Urban Roads Bridges & Flood Control

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城市道桥与防洪

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主办：上海市政工程设计研究总院(集团)有限公司

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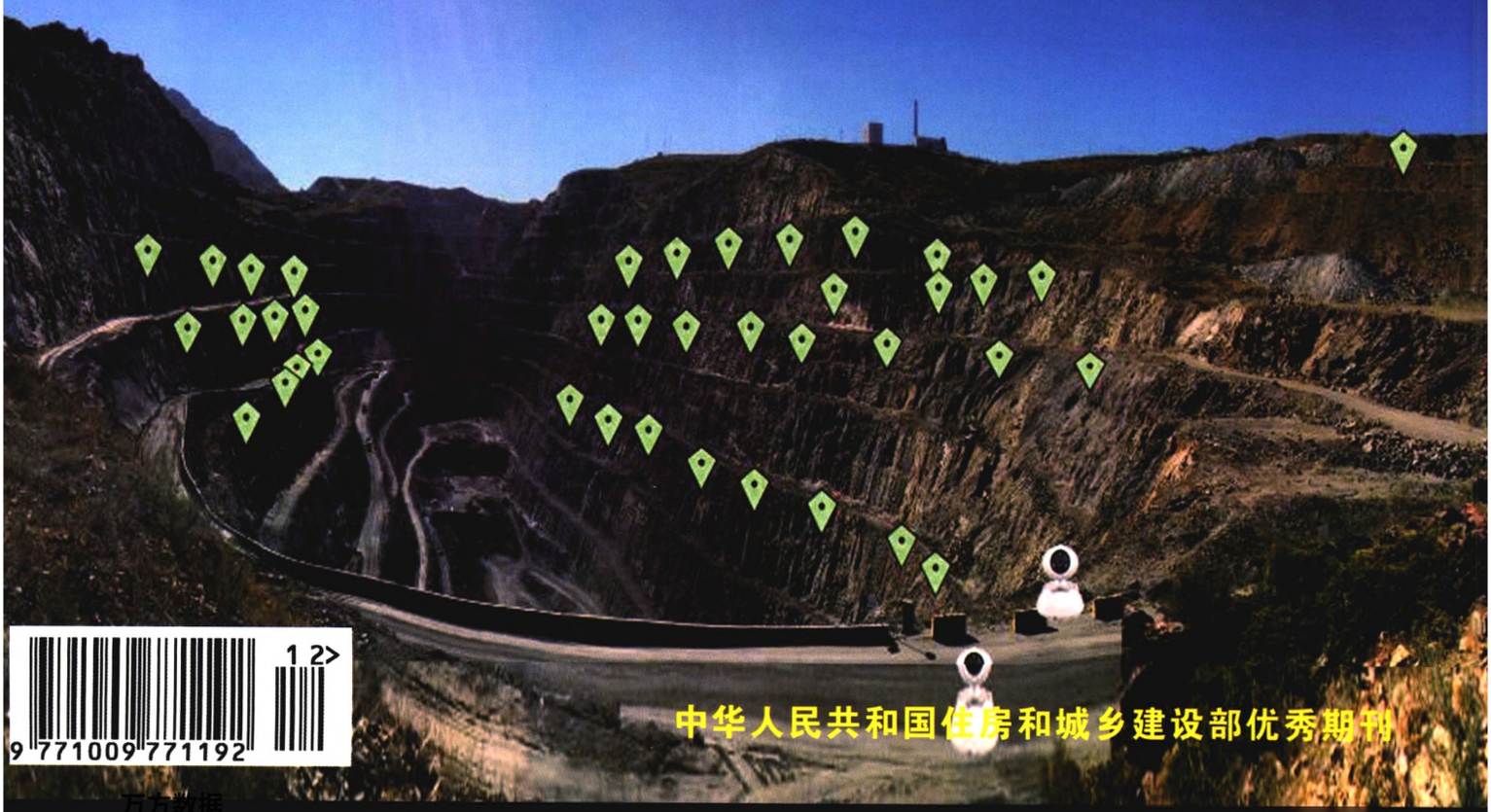
● 本期看点



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广告索引

封面工程

本期封面工程为新疆蒙库铁矿露天矿边坡监测，由重庆市勘测院勘察设计有限公司负责实施。

新疆蒙库铁矿位于新疆维吾尔自治区阿勒泰地区富蕴县，是宝钢集团八钢公司在建铁矿石主要原料供应基地。蒙库铁矿露天矿采场边坡最高标高为 +1 178 m，最低标高为 +974 m，最大垂直高度达 204 m，设计边坡角为 42° ~60° 。采场边坡现有边帮常年裸露，受自然风化及雨水侵蚀的影响，其岩体的硬度和结构已遭到一定程度破坏。另外，采场边坡长期受到爆破振动的影响，其稳定性存在一定隐患。

新疆蒙库铁矿露天矿边坡监测采用重庆市勘测院勘察设计有限公司自主研发的远程自动化在线监测系统，利用测量机器人、位移传感器等监测设备，对岩土体内部沉降、倾斜、错动变化等进行连续监测，及时捕捉边坡形状变化的特征信息。现场共布设水平位移 42 个，竖向位移 42 个，倾斜位移 3 个，视频监控设备 3 个，通过无线方式将监测数据及时发送到监测中心，由专用的计算机数据分析软件处理，对边坡的整体稳定性作出判断，并快速作出诸如山体边坡崩塌、滑坡等灾害发生的预警预报。

该工程于 2016 年 7 月开始实时，2019 年 8 月监测结束，为采矿活动安全生产和采场边坡整治工程设计提供了有力技术支撑。

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CONTENTS

ROADS & COMMUNICATION

Abstract: According to the further study on the laying traffic organization in middle of road, laying traffic organization at side of road, traffic organization at entrance and exit of unit community, traffic organization in special road section, traffic organization at typical intersection, traffic organization of vehicle base in-out line and traffic organization of pedestrian, this paper discusses the traffic organization design schemes of modern tram under the different conditions in detail. The study shows that it should be to carry out the traffic organization design of the relative road sections intersected with the rail line in a new city with the modern tram. This paper puts forward the measures to improve the traffic capacity of road network, and to upgrade the service level of existing roads.

Keywords: public transport, modern tram, traffic organization, urban road network, service level

Abstract: According to the urban planning, combined with the function orientation of the traffic axis of the principal axis of Changjiang River, the design scheme of section layout, slow traffic system and accessory facilities of the sample section of Zuoan Avenue is studied on the basis of fully considering the actual situation of the road and from the concept of human-oriented total elements design.

Keywords: urban road, reconstruction, total element design, sample section of Zuoan Avenue

Abstract: Qinhan Avenue is one of the "five vertical expressways" in the pattern of "seven-horizontal and five-vertical" expressway network in Xixian New District. According to the analysis on the overall planning of the project area, the natural conditions along the line and the construction conditions, and from the aspects of the project background, engineering situation, overall project scheme, node design scheme and bus rapid transit, this paper more completely introduces the design of Qinhan Avenue Expressway Project.

Keywords: expressway, overall layout scheme, node design scheme, bus rapid transit (BRT)

Abstract: Yizhou Street–Minxiao Highway is located in Pingan District of Haidong City in Qinghai Province. In order not to affect the continuity of the mainline driving of Minxiao Highway, Yizhou Street – Minxiao Highway adopts the form of grade separation. This paper mainly introduces the design scheme of grade separation, and discusses the design standard used for the ramps when an urban road intersects a highway.

Keywords: interchanges, cross section layout, ramp ultrahigh, ramp widening, entrance and exit connection

Abstract: Taking a design case of specific underground road as the study object, this paper describes how to seek the solution process and comparison result of the best implementation scheme under the complex conditions, which can provide the reference for the similar projects.

Keywords: complex conditions, underground road, implementation scheme

Abstract: Taking Nanchang South Tianxiang Avenue Expressway Project as an example, this paper discusses the principle ideas of the soft ground treatment scheme design, and the technical parameter control proposal, construction quality control essentials and construction quality requirements for the soft ground treatment of high–pressure jet grouting pile. The observation of this project after 2–year operation shows that the effect of the soft ground treatment scheme is good, can satisfy the relative design specifications and the using function requirements, and has a certain referring value.

Keywords: expressway engineering, soft ground treatment, practice

Abstract: In order accurately evaluate the environmental impact of rubber asphalt pavement and based on the idea of life cycle assessment, the environmental impact assessment indicator system is established. And on the basis of the investigation of energy consumption data in each link of asphalt pavement construction, the energy consumption and greenhouse gas emission of modified asphalt, ordinary asphalt and rubber asphalt pavements are respectively measured and analyzed. The results show that the rubber asphalt mixture has the obvious energy–saving benefit considering from the viewpoint of life cycle, but it has no advantage in the term of greenhouse gas emission.

Keywords: asphalt pavement, rubber asphalt, energy conservation and emission reduction, life cycle assessment

Abstract: Taking the total element municipal urban landscape function upgrading project of I-shaped area in Hongkou District for Shanghai Import Expo as an example, this paper sets forth the treatment of common diseases of asphalt pavement in the reconstruction of old road. Also from the design viewpoint of total element, the reconstruction of old road is combined with the landscape upgrading of streets in order to create a coordinated, integrated and overall street environment.

Keywords: total element idea, analysis of pavement disease, pavement treatment, landscape upgrading

Abstract: In the present road construction, the asphalt concrete is a mainstream direction for the pavement materials. In the road pavement construction, the hot-mixed asphalt mixture is commonly used. But the hot-mixed asphalt mixture will not only waste a lot of energy in the mixing process, but also cause the serious environmental pollution and endanger the health of construction personnel. Aiming at this kind of phenomenon, the warm-mixed asphalt mixture is born at the right moment after the long-term study. According to the study on the technical principle of warm-mixed asphalt mixture, this paper analyzes its advantages and disadvantages, which can be referred for the application of warm-mixed asphalt mixture in the engineering practice.

Keywords: pavement material, hot-mixed asphalt mixture, warm-mixed asphalt mixture, technical principle

BRIDGES & STRUCTURES

Abstract: The urban interconnection and transportation hub area is affected by the ground roads and underground space. Its ramp bridges tend to be small in radius and long in span. At present, the steel box girder structure is generally adopted. Combined with the practical engineering designs, this paper sets forth it from the structural measures and calculation analysis in detail. The characteristics of this steel box girder are the double-chamber oblique abdomen type, the top and bottom stiffening ribs in plate type, and the web only set with transverse stiffening ribs. The structural design of this project is reasonable and reliable, which can be referred for the similar projects.

Keywords: small radius and long span, steel box girder, single box and double chamber, analysis and design

Abstract: The main bridge of Bisheng Road Bridge spanning Chuanyang River is an 81 m span through simple-supported bowstring steel-box basket-shaped arch bridge. The structural forms of arch rib, bowstring and stiffened beam deck slab are determined through the overall analysis and comparison of structures. This paper mainly introduces the definite design of the structural form of this bridge, and the static and dynamic calculations of the structure, studies the loading features of this kind of bridge structure and summarizes the relative experience of the engineering design of this project, which can be referred for the similar projects.

Abstract: In order to analyze the anti-torsional property of assembled piers, starting from the stress characteristics of joint surface of assembled piers and combined with the issued standards in China, the anti-torsional calculation method of joint surface of assembled piers is obtained. The anti-torsional property of the assembled piers of an overpass is calculated. And the overall anti-torsional property of the piers is quantitatively analyzed.

Keywords: prefabricated, assembled, anti-torsional property, joint surface

Abstract: Taking the foundation of dumbbell-shaped low-pile base slab of Sanguantang Bridge in Ningbo as the engineering background, this paper studies the static and dynamic characteristics of large dumbbell-shaped base slab by the finite element model, and compares with the calculation results of the plane m method, and meanwhile, mainly discusses the law of force transfer of cross tie beam under the seismic action by the response spectrum method. The results show that the plane m method is more accurate in calculating the axial force on the top of pile, but the bending moment and shear error of pile top is large. The stiffness of tie beam after set up will have a greater impact on the seismic response of dumbbell-shaped low-pile base slab foundation. With the gradual increment of tie beam stiffness, the tie beam mainly transmits the axial force when it is small stiffness and mainly transmits the bending moment when it is large stiffness.

Keywords: dumbbell-shaped base slab, cross tie beam, seismic response

FLOOD CONTROL & DRAINAGE

Abstract: The construction of the weir dam on the natural river course blocks the fish communication and reproduction. Compared with the traditional engineering fishway, the imitated natural-type fishway has the higher fish-passing efficiency due to the construction of water flow regime familiarly for the fish. Combined with a weir dam reconstruction project in Shifeng Creek of Tiantai County, according to the topographical features, local building materials and other natural conditions, from the design concept, type selection, structure layout, hydraulic calculation and other aspects of the fishway, this paper designs and studies the application of the imitated natural-type fishway in the weir dam engineering, which can be referred for the development and application of ecological fishways.

Keywords: imitated natural-type fishway, roughening ramp, fish slope, ecological environment

Abstract: Hangtang Port Pump Sluice is an important waterlogging drainage pump brake in Pudong Area of Shanghai. Its main functions are to remove the waterlogging, to resist the moisture and to give consideration to water resource scheduling, and to form the flood-control (tide) sealing circle together with Hangzhou Bay Seawall. In order to guarantee the safe operation of Hangtang Port Pump Sluice Project, it is proposed to verify the plane layout of the pump sluice and the structure of energy dissipation and erosion control facilities through the mathematic model test and hydraulic model test, which can test the discharge capacity of the sluice, and the flow pattern and velocity distribution of influent and effluent of the pump sluice, and can analyze the influence of pump sluice operation on the sea area of Hangzhou Bay, the current beach on both sides and the inland river side watercourse.

Keywords: Hangtang Port Pump Sluice, overall layout, hydraulic model test, flow pattern, vertical mean velocity

Abstract: Aiming at the situations of little rainfall and low utilization rate of rainwater pipeline network in the cities in the arid northwest of China, this paper puts forward the planning scheme of incompletely separated-system rainwater system. Taking Wuyi New Town in Wuchang New District of Xinjiang as an example, this paper sets forth the methods and essentials of the incompletely separated-system rainwater system planning in the arid cities. Through the establishment of the rainwater drainage ICM mode in this city, this paper analyzes the rainwater runoff route and waterlogging situation of this area before and after developed. On this basis, the rainwater drains are reasonably planned and the waterlogging points easily happening in the urban area after developed are decreased. The simulation result shows that it is feasible to use the incompletely separated-system rainwater drains for drainage.

Keywords: arid area, planning of rainwater system, incompletely separated system, drainage model

Abstract: The main structural styles of pump brake in plain area are mostly similar, and the traditional 2D design still needs to be designed one by one. And the adjustment of the preliminary design scheme and the drawing of the 2D reinforcement diagram in construction drawing stage have a lot of modification work to make the design inefficient. Aiming at the above problems, the 3D parameterization design is considered to solve. The parameterized model template is set up for the same type of pump brake. The utilization of this template can obtain the pump brake of same type and different sizes by modifying the parameters. It can directly carry out the next 3D reinforcement, drawing and statistics of engineering quantity. Through a pump brake engineering example, BIM software MicroStation CONNECT is used to set up the parameterized model of this pump brake. The generic parameter and constrained relationship parameter are defined. The ReStation is used to complete the design of 3D reinforcement, drawing and

Abstract: In the road waterlogging improvement project of the central urban area in Shanghai, the trenchless pipe-jacking construction method is commonly used in the drainage pipeline crossing river. Taking a road waterlogging improvement project of Hongkou District as an example, this paper puts forward the flood control wall reconstruction scheme of pipeline crossing section, and analyzes the influence of pipe-jacking crossing river construction on the flood control and safety by using the finite element calculation software, which provides a certain referring value for carrying out the relative design and analysis of flood control and safety influence.

Keywords: pipe jacking, foundation pit, flood control wall, finite element analysis

Abstract: Taking the influence of pile foundation construction for a flood control wall in Shanghai on the existing cross-river inverted siphon as an example, this paper establishes a dynamic analysis model of pile - soil - inverted water-supply siphon interaction by the finite element method, studies the influence rule of construction distance of vibroflotation pile sinking on the pipes, and analyzes the comprehensive influence of pile group construction sequence on the pipes. The study results show that the influence of pile driving vibrations on pipes is mainly vertical displacement. With the increase of horizontal distance between pile foundation and inverted water-supply siphon, the influence of pile driving vibration on pipes gradually decreases. In pile group construction for the surrounding pile foundation of pipe, the construction sequence of both-side alternating driving at the adjacent pipelines has little influence on the pipeline.

Keywords: vibroflotation pile sinking, cross-river inverted siphon, dynamic finite element analysis, pile group construction sequence

Abstract: To solve the problem of small and micro water black-odor pollution, the comprehensive treatment measures must be considered in the engineering design. Taking Beiduxiangzhai River in Huacao Town of Minhang District as an engineering example, this paper analyzes the pollution causes and sorts out the treatment ideas. Based on the features of water body, this paper summarizes and analyzes the treatment measures. Combined with the late monitoring data, the treatment efficiency is verified, and the study of small and micro water treatment is perfected. This kind of water treatment should start with controlling the sources and intercepting the pollution. Combined with the dredging of sediment, scheduling or communication of water system, shape optimization of water body, building of ecological revetment and construction of water ecosystem, the ideal result is achieved.

Keywords: small and micro water body, improvement of water quality, treatment measures

MANAGEMENT & CONSTRUCITON

Abstract: Aiming at the difficulties existing in the current highway management and maintenance indicators, this paper points out that a single indicator must meet the measurable conditions and the composite indicator belongs to the linear space. Then five significant attributes and four principles for building the rigorous indicator system are obtained, and are used to construct the health monitoring indicator and bridge technical condition indicator. The analysis on object and attribute determines the indicator system. In the practical evaluation, the use of screening method is successful in order to solve the complexity problem. Finally, this method is extended to the evaluation indicators of tunnel technical condition and maintenance behavior.

Keywords: single indicator, composite indicator, linear space, indicator spatial structure analysis, screening method

Abstract: In view of the current situation of frequent safety accidents in the highway construction of Gansu Province, the informatization system management is implemented in the construction process by means of multimedia, Internet technology, Beidou Navigation Satellite System and other technical platforms. Meanwhile, the intelligent safety management system and Beidou Navigation Satellite System are used to monitor the construction site in real time in order to realize the all-around precaution, management and control of various safety accidents and to achieve the ultimate goal of zero safety accidents in the construction process of expressway. These innovation modes of construction informatization management have certain reference value and guiding significance for the safety management of other projects.

Keywords: expressway, safety construction, safety management, informatization management

Abstract: This paper briefly introduces the principle and characteristics of self-balancing static load detection technology, and compares the result of the single-pile bearing capacity of pile foundation detected by the self-balancing method with the static load detection result of stack-load method. The feasibility of self-balancing method to carry out the static load detection of pile foundation can be achieved in this project.

Keywords: self-balancing, pile foundation, static load

Abstract: The assembly-type bridge structure can greatly shorten the construction period, decrease the site

STUDY ON SCIENCE & TECHNOLOGY

Keywords: long-span composite cable-stayed bridge, connectors, composite beam element considering slip

Abstract: The software ANSYS/LS-DYNA is used to carry out the blast simulation analysis of steel reinforced concrete bridge piers and to analyze the blast resistances of the bridge piers with three reinforcement methods of CFRP (carbon fiber reinforced plastics). The simulation results show that CFRP reinforcement can obviously decrease the lateral displacement of bridge piers under the blast load, effectively improve overall bearing capacity of piers and the ability to resist the local failure, and is a high-efficient anti-detonation reinforcement technology. The M reinforcement mode with 21.7% material used has realized the basically same reinforcement effect by W reinforcement mode. Due to the spalling of CFRP strip and the local failure of concrete between strips, the E reinforcement mode to carry out the anti-detonation reinforcement of pier is not recommended.

Keywords: steel reinforced concrete pier, carbon fiber reinforced plastics (CFRP), blast resistance, dynamic responses

Abstract: Due to the protective requirements of heritage remains, the spatial arrangement of piers under the bridge is limited. So the eccentricity design of double-columned pier from the street center line is necessary, and the seismic response of eccentric double-columned pier under earthquake action is studied. Midas Civil is used to conduct the spatial finite element dynamic analysis on the modeling of eccentric double-columned pier in order to obtain the seismic response of the vertical and horizontal piers and the pile foundation under earthquake action. The seismic responses of vertical and horizontal piers and the pile foundation are analyzed in order to obtain the seismic response features of eccentric double-columned pier, which have certain reference significance for the analysis on the seismic performance of eccentric double-columned pier in the future.

Keywords: eccentric double-columned pier, finite element analysis, seismic response, seismic performance

Abstract: Taking a steel-concrete composite beam bridge as an example, the study shows that the concrete creep effect cannot be ignored. Combining theory and finite element model, analysis, and comparing the results of the structural stress and deflection of composite beam, the sensitivity of parameters is analyzed., and the concrete strength, the theoretical thickness of concrete deck plate, the age of concrete, the annual medial humidity of environment, the shear rigidity of shear connector and the other complex effects are compared.

Keywords: composite beam, concrete creep, parameter analysis

Abstract: In order to study the effect of the engineering measure of building the dam around the lake on the reduction of pollutants entering the lake, taking Dishui Lake and its surrounding water system in Lingang Area of Shanghai as the basis of the model, this paper uses MIKE series model to simulate the variation of river level of the ring lake gate and dam respectively in normal conditions, small and medium rain conditions and heavy rain conditions according to the established model. According to the target of reducing the pollution into the lake by about 95% and not entering Dishui Lake, the height of the gate and dam around the lake suitable for Dishui Lake is obtained through data analysis.

Keywords: ring-lake gate and dam, water quality, MIKE, Dishui Lake

Abstract: Since the 12 th Five-Year Plan, the sludge treatment and disposal has been paid more and more attention. The bottom sediment from rivers and the sludge from wastewater treatment plant (WWTP) all belong to the urban sludge. The public knows more about the sludge from WWTP, but the formation, properties, treatment and disposal technologies of bottom sediment from rivers have not been widely cognized. The bottom sediment from rivers and the sludge from WWTP have certain similarity and correlation in the sources, compositions, properties, and treatment and disposal technologies. Compared with the sludge from WWTP, this paper introduces the source, composition, property, and treatment and disposal technologies of bottom sediment from rivers, and expects the development direction of its treatment and disposal.

Keywords: bottom sediment from rivers, sludge from WWTP, property, treatment, disposal

Abstract: Low elevation greenbelt is an urban rainwater low-impact development technology based on the source control, and has certain effect of retention and purification. This paper introduces the application of low elevation greenbelt, summarizes its hydrological effect and purification effect, and analyzes the impact factors of purification effect in order to provide the reference for the design and effect improvement of the low elevation greenbelt.

Keywords: low elevation greenbelt, application, retention, purification, impact factor

Abstract: There are the great risk and indeterminacy in the process of the rectangular pipe jacking crossing through the existing box culvert. This paper analyzes the failure mode of rectangular pipe jacking crossing through the existing box culvert, sums up the discrimination method of box culvert structural safety, and puts forward a new risk early-warning method of pipe jacking crossing through the existing box culvert, which can

APPLICATION OF ACHIEVEMENTS

THE RELATIVE SPECIALITIES

Abstract: Airport runway FOD is one of the main hidden dangers threatening the safe operation of civil aviation. The "all-weather, whole-runway and high-accuracy" runway FOD monitoring system is the guarantee of the aviation safety. This paper concludes the type of runway FOD, clarifies the mismatch between the manual inspection means and runway FOD monitoring requirements, and also compares and analyzes four international typical runway FOD monitoring systems now, which can be referred for the introduction of civil aviation airport FOD monitoring system into China. This paper analyzes the architectural pattern of runway FOD monitoring system from the viewpoint of information stream, which can provide certain support for realizing the sustaining safety civil aviation in China.

Keywords: runway FOD, monitoring system, architectural pattern

Abstract: With the improvement of traffic demand of the people, the using functions of some early built highway tunnels have not met the requirements, i.e. the illumination in tunnel cannot meet the requirements, the air conditions in tunnel are poor and etc. The fire and rescue facilities in several super-long tunnels are poor because of the early construction. Therefore, the highway administration departments various regions carry out the upgrading reconstruction of these facilities step by step according to the practical service conditions of tunnel. In many reconstructions, the fire and rescue facilities are difficultly reconstructed due to the tunnels are underground projects and the reconstruction sections are more difficult. It is necessary to study, compare and select many schemes. Taking a low-grade super-long highway tunnel in Lianyungang as an example, three schemes of refuge, parallel pilot tunnel and upper escape tunnel are studied. Finally, based on the conditions of the project, the refuge is recommended as the scheme for this project, which can be referred for the similar projects.

Keywords: low grade, super long, highway tunnel, escape and rescue

Abstract: Lanzhou North Ring Road (Anning ~ National Highway 109) Project is a major engineering construction project in Lanzhou City. Jiuan Tunnel Project is a key node project of this project, and is the first upper and lower separated single-hole three-lane long-span tunnel in Gansu Province. The NATM (New Austrian Tunneling Method) design principle and dynamic design concept are used in the tunnel design. Based on the different situations of surrounding rock, the corresponding design parameters are adopted. The construction methods of more advanced benching tunneling method, CD method and CRD method are adopted. Through the assisting measures of advance geology forecast and forepoling, the tunnel project is completed in order to provide the decisive conditions for opening the middle section of North Ring Road. This paper briefly describes the design and construction schemes of Jiuan Tunnel in North Ring Road of Lanzhou in order to provide the reference basis for the tunnel projects in the east section and the west section of North

Abstract: Under the background of strictly controlling local government debt, the investment and financing mode of expressway has greatly changed. This paper discusses the calculating method and analysis process of the relative parameters in the financial analysis of government-financed and operational expressway, which provide reference for the similar investment and financing decision of expressway.

Keywords: expressway, financial analysis, financing mode

Abstract: With the acceleration of the urbanization process, the municipal reconstruction projects are also increasing. It is very important to control the reconstruction engineering cost and avoid the phenomenon of super investment. This article introduces the characteristics of the reconstruction project, analyzes the main influencing factors and the causes of the cost of the reconstruction project in the design stage combined with the engineering experience, and proposes the corresponding measures to control the cost for the factors easily causing the cost increase.

Keywords: municipal, reconstruction project, design stage, cost control

Abstract: The dynamic update of underground pipeline database established after carrying out the general survey of underground pipelines is to ensure the present situation and vitality of data, and to improve the comprehensive carrying capacity of a city and the groundwork of urbanization development quality. According to the analysis on the present situation of underground pipeline management, this paper introduces the dynamic updating practice of underground pipeline database in Pudong New District. Its results can be referred for the management of the other urban underground pipelines.

Keywords: underground pipeline, dynamic update of database, practice, results

Abstract: According to the requirements of *Guiding Opinions of the State Council on Giving Priority to the Development of Public Transport in Cities* and *Measures for the Management of the Operation and Service Quality of All in One Transport Card (for Trial Implementation)* formulated by the Ministry of Transport in 2018, the intercommunication of city transportation card has been promoted to the great measures of the Ministry of Transport for "keeping close to the livelihood of the people". The local transportation departments successively put forward the requirements covering the bus, subway, urban (suburban) railway, road passenger transport, waterway passenger transport and other overall travel services. In the future, the industry-unified platform construction goal of "MaaS smart transportation travel environment" will be extended to the other scenes in order to give the public a convenient, fast, easy to use, safe, efficient and advanced travel service, to give the government and operating agencies a digitization cloud environment of traffic operation management,

operation maintenance, planning design, scheduling command and security control and to build a data cloud platform of transportation intercommunication for the city traffic service operation agencies to form the ecological service system of traffic travel. This paper puts forward the application of "data intercommunication mode" to interconnect and cooperate with the traffic service operation agencies, stations and business district comprehensive service providers in trading area. The travel ecosphere is formed through open interface. The personalized and accurate service is provided to the travelers and the ecological win-win platform is built for the practitioners in order to satisfy the public demands of "intercommunication, convenient interchange, multiple-city in a network and one-ticket access" transportation.

Keywords: city transportation card, electronic payment, mobile payment, QR code, NFC, biological recognition, MaaS

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