the height of the main girder, cooperate with the transverse arc transition structure and improve the rigidity connection between the main girder and the wide pier in order to make the internal force of the main girder directly transmitted to the wide pier and to reduce the influence on the narrow pylon. The pylon–girder–pier combination section of wide pier and narrow pylon has the reliable force transmission and smooth stress transmission. The stress state is within a reasonable range. The structural form and design method of the formed wide–pier narrow–pylon combination section can provide the reference for the design of the similar combination sections when the transverse dimension of the pylon column is limited.

Keywords: cable–stayed bridge; wide pier and narrow pylon; pylon–girder–pier combination section; structural design; stress analysis

Abstract: Combined with the project background of a long–span prestressed underpass crossing the expressway in the east extension of South Inner Ring Street in Taiyuan City, firstly the characteristics and difficulties of the structure are analyzed. Then the design concepts and technology, the construction process, the late operation and economic factors are comprehensively considered and analyzed to carry out the analysis and research on theory and calculation. Finally, some suggestions and references are provided for the design of this kind of structure to be used in the future.

Keywords: underpass; long span; prestressing; design

Abstract: Relying on the project of Jingshan River Bridge, the structural stress and deformation in the incremental launching construction of steel girder are studied. The incremental launching construction process is simulated by means of numerical simulation, and the stress state of each segment model in the process is analyzed. The local stress performance of the steel box girder is specially analyzed under the influence of multi parameters such as cushion block, lateral offset, local support and so on. A multi–scale three–dimensional finite element model is established. The mechanical state and stability of the steel box girder structure are parametrically analyzed. The reasonable parameter range is determined. The lateral correction threshold is clarified. The deviation correction frequency is controlled. The safety and reliability of the structure before and after the completion of the bridge are ensured.

Keywords: walking–type; incremental launching construction; numerical simulation; stress analysis

Abstract: In order to study the seismic performance of long-span cable-stayed bridges, taking the project of Wangpeng Bridge in Shenzhen-Shantou Special Cooperation Zone as the research object, the response spectrum method and the nonlinear time history analysis method are used to compare and analyze the seismic response of the double-arched pylon steel-concrete composite girder long-span cable-stayed bridge under E1 and E2 earthquakes. The results show that the results obtained by two analysis methods can complement and confirm each other to ensure that the structural internal force and deformation obtained by the calculation can reflect the structural response under the actual earthquake action. The seismic performance of the main bridge of Wangpeng Bridge can satisfy the expected objective and the seismic performance of the long-span cable-stayed bridge can be effectively improved by setting dampers.

Keywords: cable-stayed bridge; dynamic characteristics; seismic response; response spectrum analysis; nonlinear time history analysis; seismic performance.

Abstract: In order to study the influence of V-shaped river valley site effect on the seismic response of long-span concrete-filled steel tube arch bridge, taking a long-span concrete-filled steel tube arch bridge as the engineering background, the V-shaped river valley site model is simplified. The overall finite element model of river valley – arch bridge is established to discuss the seismic response effect on the bridge under SV wave. The results show that the internal force and displacement response trend of the main arch ring of the arch bridge are symmetrically distributed because the seismic load is uniformly acting on the site and the river valley – arch bridge model is an axisymmetric model. The internal force and displacement response of the main arch ring under different seismic waves are different, which are related to the ground motion intensity at the arch foot and the site connection part of arch bridge, and related to the spectral characteristics of the seismic wave. In the seismic design of bridge, the key parts of arch bridge under SV wave should be focused on.

Keywords: site effect; artificial boundary; seismic response; spectral characteristic

Abstract: In order to explore the seismic response law of continuous rigid-frame bridges in high-intensity areas, firstly, taking a long-span continuous rigid-frame bridge in a high-intensity area in Guizhou as the research background, a three-dimensional spatial finite element model is established according to MIDAS Civil 2019, and the structural natural vibration characteristics of the bridge are explored. Secondly, based on the site conditions of the bridge, combined with the relevant specifications, the target response spectrum and artificial seismic wave are given. Finally, the results of response spectrum and time history analysis are given, and a detailed comparative analysis is made. The research shows that under the premise of ensuring the strength and stability, the long-span continuous rigid-frame bridge located in high intensity areas should have certain restraint release in the longitudinal and transverse directions, which is conducive to the structural deformation to absorb the seismic energy, and then reduce the seismic damage. Under the working condition of response spectrum calculation, the maximum longitudinal displacement and transverse displacement are 0.304 m and 0.381 m respectively, which are related to the direction of seismic excitation. The vertical displacement is about 0.05 m, which has little relationship with the direction of seismic

high flood stages. Therefore, according to the characteristics and anti-collision requirements of bridge pier structure, a self-floating steel clad composite material anti-collision device is designed, and LS-DYNA software is used to build the ship-bridge collision model to simulate the different working conditions. The results show that the anti-ship collision device can effectively reduce the ship impact force on bridge piers and delay the impact time, and the peak value of ship impact force can be reduced by 30%~39%, which has a good anti-collision and energy-dissipation effects.
Keywords: bridge anti-collision; steel clad composite material; ship impact force; finite element simulation

FLOOD CONTROL & DRAINAGE

Abstract: With the rapid promotion of urbanization and the increase of extreme weather, the waterlogging problem affecting the urban safety is attracting the increasing public attention. Pudong New District is located in the eastern part of Shanghai with the uneven distribution of river channels, showing the characteristics of dense in the south and sparse in the north, dense outside the center and sparse in the center. The traditional drainage planning has been unable to fully meet the need of the current urban security. Combined with the characteristics of the city, the drainage and waterlogging control planning of Pudong New District adheres to the concept of "green-gray-blue" measures to explore the existing facilities deeply and reasonably solves the problem of source control and the combination of large and small drainage systems. By building a model to assess the risk of urban waterlogging, efficiently predict the regional flooding disasters and clarify the focus on upgrading and reconstructing the areas, the planning efficiency can be effectively improved and the planning effect can be timely fed back. The drainage system is upgraded and reconstructed by means of low-impact development of the existing system and the multi-purpose utilization of the existing drainage facilities. The ability of urban drainage and waterlogging prevention has been effectively improved, and some references are provided for the preparation of similar planning in the future.
Keywords: drainage and waterlogging prevention; assessment of waterlogging risk; upgrading and reconstruction; low-impact development

Abstract: The waterproof and drainage design of underwater engineering is the key in the engineering design. Relying on the practical engineering design, the waterproof and drainage design of underground engineering is studied. The key technology of underwater engineering design is put forward. And fully considering the design service life of the existing waterproof materials, the waterproof remedial measures for the failure of the existing waterproof facilities are proposed. It has the important guidance and reference significance for similar waterproof and drainage design of underground engineering, which hope to promote the progress and development of underwater engineering construction.
Keywords: underwater engineering; waterproof and drainage design; design life; remedial measures

Abstract: The transient analysis program (TAP) model is used to simulate the inflow process of Qianhai-Nanshan Drainage Deep Tunnel in Shenzhen. Through the simulation of design standards,

Abstract: Taking the sludge treatment phase Ⅱ project of Shanghai Shidongkou Wastewater Treatment Plant as an example, BIM forward design is carried out specifically for the design points of complex sludge treatment systems, numerous equipment pipelines and high odor discharge standards. The design process of the project revolves around improving the overall efficiency of design and improving the design accuracy. Finally, as the deliverable, the design achievement bearing the correct design information analyzed and checked by BIM technology is formed. The design results indicate that using BIM simulation analysis software can perform complex and high-precision simulation analysis. The BIM forward design route is suitable for the engineering design of sludge treatment plants and can provide the accurate and quantifiable basis for verification and optimization of the design.
Keywords: BIM technology; municipal design; sludge drying incineration; forward design

Abstract: The raw water pipeline of Shanghai Lingang Waterworks inevitably causes the stress relief and redistribution of stratum soil mass in the construction of crossing the embankment of Dazhi River. The pipe jacking and foundation pit construction will inevitably affect the safety of Dazhi River embankment. From the perspective of view of protecting the embankment safety of Dazhi River, the finite element analysis method is used to carry out the in-depth theoretical analysis, study and demonstrate the impact of construction on the embankment safety of Dazhi River under the conditions of foundation pit construction, pipe jacking construction and cofferdam construction, and put forward the relevant suggestions for reducing the impact in order to provide the effective support for ensuring the structural safety of Dazhi River embankment. The research shows that the deformation of Dazhi River embankment caused by the foundation pit construction of manhole is within the allowable range and has little influence on the current structure.
Keywords: pipeline engineering; underground engineering; flood control wall

Abstract: Jinze Reservoir in the upper reaches of the Huangpu River is the second largest water source in Shanghai. The clay compaction degree is required to reach 98% in the design. Although the embankment filling height is small, there is no similar experience in quality control of high pressure solid layered rolling embankment construction in this area before. Combined with the example of reservoir engineering construction, the key technical requirements and practical application of roller earth dam construction are systematically analyzed, which improves the quality management level of such projects in Shanghai, and also provides the reference for the construction of similar major projects.
Keywords: dike filling; compaction degree; quality control

Abstract: The high-density polyethylene (HDPE) lining is mechanically embedded into the inner wall of the reinforced concrete pipe through the anchor key to enhance the corrosion resistance of the reinforced concrete pipe. In order to obtain the characteristics of HDPE lining under the different

MANAGEMENT & CONSTRUCITON

Abstract: With the progress of urbanization in China, the state is committed to the transformation of the urban development mode, the formation of urban characteristics, the improvement of urban environmental quality and the innovation of urban management services. In the meantime, the prefabricated and rapid construction technology of bridge has been developed rapidly. Combined with the Suqian Yingbin Avenue Rapid Reconstruction Project, the component prefabrication and component assembly of the superstructure and substructure of the bridge are introduced, which provides a certain reference for the application and practice of rapid construction technology in similar projects.
Keywords: urban elevated road; rapid construction; factory for prefabrication; small box girder; bent cap; component connection

Abstract: Relying on the design and construction of the expanded foundation of the Sanjiangkou Bridge, the details of the expanded foundation structure, burial depth, parameter values and foundation pit backfilling of the bridge using the expanded foundation are discussed. The relevant experience is provided. The results indicate that the cost of expanding the foundation is relatively low, the construction period is short, and the construction risk is low. From the perspective of economy, construction period, and risk control, in areas with good geological conditions, the expanded foundation of the bridge is better than other foundation forms.
Keywords: expanded foundation structure; buried depth; anti-sliding block; sub-base; anti-sliding stability coefficient; anti-overturning stability coefficient

Abstract: A prospecting road of a hydropower station is located in Qamdo, Tibet Autonomous Region, which is a necessary condition for the construction of roads and diversion tunnels within the hydropower station as soon as possible. The single-span Bailey bridge is used for the prospecting road across the Lancang River. Its net span is 54.864 m. In order to make it into use as soon as possible and to satisfy the construction period requirements of key projects of the power station, the 200-type double-deck reinforced beret steel bridge is used and is constructed by the "cantilever" push method. And the bridge is improved on the basis of the original construction method. The components of steel bridge can be used for recycling. Under the premise of not adding the guide beam components, the erection of the whole bridge can be completed within 15 days in order to save the cost and achieve the maximization of economic benefit, which can be referred for the similar projects.
Keywords: canyon area; long span; Bailey bridge; cantilever push method

Abstract: Taking the engineering cases of subgrade treatment and slope protection as the examples, the applicable conditions and application scenarios of dry jet mixing (DJM) pile, SDDC pile, polymer grouting and foam light soil in the subgrade treatment, and row pile retaining wall in the slope protection are introduced in order to help the road engineers to choose the suitable, economical, reasonable and feasible engineering measures and schemes to solve the practical engineering problems according to the different engineering boundary conditions.
Keywords: dry jet mixing (DJM) pile; SDDC pile; trenchless treatment; polymer grouting; foam light soil; row pile retaining wall

Abstract: Landslide prevention and control is a point that must be considered in the design and construction of slope engineering. According to the provisions of the new code, the prevention and control measures for the traction-type landslide on the ancient slip mass in the main line K12+400 ~ K12+700 of the national highway G342 are introduced in detail, including the stability of the landslide under various construction conditions after earth clearing and load reduction, and the calculation explanation and rationality verification of the design process such as the size, reinforcement and layout of anti-slide piles. A integrated monitoring system has been established for the subsequent construction and operation of the highway in this section in order to prove the rationality of the treatment scheme for the landslide disposal of the project, and also provide the reference for the landslide disposal in the other related engineering examples.

Keywords: traction-type landslide; ancient slip mass; anti-slide pile; monitor

Abstract: The joint box of underground diaphragm wall is widely used in the construction of underground diaphragm wall. Accidents occur when the joint box is buried on occasion. Based on the engineering practice of the actual projects, the causes of the buried joint box are comprehensively analyzed. Two causes including the technology and construction environment are summarized. Several disposal measures for the buried joint box are proposed respectively three kinds of crane topping pulling, oil topping with crane topping pulling and lateral stripping. Based on the accident of the buried joint box in a waterworks extension project, the cause analysis, practical disposal measures and disposal results of the accident are given. Finally, some construction suggestions are put forward in order to provide the effective solutions for the relative accidents.

Keywords: underground diaphragm wall; joint box; disposal measures; crane topping pulling; oil topping; lateral stripping

Abstract: During the construction of the seawall up-to-standard project along the Chongming Island in Shanghai, it is required to analyze the influence and protect the piers during the construction near the piers of the G40 Yangtze River Bridge. Therefore, the PLAXIS finite element software is used to analyze the influence of the seawall up-to-standard reconstruction on the bridge, and the relevant reinforcing reconstruction measures are proposed.

Keywords: seawall; pier displacement; finite element calculation

Abstract: Taking a typical three-span prestressed concrete continuous box girder bridge in Yiwu City as the research background, the reinforcement scheme of external prestressed carbon fiber plates is put forward according to the bridge disease, and the reinforcement essentials are analyzed. The reinforcement effect of external prestressed carbon fiber plate is judged from the perspective of construction monitoring. The results show that the reinforcement of external prestressed carbon fiber plates can better improve the

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APPLICATION OF ACHIEVEMENTS

improve the management precision, which provides the model for improving the enterprise-level platform. At the same time, the digital twin assets of the project completion are formed, which provides the reliable data support for the operation and maintenance stages.
Keywords: digital twin; trunk road reconstruction project; BIM information management platform; smart construction site

Abstract: The application method of GIS technology is proposed in optimizing the earthwork of the surface and underground space development of mountain cities. GIS technology can not only directly show the connection of urban surface space with natural environment, but also realize the calculation of earthwork with the different design surfaces. Combined with the calculation of earthwork in the underground space, the amount of earthwork development in urban three-dimensional space is obtained, which guides the vertical optimization design of road network and land use. Taking Longxing RS standard zoning road network and land earthwork optimization as an example, after optimization, the good economic and social benefits for the urban development and construction are achieved.
Keywords: GIS technology; mountainous city; underground space development; earthwork optimization

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