

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

公路运输领域高质量科技期刊分级目录

万方数据-数字化期刊群

清华同方-中国期刊全文数据库

维普资讯-中文科技期刊数据库

中国核心期刊(遴选)数据库

中国学术期刊综合评价数据库

日本科学技术振兴机构数据库(JST)

入选期刊

全文收录

全文收录

全文收录

收录期刊

统计源期刊

收录期刊

2024



第1期 总第297期 月刊
2024年1月

图为重庆市设计院有限公司设计的重庆市快速路一纵线(中心站立交—狮子岩立交)工程



QK2401245

● 本期看点

国内灰绿基础设施协同策略研究进展及展望

基于LCA的城市道路碳排放测算与敏感性分析

空间曲塔大跨斜拉桥抗风性能研究

排洪渠工程总体设计及探讨

因为我们专心,所以我们专业!

——《城市道桥与防洪》

学术联盟：上海市城市科学研究会



9 771009 771246

万方数据

中华人民共和国住房和城乡建设部优秀期刊

中华人民共和国住房和城乡建设部优秀期刊

城市道桥与防洪 (月刊)

CHENGSHI DAOQIAO YU FANGHONG

2024 年 第 1 期(总第 297 期)

2024 年 1 月15 日出版

1984 年创刊

主管单位: 中华人民共和国住房和城乡建设部
主办单位: 上海市政工程设计研究总院(集团)有限公司
出版单位: 《城市道桥与防洪》编辑部

编辑委员会(第九届)

主任委员: 王士林

副主任委员: 刘旭锴 和坤玲

委员(排名不分先后):

马国纲 廖崇庆 卢永成 宁平华 陆 军 李军代
李克平 李 东 徐一峰 朱晓东 朱海鹏 王永兴
杨红卫 陈翰新 陈 伟 张东权 王建光 杨 斌
蒋海里 陈 军 葛景春 谢 鲁 骆燕妮 赵乐军
赵林强 徐 波 赵 刚 高中俊 黄永春 童景盛
周 俊 蒋中贵 潘怡宏 徐 辉 汪 勇 陈 谱
张国庆

青年编委(排名不分先后):

李少杰 杨春山 刘 彬 黄钦寿 牟振华 孙宏亮
张显忠 刘 鹏 周小猷 赵刘伟

编辑出版: 《城市道桥与防洪》编辑部

总 编 辑: 赵晓燕

责任编辑: 叶 露 龚雪菲

美术编辑: 杨建华 英文校审: 孙宁萍

地址: 上海市中山北二路 901 号 邮编: 200092

电话: (021)55008850 传真: (021)55008850

投稿网址: <http://www.csdqyfh.com>

联系邮箱: cdq@smedi.com

国内发行: 《城市道桥与防洪》编辑部

国外发行: 中国国际图书贸易总公司 代号: BM 1859

印 刷: 上海商务联西印刷有限公司

地址: 上海市春和路 1350 号 7 号楼

中国标准连续出版物号: ISSN 1009-7716
CN 31-1602/U

广告发布登记号: 3101020130030

目 次

专题论述

国内灰绿基础设施协同策略研究进展及展望
..... 王 欣, 朱 峰, 方 圆, 明 卉(1)

“碳减排”专题

基于“绿色低碳”理念的城市道路技术要素的探索与实践
..... 王斌强, 郑卫国, 袁 伟, 马玉林(9)

城市道路交通碳中和措施系统的概念与架构
..... 卜政滔(13)

OGFC 生产过程碳排放计算和碳减排技术研究
..... 凌宏伟, 郑晓光, 闫国杰, 陆文亮(19)

基于 LCA 的城市道路碳排放测算与敏感性分析
..... 牛 凯, 左贵强, 张兴宇, 朱晓东(23)

市政道路碳排放计算及分析 余希帆(27)

津石高速公路碳减排测算与特征规律研究
..... 何 佳, 朱晓东, 张兴宇, 陈永昊(30)

道路交通

面向2035长沙骨干路网建设的思考 史 啸(35)

汕尾综合保税区交通系统规划研究 龙家彦(40)

江宁区交通拥堵成因及治理对策研究 贺瑞梅(43)

申港大道(随塘河西—沪城环路)改建工程总体方案设计
..... 董 理, 牛建峰(48)

吉安南互通与西外环立交节点方案研究
..... 罗雄雄(54)

互通立交入口匝道大型车加速车道长度研究
..... 李 敏, 苏莉晓, 李纳纳, 陈婷婷(58)

城市道路快速化改造中的掉头设计策略及案例
..... 高旺生(62)

青岛第二条海底隧道黄岛端道路交通衔接规划研究
..... 王亚龙, 王吉昌(65)

城市道路街道一体化设计探讨 迈 娇(70)

道路交通项目建设中资源要素平衡与保障研究
..... 伍洋洋, 郑仕文, 张 功(74)

城市道路无障碍设施优化提升策略研究
..... 徐志红(78)

抗滑桩加固高边坡受力特征影响因素分析
..... 张桂芹(81)

桥梁结构

空间曲塔大跨斜拉桥抗风性能研究
..... 聂 斌, 王定全, 具鑫兰, 孙丽明(85)

洪塘大桥自锚式悬索桥设计要点 蔡 亮(89)

期刊基本参数: CN 31-1602/U * 1984 * m * A4 * 270 * zh * P * ¥25.00 * 5000 * 65 * 2024-01

上海祁连山路跨蕴藻浜大桥总体设计 田周松(94)

钢-UHPC组合梁在大跨径桥梁中的设计与应用分析
..... 沈理斌,刘晓奎(98)

某高速公路25 m跨钢板组合梁设计与数值模拟研究
..... 黄宇辰(102)

负荷钢桁桥节点连接加固设计方法研究 陈祖贺(105)

钢混组合梁宽桥的箱室划分研究
..... 胡鑫,罗晶,潘传银(111)

青岛西海岸珊瑚贝桥创意构思与总体设计
..... 俞雷,李永君,强玮怡(116)

斜靠式钢箱拱桥稳定承载力及成桥试验 顾晓毅(120)

山区公园跨水域拱桥设计方案研究 吴连波(123)

城市新区桥梁群景观设计方法探讨——以容东某片区桥梁群
景观设计为例 郑永星,徐安宁,王航(127)

齐河路/华绣路人行天桥方案研究 邹 骋(131)

紧凑空间城市人行连廊设计 郭宏伟(134)

防洪排水

排洪渠工程总体设计及探讨——以张家川胡川片区排洪渠
工程为例 张永福,童景盛,康联国,马恩泽(138)

软弱土地地区城市道路河道生态护岸设计
..... 卫军刚,张卢明(142)

对隧道排水设计中关键性问题的探讨 李 媛(145)

大型曝气生物滤池污水处理厂提标改造设计
..... 汪启光(149)

多段AAO污水处理厂精确曝气系统设计与调试
..... 应基光,林莉峰,汪芸芸(153)

污水处理厂扩建工程设计及运行实例 王兴斌(157)

苏州市长桥街道北片区生活污水处理提质增效达标区工程
设计 赵永生,王振中,王小刚(160)

饮用水源地污水处理方案比选研究与应用 翟 林(164)

管理施工

探讨高速路网新型综合养护模式的建立与应用
..... 邓少伟,梁伟斌,许 杰(169)

浅析基于大数据水利工程监管体系构建与应用
..... 邓国民(175)

矩形桩施工技术及应用研究 张 艾(178)

锚碇基坑地下连续墙围护结构作永久受力结构的应用研究
..... 薛 磊(182)

空间受限情况下地下连续墙施工技术 贺 华(186)

非开挖电力管线下穿河道的问题及防护措施
..... 范春英(189)

片区综合开发项目“投资人+工程总承包+运营”
开发模式研究 李立岩,汪小南(192)

科技研究

变形协调条件下锚索框架梁-抗滑桩边坡支护体系设计方法

编委成员单位(排列不分前后)

- 主任编委单位:
- 上海市市政工程设计研究总院(集团)有限公司
- 副主任编委单位:
- 北京市市政工程设计研究总院有限公司
- 天津市政工程设计研究总院有限公司
- 编委单位:
- 南京市水利规划设计院股份有限公司
- 中国市政工程西南设计研究总院有限公司
- 同济大学交通运输工程学院
- 上海市市政规划设计研究院有限公司
- 广东省建筑设计研究院有限公司
- 广州市市政工程设计研究总院有限公司
- 沈阳市市政工程设计研究院有限公司
- 中国市政工程西北设计研究院有限公司
- 中国市政工程华北设计研究总院有限公司
- 中国市政工程中南设计研究总院有限公司
- 上海市城市建设设计研究总院(集团)有限公司
- 武汉市市政工程设计研究院有限责任公司
- 西安市政设计研究院有限公司
- 重庆市市政设计研究院有限公司
- 重庆市设计院有限公司
- 重庆市勘测院
- 林同棧国际工程咨询(中国)有限公司
- 中机中联工程有限公司
- 济南市市政工程设计研究院(集团)有限责任公司
- 成都市市政工程设计研究院有限公司
- 上海公路桥梁(集团)有限公司
- 上海城建市政工程(集团)有限公司
- 杭州市市政工程集团有限公司
- 深圳市市政设计研究院有限公司
- 杭州市城建设计研究院有限公司
- 兰州市城市建设设计院
- 上海浦东路桥(集团)有限公司
- 上海市政交通设计研究院有限公司
- 上海弘路建设发展有限公司
- 上海奉贤建设发展集团市政公路工程有限公司
- 上海市市政工程建设发展有限公司

研究	郭鹏辉(194)
土-承台动力相互作用对砂土地桩桥梁地震反应的影响	杨 当,王靖程,叶爱君(199)
不同季节影响下复合道面力学响应分析	郭成超,张顺杰,杨晓东,闫卫红(205)
U型 Twin-PBL 剪力键极限承载力的数值分析	李志勇,王银辉,张乾坤,王松林(209)
基于位移与轴力的软土深基坑开挖扰动控制	卫俊杰,王颖轶,荣 建,徐伟忠,谢广州(214)
基于 Matlab PDE 工具箱的土体冻结温度场模拟研究	姚远宏,张泽雨,刘永成(221)
高速公路养护工程安全变道控制距离研究	李大鹏,陈龙庭,金坚定(224)
高架出口匝道下游交叉口信号控制方法研究	阳 杰(226)
清水池水力效率影响因素研究	朱智勇(230)

成果应用

交通基础设施 BIM 全景展示平台应用	吴军伟(233)
基于 BIM+AIoT 的市政工程智慧工地平台开发与应用	闫 涛(237)
基于鸿城软件平台的 BIM 模型的集成展示应用	杨明熹(241)
智能市政基础设施可扩展元数据和数据字典	李天逸(245)
光伏声屏障在城市快速路上应用可行性分析	李洋洋(248)
道路红线可视化技术研究	何 勇(251)

相关专业

近距离下穿既有隧道的矿山法隧道支护方案选择	田 帅(251)
机场枢纽近磁浮区域超深基坑地下水控制技术	张 宁(258)
基于声波频谱特征的土体障碍物超声探测分析	杨立君,诸 岩(264)

政策规范

《国家科学技术奖提名办法》政策解读问答	(269)
---------------------------	-------

《城市道桥与防洪》编辑部恭贺新年	(封2)
常任理事单位名单	(前插4)
理事单位名单	(前插5)
理事单位名单	(前插6)
编委成员单位名单	(目次2)
封面工程	(目次3)

广告索引

广 1 郑州市市政工程勘测设计研究院有限公司 (前插 1)
广 2 南昌市城市规划设计研究总院集团有限公司 (前插 2)
广 3 宁波宁工交通工程设计咨询有限公司(前插 3)
广 4 《城市道桥与防洪》编辑部公益广告(封 3)
广 5 青岛润邦防水建材有限公司(封 4)
广 6~29 《城市道桥与防洪》编辑部(补白)

封面工程

本期封面工程为重庆市快速路一纵线(中心站立交—狮子岩立交)工程,建设单位为重庆市城市建设投资(集团)有限公司,由重庆市设计院有限公司设计,重庆建工集团股份有限公司施工。

该工程位于重庆市沙坪坝区,是科学大道的一段,起点向北延伸至现状狮子岩立交,向南接现状中心站立交,路线长 9.94 km,主线双向 8 车道,路幅宽度 37 m,全线包含回龙坝立交、横五路立交两座全互通立交。

该工程主线设计遵循科学大道总体风格,通过中央分隔带和两侧边坡的绿化景观打造,形成南北向景观走廊,展示了重庆科学城现代都市形象。作为重庆市市级重点工程,该快速路的建成极大地改善了周边居民的出行,有效地改善了区域落后的基础设施配置,有力地促进了周围区域的快速发展,实现了良好的经济效益和社会效益,标志着中国西部(重庆)科学城交通建设向前迈进了坚实的一步。

工程从 2016 年 2 月开始前期设计,2016 年 6 月完成施工图设计;2016 年 12 月开工建设,2021 年 12 月主体竣工并正式运营。

本刊声明

1. 来稿文责自负;对录用文章,本刊有权进行文字性修改或文字、图片、表格删节,如有异议,请事先声明。
 2. 来稿一经刊用,视为作者已将其复制权、发行权、信息网络传播权、汇编权等相关权利授予本刊。作者须与本编辑部签订《论文著作权授权使用协议》,并上传投稿系统,永久保存。
 3. 凡被本刊录用的文章,本刊均已通过万方检测系统进行查重。如本刊发表之文章涉及版权问
- 题,请版权人与本刊联系。

Urban Roads, Bridges & Flood Control

(Monthly)

Number 1,2024 (Total Number 297)

CONTENTS

MONOGRAPHS

Research Progress and Prospect of Domestic Gray-green Infrastructure Collaboration Strategy WANG Xin, ZHU Feng, FANG Yuan, MING Hui (1)

Abstract: From the perspective of building the urban life support system, the importance of grey and green infrastructure as well as grey-green collaboration is re-cognized. The research progress of grey-green collaboration in the three hot directions of water-related infrastructure, transportation infrastructure and energy infrastructure by systematically sorting out the relevant domestic studies, and then the concept, connotation, characteristics and theoretical framework of grey-green collaboration are proposed, which will provide the theoretical support and practical basis for the subsequent refinement of the collaborative technology system. In addition, the limitations of the grey-green collaborative theory in the past research are discussed. And four-point prospects are proposed for the collaborative direction, collaborative technology, collaborative evaluation and collaborative digitalisation, which provide the corresponding suggestions for strengthening the infrastructure collaboration and solidly promoting the construction of ecological civilization.

Keywords: municipal infrastructure; green infrastructure; grey-green collaboration

SPECIAL TOPIC ON CARBON EMISSION REDUCTION

Exploration and Practice of Urban Road Technology Elements Based on Concept of "Green and Low Carbon" WANG Binqiang, ZHENG Weiguo, YUAN Wei, MA Yulin (9)

Abstract: Under the background of "green and low carbon", in order to study the design method of "green and low carbon" urban road, firstly from the concept of "green and low carbon", the key technical elements of safety, ecology and low carbon in the full life cycle of urban roads are explored. And then taking a certain urban road as a case, the application techniques and design techniques of key technical elements of "green and low carbon" urban roads are set forth in order to provide the useful references for similar projects.

Keywords: green and low carbon; urban road; design

Concept and Framework of Carbon Neutral Measures System for Urban Road Traffic BU Zhengtao (13)

Abstract: The current situation shows that the urgency of carbon governance has never been so clear and urgent. Urban road traffic still faces the major challenges in meeting the scheduled carbon targets on time. In order to clarify the relationship between various measures, paths or methods, a clear governance framework is built, and the key path of research and practice is grasped so as to facilitate more effective carbon neutral action. By using the methods of literature study, statistical analysis, induction and deduction, the systematic solution of urban road traffic and the basic framework of carbon neutral measures subsystem are studied and put forward to defines the key lines from the system, subsystem and subsystem to key components. Two main negative emission measures in the carbon neutral measures subsystem are further analyzed, and the decisive role of negative emission subsystem in realizing the zero carbon emission state of urban road traffic is emphasized. The conclusion can provide the reference for the construction of carbon neutral measures system

in other industries or fields.

Keywords: carbon neutrality; zero emissions; carbon sink; carbon capture

Research on Carbon Emission Calculation and Carbon Reduction Technology in OGFC Production Process

..... LING Hongwei, ZHENG Xiaoguang, YAN Guojie, LU Wenliang (19)

Abstract: Aimed at reducing the carbon emission in the process of design, production, construction and maintenance of asphalt concrete pavement, the carbon emission calculation method of OGFC asphalt mixture in the production process including raw material preparation, raw material transportation to the production base and mixing stage of the mixture is studied. The production process of OGFC asphalt mixture for drainage asphalt pavement is divided into two stages of material preparation and mixture production and mixing. Based on the mix design, material preparation scheme, production process, etc. of the mixture, the carbon emissions of each stage within the system boundary are calculated by using the emission factor method. According to the proportion of carbon emissions in each sub item, the appropriate carbon emission reduction measures are analyzed and proposed. Taking Shanghai Pudong New District High-class Road Jinhai Road Reconstruction Project as an example, the practical application of the carbon emission calculation method and carbon emission reduction technology proposed in this study is analyzed. The results show that the carbon emission reduction effect is remarkable.

Keywords: OGFC; carbon emissions; carbon reduction; emission factor method; computational formula

Calculation on Carbon Emission and Analysis on Sensitivity of Urban Road Based on LCA

..... NIU Kai, ZUO Guiqiang, ZHANG Xingyu, ZHU Xiaodong (23)

Abstract: The calculation and analysis of urban road carbon emissions is a key measure to serve the "double carbon" goal and promote the sustainable development of transportation. Based on the Ecological Restoration and Quality Improvement Project of Guangyang Avenue in Chongqing, a carbon emission calculation model of urban road in construction stage is built based on the full life circle evaluation method. According to the calculation result of the model, the sensitivity analysis of key input parameters of carbon emission of newly built urban roads is carried out. The main influencing factors of carbon emission are identified from the perspectives of construction materials, construction machinery fuel and electricity, which provide the theoretical and technical support for the proposal of carbon emission reduction strategies and contributed to the green development of road construction from the design and construction process.

Keywords: full life cycle; carbon emission; urban road; sensitivity

Calculation and Analysis of Carbon Emissions from Urban Roads

..... YU Xifan (27)

Abstract: Based on the evaluation method of the full life cycle of urban roads, the principles and ideas for calculating the carbon emissions of urban roads and supporting facilities are proposed. The calculation model of carbon emission of urban roads and supporting engineering in three stages of "construction stage, operation stage and demolition stage is built. Through the classified statistic of the energy consumption and carbon emission factors in the different stages, the carbon emission and carbon sink of the full life cycle of urban roads are quantitatively analyzed. Through the practical examples, the basic steps of the proposed carbon emission calculation model in carbon peaking and carbon neutrality analysis and the data needed to be collected are discussed in order to provide the technical reference for the subsequent urban roads and other municipal infrastructure construction projects to participate in carbon emission trading, carbon footprint and other works.

Keywords: urban roads; full life circle; carbon emission; carbon emission factor

Research on Carbon Emission Reduction Calculation and Characteristic Law of Tianjin-Shijiazhuang Expressway

..... HE Jia, ZHU Xiaodong, ZHANG Xingyu, CHEN Yonghao (30)

Abstract: Based on the new situation of the development of dual-carbon goal, the focus is on research of the

carbon emission calculation in the construction stage of green roads. Relying on the Tianjin West Section Project of Tianjin – Shijiazhuang Expressway, the carbon emission calculation model is built to achieve the quantitative calculation of carbon emissions in the construction of green road with the different granularities from the multiple levels, and the emission characteristics are analyzed. The statistics shows that the materials with the greater carbon emission are the cement, steel and quicklime, which are accounted for 32.27% , 41.09% and 23.48% of the total carbon emissions of the materials. The total proportion is over 95%. The material with the greater consumption is mainly mineral soil, which is accounted over 85% of the total consumption. The Rotary drilling RIGS and dump trucks are the largest emitting mechanical equipment, which are accounted for 22.28% and 19.84% of the total emission, and accumulatively over 40% . The machine with the largest consumption is electric hoist. The number of consuming stations is accounted for 20.99% of the total number of stations.

Keywords: carbon emissions; calculation model; highway; green

ROADS & COMMUNICATION

Reflections on Construction of Changsha Backbone Road Network towards 2035 SHI Xiao (35)

Abstract: The 2015 version of Changsha backbone road network planning focused on the "one-axis, two-belt and multiple-center" urban development direction and the "one-main, two-secondary and five-group" urban spatial pattern is developed. The backbone road structure is composed of "two-ring four-horizontal seven-vertical twelve-shoot" expressways and "five-horizontal five-vertical" express roads. Combined with the overall plan of Changsha to build an emerging national central city, and a demonstration city of high-quality development in the central region and metropolitan area construction, with the continuous expansion of urban space, the construction of "three highlands" and the major transportation facilities such as Huanghua Airport and the Yu-Chang-Xia High-speed Railway is started. For Changsha, the construction of backbone road network is required to re-examine. To support and respond to the development opportunities brought by the multiple strategies, it should be to comprehensively upgrade the energy level of city, comprehensively radiate Changzhutan and comprehensively promote high-quality development.

Keywords: expressway network; backbone road network; express road; highway

Research on Planning of Transportation System for Shanwei Comprehensive Bonded Zone LONG Jiayan (40)

Abstract: The comprehensive bonded zone has the special requirements for the monitoring and management, the entrance and exit, and the traffic organization due to its functions of bonded, import and export. By sorting out and studying the planning situations of present comprehensive bonded zones in Guangzhou anf Shenzhen, and combined with the practical conditions of Shanwei Comprehensive Bonded Zone, the relevant planning scheme is proposed from the aspects of planning the internal road network, setting the entrance and exit, layout of traffic facilities, and the traffic organization to make the planned traffic system able to fully play its service functions so as to support the development demand of Shanwei Comprehensive Bonded Zone.

Keywords: comprehensive bonded zone; internal road network; entrance and exit; traffic facilities; traffic organization

Research on Causes and Countermeasure for Traffic Congestion in Jiangning District HE Ruimei (43)

Abstract: Based on multi-source traffic big data analysis, the traffic congestion situation of Jiangning District is systematically evaluated from the travel demand, land use layout, traffic system and other aspects so as to identify the causes of traffic congestion and accurately grasp the crux of traffic. Learning from the experience and practice of the advanced areas, the focus on the congestion management is promoted from ensuring "smooth traffic flow" to improving "vehicle efficiency" and "human experience". With the healthy development, improving supply and demand regulation as the core strategy, the control countermeasures for the traffic congestion are drawn up from six aspects of land development, rail transit, road network system,

conventional bus, slow traffic and parking system.

Keywords: transportation governance; healthy development; demand regulation

Design of Overall Scheme for Shengang Avenue (West Suitanghe Road – Hucheng Ring Road) Reconstruction Project DONG Li, NIU Jianfeng (48)

Abstract: With the development of economy and society, the demand for urban road reconstruction and expansion is increasing. The reconstruction and expansion of road should meet the new functional orientation, ensure the new design speed and take into account the status quo of the existing distributed transportation system. In the Shengang Avenue (West Suitanghe Road – Hucheng Ring Road) Reconstruction Project, by analyzing and studying its functional orientation and construction conditions, and combined with the requirements of the *Guidelines for Design of High-quality Municipal Traffic Infrastructure in Nanhui New City* and the traffic flow forecast results, the overall scheme of the reconstruction project is studied and designed. The obtained results can provide some engineering experience and design reference for the application of the above *Guidelines* in the practical, and the reconstruction upgrading of urban main roads.

Keywords: Shengang Avenue (West Suitanghe Road – Hucheng Ring Road); reconstruction of urban trunk road; traffic flow prediction; overall scheme; node scheme

Study on Node Scheme of South Interchange and West Outer Ring Expressway in Jian LUO Xiongiong (54)

Abstract: With the gradual acceleration of urbanization in China, the scope of urban construction starts to expand outward. In the early construction, The gateway of expressway in the periphery of city has been close to the new urban construction and development boundary, and is gradually integrated with the expressway outside the city, which will produce the multi-way intersections with the superposed expressway gateway and urban rapid traffic demand. The five-road intersection is formed by the south interchange and the west outer ring expressway in Jian. By analyzing the functional localization and traffic demand of the node, combining with the development stage of urban planning, the reasonable scheme is demonstrated in order to provide the experience for the same type of urban multi-road intersections.

Keywords: five-road intersection; expressway; expressway gateway; interchange

Research on Length of Acceleration Lane for Large Vehicles on On-ramp of Interchange LI Min, SU Lixiao, LI Nana, CHEN Tingting (58)

Abstract: Whether the design of the acceleration lane length is reasonable is very important to the safety of vehicle operation. In order to improve the rationality of the acceleration lane length design on the on-ramp of interchange and the safety of the vehicle operation, by analyzing the traffic characteristics of the vehicles in the merge influence area, based on the modified second-order Erlang time headway distribution model, the calculation model of acceleration lane length for the large vehicles at different slopes ($-2\% \leq i \leq 2\%$) and different specific powers (8~12 kW/t) is built to study the length of acceleration lane for the large vehicles under the different slopes and different specific powers. The research shows that the slope, the specific power and the length of the acceleration lane are all proportional, which can provide a reference for the revision of the relative specifications on the length of the acceleration lane at expressway interchanges for large vehicles.

Keywords: large vehicles; interchanges; acceleration lane length; slope; specific power

Design Strategies and Cases of Turnaround in Express Reconstruction of Urban Road GAO Wangsheng (62)

Abstract: In the express reconstruction of urban roads, some small traffic light intersections will often be changed into the right-in and right-out intersections, and the rigid traffic demand of residents along the line will need to take the form of turn around. Therefore, the setting of turnaround intersection is more important. The front and rear traffic lights can be used to turn around, and the turnaround intersection can be set in the road section. And the air turn lane can be also set in the road section if permitted. By studying the relative situation of setting the turnaround intersection in the road section, the design strategies of turnaround are put

forward. The relevant case analysis is given. It is hoped to provide some useful reference for solving the problem of vehicle turnaround in the express reconstruction of urban roads.

Keywords: road turnaround; express reconstruction

Research on Road Traffic Connection Planning for Huangdao End of Qingdao Second Undersea Tunnel WANG Yalong, WANG Jichang (65)

Abstract: The second undersea tunnel in Jiaozhou Bay of Qingdao connects the old Huangdao with the east coast urban, and is of great significance in strengthening the traffic links between the east and west banks of Jiaozhou Bay, which has been started to construct. In order to meet the demand for traffic relief at the Huangdao end of the tunnel and improve the traffic operation efficiency, the traffic connection scheme of the skeleton road networks at the end of Huangdao of the second tunnel is studied. Based on the analysis of the current situation and planning conditions of the Huangdao area, the travel demand across the sea is predicted. And the traffic impact of the tunnel on the regional road network is analyzed. The suggestions for the improvement and optimization of the Huangdao terminal connection road and the construction timing are proposed. Finally, the overall scheme for upgrading Huaihe Road, Shugang Elevated Road and Huanghe Road is studied, which aims to provide the reference for the subsequent road construction.

Keywords: Qingdao second undersea tunnel; traffic connection; traffic impact; overall scheme

Discussion on Integrated Design of Urban Roads and Streets MAI Jiao (70)

Abstract: As the urban public spaces, the road sidewalks and the building retreat range of urban road jointly bear the needs of road infrastructure construction and urban ecological corridor layout, and are also the carriers for the citizens to travel on foot, facilitate life and communicate with neighbors, which are closely related to "infrastructure, people's livelihood" and other issues. Xiongdong Community A is a livable living unit dominated by residence, where the mixed use of urban construction land in different degrees and ways is encouraged to guide the intensive and efficient use of land and promote the integration of urban functions. A modern city with "nearby work and residence and multiple functions" is created and the integrated design of street is carried out in planning and design.

Keywords: building retreat; street integration; footpath

Research on Balance and Guarantee of Resource Elements in Construction of Road Traffic Project WU Yangyang, ZHENG Shiwen, ZHANG Gong (74)

Abstract: In order to promote the stability and implementation of major transportation engineering schemes and strengthen the support and guarantee of infrastructure construction, the national and industrial competent departments have put forward the high standards for the guarantee of resource elements. By investigating the coordination process and balance scheme of resource elements of major road traffic construction projects in Shanghai during the 14th Five-Year Plan period, the resource elements are classified into eight categories of water resources, green space, forest land, land, houses, pipelines, environmental protection and other facilities. And the main contents and balance ideas of element guarantee are summarized according to the project promotion stage so as to form a reasonable, scientific, efficient and coordinated resource element balance and guarantee scheme. The obtained scheme can be referred for the construction of road traffic projects in the future, and provide the reference for the guarantee of resource elements in the construction of railway, shipping and other transportation infrastructures.

Keywords: road traffic; resource elements; balance and guarantee; coordination

Study on Optimization and Improvement Strategy of Urban Road Accessibility Facilities XU Zhihong (78)

Abstract: With the growth in the living standard, the requirements of the people for a better life are getting higher and higher, and the demand for urban road accessibility facilities is gradually shifting from "there" to "good". The construction of accessibility facilities urgently needs the high-quality development. By

investigating the common problems of accessibility facilities in urban roads, guided by the requirement goal of the people, the strategies to optimize and improve the accessibility facilities are put forward in order to lead the iteration of accessibility facilities from meeting the requirements of specifications to meeting the needs of high quality.

Keywords: urban roads; accessibility facilities; optimization and improvement; service quality

Analysis on Factors Influencing Mechanics Characteristics of High Slope Reinforced by Anti-slide Piles ZHANG Guiqin (81)

Abstract: Anti-slide pile is a kind of common retaining measure for high slope. In order to study the main factors affecting the force performance of anti-slide pile, based on Abaqus numerical simulation, the influence of pile diameter, pile length of embedded segment and pile position on the distribution of internal force of pile is studied. The results show that (1) the pile bending moment and shear force are positively correlated with pile diameter. And the anti-slide pile can significantly improve the stability of high slope, and increasing the diameter of pile is more beneficial to the stability of slope. (2) The embedded depth of anti-slide pile also has an effect on the distribution of internal force of pile. In particular, the longer the embedded section is, the greater the internal force of the pile is, but increasing the length of the embedded section can effectively reduce the displacement of the pile top. (3) The influence of pile location on the internal force of the pile shows that the closer the pile is to the toe of the slope, the smaller the internal force of the pile and the displacement of the pile top. Therefore, when the anti-slide pile is designed, the pile force and the pile displacement should be considered comprehensively. The research results provide a useful reference for the engineering treatment of high slope.

Keywords: design of anti-sliding pile; pile diameter; embedded section; numerical simulation

BRIDGES & STRUCTURES

Study on Wind Resistance Performance of Long-span Cable-stayed Bridge with Spatial Curved Pylon NIE Bin, WANG Dingquan, JU Xinlan, SUN Liming (85)

Abstract: It is very important for the wind resistance of bridge because of its long span crossing river and high wind speed at the bridge location. With the bridge structure becoming more and more complicated, the general formulas in specifications cannot be applied to the calculation of wind resistance. Therefore, the wind resistance performance of a river-crossing curved-pylon cable-stayed bridge with a main span of 238 m is studied. The research includes that the virtual wind tunnel technology is used to obtain the static aerodynamic coefficients, aerodynamic derivatives of the main girder and the simulated wind load of the bridge pylon sections. The flutter performance of the main girder is tested by the three-dimensional flutter stability analysis method. The vortex-induced resonance of the main girder is numerically simulated to obtain the amplitude-wind speed curves under the different wind attack angles. The displacement response of the structure under the static wind load is analyzed. The results show that the wind resistance performance of the bridge meets the specification requirements.

Keywords: spatial curved pylon; cable-stayed bridge; wind resistance performance; numerical simulation

Design Essentials of Self-anchored Suspension Bridge for Hongtang Bridge CAI Liang (89)

Abstract: Located in the western suburbs of Fuzhou, crossing Wulong River, Hongtang Bridge is required to widen and reconstruct on its original location. The new main bridge is a self-anchored suspension bridge. Based on the requirements of people's livelihood to ensure open traffic during the construction period, the design scheme of three-stage transverse assembling construction is proposed. The self-anchored suspension bridge is built in China which realized the aim of open traffic in the reconstruction project. The flat curved anchoring scheme of the main cable is firstly put forward to improve the management and maintenance conditions of anchorage zone of the main cable. The finite element programs are used to simulate and analyze

the key processes in the operation and construction periods of the bridge. Based on the analysis results, the construction and control are guided. The site monitoring data shows that the calculated values are consistent with the measured values.

Keywords: self-anchored suspension bridge; open traffic; three-stage transverse assembling construction; flat curved anchorage of the main cable; steel-concrete composite bridge deck

Overall Design of Qilianshan Road Bridge across Wenzaobang Creek in Shanghai TIAN Zhousong (94)

Abstract: The Qilianshan Road Bridge across Wenzaobang Creek is located in Baoshan District of Shanghai, and connects the current broken road between Putuo District and Baoshan District, and spans the Class III channel Wenzaobang Creek. The main bridge of Qilianshan Road Bridge across Wenzaobang Creek is a single-pylon double-plane composite beam cable-stayed bridge. The layout of its spans is (65+132) m. Its structural system is the pylon-beam consolidation and the pylon-pier separation. The main beam is the steel-concrete composite beam. The main pylon is a sail-shaped pylon. The appearance is beautiful. The span proposal, general layout, structural system, structural design, and determination principle of finished cable force of the Qilianshan Road Bridge across Wenzaobang Creek are specially introduced.

Keywords: single-pylon cable-stayed bridge; composite beam; structural design

Analysis on Design and Application of Steel-UHPC Composite Girder in Long-span Bridge SHEN Libin, LIU Xiaoluan (98)

Abstract: Jiaxing Urban Expressway Ring Line Project crosses the old ground bridge (Longfeng Bridge) of Beijing-Hangzhou Grand Canal. It is proposed to use the steel-UHPC composite girder scheme. Compared with conventional prestressed concrete continuous beams, corrugated steel web continuous beams and bowstring arch bridge schemes, the aspects of economy, construction scheme and durability are compared and analyzed. The results show that steel -UHPC composite beams have obvious advantages and good application prospects in long-span bridge projects.

Keywords: bridge engineering; ultra-high performance concrete; composite girder; economy

Study on Design and Numerical Simulation of 25-m Span Steel Plate Composite Beam of an Expressway HUANG Yuchen (102)

Abstract: The steel plate composite beam structure has the advantages of lightweight, high strength, fast construction, green and environmental protection in the whole life cycle, which is one of the effective ways to realize the industrial construction of bridge superstructure. Based on the engineering background of a 25 m medium-span steel plate composite beam of an expressway, the structural design is firstly introduced, and then the structural stress characteristics based on the finite element numerical simulation software is studied. The fundamental frequency of the structure and the stress of the steel plate under the most unfavorable condition are calculated. The calculation results can provide a reference for similar structures.

Keywords: steel plate composite beam; industrial construction; structural design; finite element numerical simulation

Study on Design Method of Joint Connection Reinforcement of Loaded Steel Truss Bridge CHEN Zuhe (105)

Abstract: The joint connection of loaded steel truss bridge is reinforced under stress, which is faced with the problems that the reinforcing member and the original component are not synchronized, the original component cannot be arbitrarily removed, and the force transmission path is complex after reinforcement. The principle of "strong joint, weak rod body" is often adopted in the design of steel truss bridge. When the joint is connected and reinforced, to connect the rod body often needs to be reinforced together. The two are inseparable. The connection structure plays a key role in the force transmission effect and its effectiveness. Based on the overhaul project of Songpu Bridge in Shanghai, the joint connection and

reinforcement design of loaded steel truss bridge is studied according to the principle of controlling the existing original components to meet the requirements of current specifications. Firstly, four kinds of joint connection reinforcement schemes are analyzed. It is pointed out that the joint connection reinforcement design of load steel truss bridge should avoid the removal of the original connectors as far as possible, and should be considered as a whole with the connection structure of the rod reinforcement. Then, based on the construction scheme 4, three kinds of calculation methods and processes of joint connection reinforcement are given. And the differences of the three methods are illustrated by an example. It is proposed that the joint connection reinforcement should provide the sufficient support stiffness for the force transmission of the rod reinforcement in order to avoid the transfer of the internal force of the reinforcing member to the original member at the end of the rod. Finally, through the test results of the finished bridge, the design is corrected, and the correctness of the design method is demonstrated.

Keywords: loaded steel truss bridge; joint connection reinforcement; batch stress; support stiffness; equal strength design

Study of Division of Box Chamber for Steel-concrete Composite Beam Wide-deck Bridge HU Xin, LUO Jin, PAN Chuanyin (111)

Abstract: In order to study the optimal division method of the box chamber for steel-concrete composite wide-deck bridge, respectively from the perspective of longitudinal stress of the bridge, transverse stress of bridge deck and related engineering measures, the control variable method is used to calculate and analyze the case of composite beam according to the current bridge design specifications. The economical and reasonable method of dividing the box chamber of the composite beam wide-deck bridge is given, and the suggested parameter values are obtained.

Keywords: steel-concrete composite beam; division of box chamber; effective width coefficient; analysis on deck stress

Creative Conception and Overall Design of Qingdao West Coast Coral Shell Bridge YU Lei, LI Yongjun, QIANG Weiyi (116)

Abstract: Qingdao West Coast Coral Shell Bridge connects the West Coast Binhai Avenue and Mingren Island (artificial island). Its function is positioned as a coastal landmark landscape bridge of Qingdao. The total length of the bridge is 290 m. The main bridge is a (40+70+70+40)-m steel structural continuous box girder. The steel structural spatial curved special-shaped arch is constructed on the girder, and the approach bridge is (35+35)-m steel structural continuous box girder. Combined with the urban culture and bridge environment of Qingdao, through the novel creative ideas and innovative design methods, the structural design and landscape design are integrated. The Coral Shell Bridge is completed as expected, and is becoming a landmark landscape bridge and Internet celebrity bridge in Qingdao and even the whole country. The creative conception, overall design and construction of the steel structure of the bridge are specially introduced.

Keywords: landscape bridge; overall design; creative conception; Coral Shell Bridge; BIM forward design; steel structure processing

Stability Analysis and Finished Bridge Test of Leaning-type Steel-box Arch Bridge GU Xiaoxi (120)

Abstract: The leaning-type arch box bridge is a spatial stress system composed of leaning arch, cross-brace and tie beam. Taking a leaning-type steel-box arch bridge with the main span of 145 m as the engineering background, its stability bearing capacity is studied and analyzed. The finite element analysis and the static and dynamic tests of the finished bridge show that this kind of bridge has the enough stability bearing capacity and good mechanical behavior.

Keywords: bridge; arch bridge; leaning arch; stability; design

Study on Scheme Design of Arch Bridge across Water Area in Mountainous Park WU Lianbo (123)

Abstract: In the city, the bridge is not only the link of traffic, but also the expression of architectural aesthetics. Especially when the bridge is located in the park, it will become the composite landscape to improve the regional landscape quality, improve the ecological environment and beautify the city image. Taking the arch bridge crossing Gaofeng Reservoir in Yangtaishan Forest Park of Shenzhen City as the research object, its scheme selection, structure and construction scheme are analyzed. The process reflects the characteristics of innovation, environmental protection and economy, and a good combination of function and art landscape is realized. The bridge has the characteristics of high bridge position, large longitudinal slope and deep ground bearing layer. Aiming at the relevant research on this bridge, some references are provided for the design and construction of similar bridges in the future.

Keywords: mountainous park; bridge across water; deck-type continuous arch; thrust arch foundation

Discussion on Landscape Design Method of Bridge Group in New Urban Area of Xiongan ZHENG Yongxing, XU Anning, WANG Hang (127)

Abstract: In recent years, the construction of new urban areas has been developed rapidly. The landscape planning and design of bridge group in the new area should be carried out simultaneously with the overall planning and design of the new area. The landscape design of the bridge group should consider the overall landscape planning and design, the main structure landscape design and the ancillary landscape design on the bridge in combination with the regional planning, traffic functions and cultural landscape. Taking an area of Rongdong in Xiongan New Area as the project background, the landscape planning and design of the bridge group in the new area are introduced mainly in the considering factors, planning and design contents, and implementing approach of design. The methods and approaches of landscape design of bridge groups in new urban areas are summarized and discussed.

Keywords: new urban area; bridge group; landscape planning and design

Study on Scheme of Qihe Road / Huaxiu Road Pedestrian Overpass ZOU Cheng (131)

Abstract: The general situation of Qihe Road / Huaxiu Road Pedestrian Overpass Project is introduced. Its main feature is that a new overpass will be built after the road is constructed. Limited by proximity to neighborhoods, schools, pipelines, its construction cost is high and difficult. Under the condition that the Z-type scheme meets the main traffic demand, the cost will be reduced. The design scheme is explained in detail, and the experience accumulated will provide reference for the similar projects in the future.

Keywords: passenger overpass; scheme study; traffic demand

Design of Urban Pedestrian Corridor in Compact Space GUO Hongwei (134)

Abstract: With the continuous development and improvement of three-dimensional compact cities, the urban pedestrian corridors have become an important part of the urban pedestrian system. Taking the pedestrian corridor of Shishan Convention Center in Suzhou Hi-tech Zone as an example, its overall design scheme and curtain wall design scheme are discussed, and the stress of the steel truss structure is analyzed and calculated. The results show that the strength, deflection and natural vibration frequency of the steel truss structure of the pedestrian corridor meet the requirements of the code and ensure the rationality and safety of the overall structure.

Keywords: pedestrian corridor; steel truss; structural stress; natural vibration frequency

FLOOD CONTROL & DRAINAGE

Overall Design and Discussion of Flood Discharge Channel Project for Zhangjiachuan County ZHANG Yongfu, TONG Jingsheng, KANG Lianguo, MA Enze (138)

Abstract: In recent years, due to perennial seasonal rainstorm, the waterlogging in the built cities and parks has occurred frequently in the northwest China. The solution to this problem is mainly in the early stage of the construction of cities and parks. In the construction of flood drainage system in the park, not only the flood flow, but also the debris flow should be calculated. It is not only required that the drainage channel be laid smoothly, but also should follow the overall planning of the park, taking into account the impact of the existing buildings. Not only the crossing section of the flood drainage channel is calculated, but also the non-silting of the flood drainage channel is calculated.

Keywords: flood discharge; debris flow; line layout; non-silting calculation

Design of Ecological Revetment for Urban Road Rivers in Soft Soil Regions WEI Jungang, ZHANG Luming (142)

Abstract: During the construction process of Binhe Road and revetment along the Jingxi River in Shunqing District, Nanchong City, there is the thick soft plastic silty clay in the most sections of the river, which has the poor physical and mechanical properties and is extremely unfavorable for the road construction and revetment stability. Binhe Road is a proposed leisure landscape avenue. Therefore, under the premise of guaranteeing the safety of road and revetment in the project, the ecological needs are proposed. Based on the engineering geological conditions of the site, a slope-type ecological revetment form is selected, which uses the green concrete revetment and guest soil greening on the surface, and the gabion slope protection at the foot of the slope. Aiming at the thick soft plastic silty clay area, the cement soil mixing piles is used to carry out the reinforcing treatment. The monitoring results indicate that the overall stability and uneven settlement of the revetment scheme meet the requirements.

Keywords: slope-type ecological revetment; soft plastic silty clay; cement soil mixed piles; riverway; ecological revetment; design

Discussion on Key Problems in Tunnel Drainage Design LI Yuan (145)

Abstract: Urban under-cross tunnel is an important part of urban three-dimensional traffic, but there is no specific applicable design specification for tunnel drainage at present. Taking the drainage design of Wuzhen Avenue Tunnel in Tuxiang as an example, the horizontal relationship between tunnel drainage engineering and tunnel, road, electrical and other related majors is studied, and several key problems in the drainage design of anti-waterlogging measures, water collection system of pumping station and design of pumping station are summarized in order to further ensure the using safety of tunnel in the future.

Keywords: under-cross tunnel; tunnel drainage; pumping station; design; measures

Design of Upgrading and Reconstruction of Large Biological Aerated Filter in Wastewater Treatment Plant WANG Qiguang (149)

Abstract: Shenyang Xiannv River Wastewater Treatment Plant (WWTP) is a large-scale WWTP using the biological aerated filter. Its treatment scale is 400 000 m³/d. In the upgrading and reconstruction project, the existing secondary biological aerated filter is reconstructed into tertiary biological filter with denitrification function. And the settling tank with sand is used as advanced treatment unit, which makes the effluent quality is improved from the Class II standard to the Class I A standard specified in *Discharge Standard of Pollutants from Municipal Wastewater Treatment Plant* (GB 18918—2002). At the same time, through the construction of emergency treatment system, the expected goal of not stopping construction and not lowering emission standards has been achieved.

Keywords: biological aerated filter; upgrading and reconstruction; not stopping construction

Summary on Design and Commissioning of Precise Aeration System for Multi-stage AAO Wastewater Treatment Plant YING Jiguang, LIN Lifeng, WANG Yunyun (153)

Abstract: In order to better solve the problems of insufficient aeration, excess ammonia nitrogen in effluent,

excessive aeration and poor denitrification leading to excess total nitrogen and waste of energy consumption often encountered in the process of sewage treatment, taking the multi-stage AAO treatment process of a wastewater treatment plant in Shenzhen as a research object, the design and commissioning of the precise aeration system introduced into the biochemical tank are described, and the effectiveness of the precise aeration control system is analyzed and summarized according to the actual operation situation.

Keywords: multi-stage AAO; precise aeration system; dissolved oxygen; automatic control

Design and Operation of Wastewater Treatment Plant Expansion Project WANG Xingbin (157)

Abstract: The total design capacity of WWTP in a northern city is $18.0 \times 10^4 \text{ m}^3/\text{d}$, in which the design capacity of expansion project is $8.0 \times 10^4 \text{ m}^3/\text{d}$, and the effluent quality standard of WWTP is the first class A standard specified in *Discharge Standard of Pollutants for Municipal Wastewater Treatment Plant* (GB 18918—2002). According to the influent quality and discharge requirements, the process of "primary settling tank – multi-stage AO biochemical tank – high-speed air flotation tank – denitrification deep bed filter" is adopted in the design. The technological process of the expansion project, the design parameters of the main structures and the design characteristics are introduced, and the operation effects are analyzed. The actual operation data show that various indexes of the effluent can be all stable up to the standard. The average removal rates of COD, SS, $\text{NH}_3\text{-N}$, TN and TP are 88.90%, 96.24%, 97.31%, 78.00% and 92.87% respectively.

Keywords: wastewater treatment plant (WWTP); expansion project; technological process; design parameters; operation effect

Engineering Design of Domestic Sewage Treatment Quality Improvement and Efficiency Up-to-Standard Area in North Changqiao Street, Suzhou ZHAO Yongsheng, WANG Zhenzhong, WANG Xiaogang (160)

Abstract: The total area of the domestic sewage treatment quality improvement and efficiency "333" up-to-standard area project in the north section of Changqiao Street is about 665.92 hm^2 . There are 11 rivers and 234 rainwater outlets in the up-to-standard area, in which there are discharge phenomena in 36 rainwater outlets in sunny days. Through investigation, there are 20 communities with the problem of mixing the rainwater and sewage, which will be reconstructed for the separation of rainwater and sewage. The engineering investment is about 80 million yuan. After the completion of the project, the problem of sewage flowing into the river in the north section of Changqiao Street is solved. The water quality of the river in the north section of Changqiao Street has been improved, which provides the demonstration significance for the construction of sewage quality improvement and efficiency up-to-standard areas in the other regions.

Keywords: "333" up-to-standard area of quality and efficiency improvement for treatment of domestic sewage; separation of rainwater and sewage; demonstration effect

Research and Application of Sewage Treatment Scheme in Drinking Water Sources ZHAI Lin (164)

Abstract: Hanjiang River is an important drinking water source for the people in the three cities of eastern Guangdong. Its water quality safety cannot be ignored, and the treatment of domestic sewage in the water source area is particularly important and urgent. The sewage treatment scheme of Xianzhou Island in Chaozhou Section of Hanjiang River is studied. The selection, comparison and demonstration are carried out from the treatment effect, construction difficulty, maintenance difficulty, occupied area and the other aspects. The treatment scheme of "in-situ treatment + water reuse" is determined. The design and characteristics of the treatment scheme are introduced in order to provide the references for the sewage treatment in the similar drinking water sources.

Keywords: Hanjiang River; drinking water source; water reuse; design characteristic; study; application

MANAGEMENT & CONSTRUCITON

Discussion on Establishment and Application of New Comprehensive Maintenance Mode of Expressway Network DENG Shaowei, LIANG Weibin, XU Jie (169)

Abstract: Compared with the traditional maintenance mode, the new comprehensive maintenance mode is a replacement of the maintenance concept. Its core is always the establishment and operation around the "human construction", and it pays more attention to the publicity and guidance of participants through the management ideas such as collective concept, team consciousness and shared responsibility. Through the analysis of the current situation of the traditional maintenance mode, the definition and conceptual framework of the new comprehensive maintenance mode are put forward. The establishment of the elements, the mode operation, the efficiency evaluation, and the construction and supporting of the comprehensive maintenance base are discussed and guided. Combined with evaluation on an application case of ring expressway in Guangzhou, it is found that the new maintenance mode can improve the working efficiency and reduce the negative effects of maintenance process on the social traffic.

Keywords: new comprehensive maintenance mode; maintenance concept; establishment and operation, application example

Brief Analysis on Construction and Application of Supervision System for Water Conservancy Project Based on Big Data DENG Guomin (175)

Abstract: With the continuous development and application of big data technology, the development and progress of relevant industries have been greatly promoted. However, the most practitioners in the field of water conservancy engineering are still relatively unfamiliar with the big data technology, especially unfamiliar with the operation principle and application status of the water conservancy engineering supervision system based on big data technology. Through a great deal of investigation, on the basis of sorting out the concepts of big data and water conservancy big data, the construction and application of the big data supervision system framework in water conservancy engineering are discussed and analyzed. It is found that the application of big data technology in water conservancy engineering also tends to be macro-framed or is focused on the individual requirements in order to provide some reference for the water conservancy industry personnel to understand and promote the development of big data technology.

Keywords: big data; water conservancy; supervision system; framework; build; demand; application

Study on Construction Technology and Application of Rectangular Pile ZHANG Ai (178)

Abstract: At present, the application of rectangular pile has been developed to some extent. Based on the engineering practice of the rectangular piles in Thailand Rama-Bangkok West Outer Ring Expressway Project, the key construction technologies and application of rectangular pile are analyzed and discussed. The control measures for each key construction link in the construction process of rectangular pile are given. And two special and new construction technologies of rectangular pile are introduced.

Keywords: rectangular pile; key technology; control measures; special rectangular pile

Study on Application of Underground Diaphragm Wall Enclosure as Permanent Stressed Structure for of Anchored Foundation Pit XUE Lei (182)

Abstract: With the further utilization of underground construction space, the application range of underground diaphragm walls has been expanding downward. At present, the underground diaphragm walls have been as the permanently stressed structures to use in the main structure of buildings and structures. Based on the practice of anchored foundation pit of underground diaphragm wall in Shanghai, the application of diaphragm walls as permanently stressed structures is discussed, and the key

construction techniques of framed diaphragm walls, pile-wall occlusion diaphragm walls and circular diaphragm walls are elaborated. The results show that permanently stressed diaphragm wall structures are usually special, partly in the form of special structures and partly in the form of special joints. Under the current construction technology, it is possible to realize the underground diaphragm wall as a permanently stressed structure.

Keywords: framed diaphragm wall; pile-wall occlusion type underground diaphragm wall; circular underground diaphragm wall; anchored foundation pit

Construction Technology of Underground Diaphragm Wall Limited by Space HE Hua (186)

Abstract: The construction process of underground diaphragm wall will be restricted by the construction environment, and the space limitation is one. Based on the engineering practices, the construction technology of underground diaphragm wall limited by the space is studied. According to the different constraints, the space constraint conditions of underground diaphragm wall grooving are divided into three categories, i.e. low clearance restrictions, restrictions in the pilot tunnel and the obstacle restrictions. The three types of restricted conditions and the corresponding construction techniques of underground diaphragm walls under the restricted conditions are described, and the construction of underground diaphragm wall under low clearance and obstacle limitation is illustrated.

Keywords: underground diaphragm wall; slow clearance grooving; grooving in pilot tunnel; lateral grooving

Problems and Protective Measures of Trenchless Power Pipeline Undercrossing Rivers FAN Chunying (189)

Abstract: Combined with the experience of river-related demonstration of the power supply project supporting the power pipe, two typical cross-sections of power pipeline trenchless directional drilling technology undercrossing the river are analyzed and discussed. The problems existing in the process of power pipeline projects undercrossing river and the safety hazards to the river embankment structure are proposed. The suggestions for the protection measures of the river embankment structure are put forward. It is of great significance to maintain the safety of river embankments, maintain the stability of river regime, ensure the smooth flow of flood discharge and water conveyance, and ensure the safety of urban flood control.

Keywords: electric power pipeline; river; problem; measures

Research on Development Model of Investor+EPC+Operation for Regional Comprehensive Development Project LI Ligan, WANG Xiaonan (192)

Abstract: The amount of comprehensive development projects in regional areas is huge. The Chinese government is increasingly paying attention to the hidden debts of local governments. It is difficult to carry out the high-quality construction and reconstruction of large areas solely relying on the government financial funds. Based on the characteristics of the investor + EPC + operation model, the applicability of this model in the three stages of comprehensive development in the area is analyzed. In the investor + EPC + operation mode, the contractors can usually solve the project construction funding issues in the early stage of project construction, efficiently complete the project construction in the medium term, and provide the urban operation services in the later stage, and assist in the industry introduction to promote the high-quality development of regional construction.

Keywords: regional comprehensive development; investor + EPC + operation mode; development mode

STUDY ON SCIENCE & TECHNOLOGY

Study on Design Method of Slope Supporting System of Anchor Cable Frame Beam and Anti-slide Pile under

Deformation Compatibility Condition GUO Penghui (194)

Abstract: At present, the deformation compatibility is not considered in the slope support system of anchor cable frame on slope surface and anti-slide pile at slope toe in design practice. There is the risk of sequential failure of two protection forms in the supporting structure. The deformation compatibility formula of anchor cable + anti-slide pile supporting system is derived through establishing the relationship between slope deformation and deformation of anchor cable and anti-slide pile. Combined with the deformation calculation method of anchor cable and anti-slide pile, the design method of anchor cable + anti-slide pile supporting system under the condition of deformation compatibility is proposed. It is proposed that the low-stiffness anchor cable should be used and the high prestressed locking value of anchor cable is set as far as possible when the sliding force cannot be accurately determined. At the same time to guarantee the anchor cable fully to play the anchorage force, its adaptability to deformation should be enhanced, and the deformation compatibility of anchor cable frame + anti-slide pile supporting system should be improved.

Keywords: anchor cable frame; anti-slide pile; deformation compatibility; design method

Influence of Soil-Base Slab Dynamic Interaction on Seismic Response of Pile Foundation Bridges in Sandy Soil
Site YANG Dang, WANG Jingcheng, YE Aijun (199)

Abstract: Soil-pile dynamic interaction is an important issue in the seismic response analysis of pile foundation bridges. For a bridge with the low-pile base slab foundation, the base slab is buried below the earth surface, and there is also dynamic interaction between soil and base slab. At present, the influence of soil-base slab dynamic interaction is generally not considered in seismic response analysis, and is rarely studied in the literature. Therefore, based on the p-y curve method, a soil-structure integrated pile foundation single-pier model is established by using OpenSees finite element analytical procedure. 40 actual rock site seismograms are selected as input to carry out the seismic response analysis of pile-supported bridge considering the soil-base slab dynamic interaction. The results show that the basic period of structure will decrease after considering the soil-base slab dynamic interaction, and the curvature of pier-bottom section will obviously increase and the curvature of pile-head section will greatly decrease, but decrease of displacement at the pier top can be neglected.

Keywords: bridge; foundation of group pile; seismic response; soil-structure integrated model; soil-base slab dynamic interaction

Analysis on Mechanical Response of Composite Pavement under Different Seasonal Effects
..... GUO Chengchao, ZHANG Shunjie, YANG Xiaodong, YAN Weihong (205)

Abstract: In order to study the mechanical response of composite pavement in different seasons, taking an airport reconstruction project in the Central China as the project background and using the three-dimensional finite element software, a finite element model of pavement is established to analyze the mechanical response of composite pavement under the influence of temperature. Compared with the airport monitoring data, the accuracy of the model is verified. The study has found that the depth range of the pavement affected by the atmospheric temperature is within 0.56 m. Compared with the atmospheric temperature, the peak temperature of the pavement is much greater than the peak temperature. The temperature variation trend between the different structural layers within the pavement is same. With the deepening of the pavement depth, the temperature peak gradually decreases, and there is a time delay phenomenon. In the different seasons, the deformation of the pavement caused by the same aircraft type is different, which indicates that the temperature has an impact on the stress on the pavement, and in which the strain value generated by the concrete layer in winter is reduced by about 74% compared to that in summer. The change is greatly obvious.

Keywords: road engineering; finite element model; temperature field; thermal coupling; airport monitoring

Numerical Analysis on Ultimate Bearing Capacity of U-type Twin-PBL Shear Connector
..... LI Zhiyong, WANG Yinhui, ZHANG Qiankun, WANG Songlin (209)

Abstract: According to the characteristic that the bearing capacity of Twin-PBL shear connector can be improved by the end-bearing concrete, a new type of discontinuous U-type Twin-PBL shear connector able to be used for prefabricated steel-concrete composite structure is proposed. Through the nonlinear numerical simulation analysis of three groups of push-out test specimens, the ultimate bearing characteristics and bearing capacity of this new hear connector are studied. The results show that the ultimate bearing capacity of U-type Twin-PBL shear connector is significantly higher than that of common pressure-bearing type Twin-PBL shear connector, and the improvement mainly comes from the increase of end-bearing area of concrete. Therefore, the improvement of concrete strength has a significant influence on the bearing capacity of this shear connector. However, the contribution of concrete tenon and penetrating steel to the bearing capacity has no obvious change. Therefore, the computational formula of the bearing capacity of U-type Twin-PBL shear connector is presented by modifying the area of the end-bearing concrete.

Keywords: U-type Twin-PBL connector; steel-concrete composite structure; numerical simulation; ultimate bearing capacity

Disturbance Control of Deep Excavation in Soft Soil Based on Displacement and Axial Force
..... WEI Junjie, WANG Yingyi, RONG Jian, XU Weizhong, XIE Guangzhou (214)

Abstract: Aiming at the uncertainty of final displacement due to construction disturbance, and its environmental risk in hydraulic servo feedback control of pressure control of steel bracing system in foundation pit engineering of soft soil layer, an intelligent control method of hydraulic servo for steel bracing, with disturbance displacement control as the core and integrated optimization of displacement and bracing axis force, is established. Based on the allowable displacement constraint, an integrated optimized intelligent control mode of linear displacement variation and support force is proposed, and the corresponding real-time pressure regulation technology for the whole construction process is established. A feedback system based on high-precision laser ranging and hydraulic monitoring synchronization is constructed, and the random data error processing method of shape function is adopted to effectively prevent the feedback control errors and risks caused by random errors. The result shows that its reliability and applicability are verified by model test. The displacement control effect is remarkable through the demonstration application of Shanghai World Expo Channel Project.

Keywords: integrated optimization of displacement and bracing force; linear displacement control mode; synergistic pressure regulation; micro-disturbance control

Study on Simulation of Soil Freezing Temperature Field Based on Matlab PDE Toolbox
..... YAO Yuanhong, ZHANG Zeyu, LIU Yongcheng (221)

Abstract: The freezing temperature field of soil in the model tank is analyzed and simulated by Matlab PDE tool, and the accuracy of the simulated value is verified. Firstly, through the reasonable boundary assumption, the three-dimensional problem of frozen heat conduction of soil in model tank is transformed into two-dimensional space. Then, the Matlab PDE tool is used to simulate and compare the simulated temperature and measured temperature of the temperature measurement points. The results show that the heat conduction of soil in freezing temperature field can be simulated by Matlab PDE tool, and the operation is simple and easy to grasp. The accuracy of the simulated value of the temperature measuring point is related to the distance from the boundary and the freezing time.

Keywords: Matlab PDE tool; heat conduction; temperature field; frozen soil

Study on Control Distance of Safe Lane Change in Expressway Maintenance Engineering
..... LI Dapeng, CHEN Longting, JIN Jianding (224)

Abstract: In order to explore the control distance of vehicle driving under the condition of safe lane change probability in expressway maintenance engineering, the safety constraints of vehicle following during lane change are analyzed, and the combination characteristics of vehicle lane change probability are studied by using the probability theory and the traffic flow theory. The relationship between the control distance of safe lane change and the probability of successful lane change is derived. Combined with the calculation of an example, the consistency between the derived model and the recommended and calculated values in the specification is verified.

Keywords: probability theory, traffic flow theory, safe lane change probability

Study on Control Method of Signal at Intersection of Elevated Off-ramp Downstream YANG Jie (226)

Abstract: The traffic between urban elevated expressways and surface roads mainly transforms through off-ramps and downstream intersections. The traffic congestion occurs frequently at off-ramps and downstream intersections during peak hours. Based on the cellular transport model, a prediction model for the traffic of off-ramp and downstream intersection is built. The intersection signal control model based on cell transmission model is established by adopting the control strategy of dynamically adjusting the cycle length and signal phase. The dynamic optimization of signal time is carried out by taking the queue length, green light and cycle time as the constraints and the weighted average delay of each entrance as the objective function. The example of ramps and intersections in Chengdu is verified, which shows that the signal control strategy proposed can effectively reduce the saturation, delay and queue length of such intersections, and improve the traffic efficiency.

Keywords: off-ramp; intersection; cellular transport model; signal control

Study on Factor Influencing Hydraulic Efficiency of Clear Water Tank ZHU Zhiyong (230)

Abstract: The clear water tank has the dual function of hydraulic regulation and disinfection contact. The improvement of t_{10} / T is an important means to improve the disinfection efficiency and reduce the disinfectant dosage and its by-products. Aiming at a case of clear water tank, the overall modeling is carried out. By numerical simulation method, the influence of main dimensions on t_{10} / T clear water tank is studied, and the rationality of the design scheme is verified. The result shows that the length-width ratio is the most obvious factor to influence t_{10} / T , but the trend of increasing is slowing down. The t_{10} / T can be increased by reducing the number and width of bends and increasing the diameter of influent pipe. The length-width ratio of the clear water tank is 38 and the hydraulic efficiency is 0.54 in a case, which can meet the design requirement of not less than 0.5.

Keywords: clear water tank; CFD; length-width ratio; curve; influent; t_{10} / T

APPLICATION OF ACHIEVEMENTS

Application of BIM Panoramic Display Platform for Transportation Infrastructure WU Junwei (233)

Abstract: With the gradual increase in the number of transportation infrastructure construction and the continuous improvement of the level, the direction of modernization, informatization and industrialization of domestic transportation infrastructure project construction has become the main theme of the future and the inevitable choice of industry transformation and upgrading. In order to realize the expansion and promotion of the digital application in the transportation infrastructure industry, based on the detailed analysis of the core requirements for reporting and communication of transportation infrastructure projects, a BIM panoramic display platform is built to comprehensively display the characteristics and key points of the project scheme, enhance the understanding of the project scheme and reduce the cost of communication. Taking the actual project as an example, the application of BIM panoramic display platform and the results achieved are comprehensively and systematically explained.

Keywords: transportation infrastructure; informatization; project reporting; digital application; BIM

panoramic display platform

Development and Application of Smart Construction Site Platform for Municipal Engineering Based on BIM+AIoT YAN Tao (237)

Abstract: Under the overall background of the national digital transformation strategy, there are many the municipal engineering specialties, the environment of construction site is complex and the management is greatly difficult. It is urgently to improve the management level through the digital and intelligent means. Through the integrated application of BIM, AI, and IoT technology, a smart construction site management platform adapted to the characteristics of municipal engineering is developed to achieve the real-time personnel positioning, online monitoring of key equipment, safety monitoring of foundation pit, automatic identification of hidden dangers and other functions. The capacity of management and control of each element in site is improved. The application effect of the platform has been verified through the pilot projects, which provides the useful experience for the construction of smart construction sites in other similar projects.

Keywords: BIM; AIoT; smart construction site; municipal engineering

Integrated Display Application of BIM Model Based on Hongcheng Software Platform YANG Mingxi (241)

Abstract: By comparing the traditional reporting method with the new reporting method integrated with BIM models, the advantages and disadvantages of the new reporting method are discussed in terms of display effect, resource input and result reuse. On this basis to introduce, the new reporting method based on BIM model integration has the characteristics of more integrated data, display effect to meet the depth and breadth requirements, less resource input, reusable model and cloud sharing, etc. It is pointed out that the design institutes can take this opportunity to build 3D model libraries and traffic road network analysis libraries in different regional markets. In the subsequent project competition and undertaking, the new reporting method based on BIM model integration will become a part of the core competitiveness of the design institutes.

Keywords: reporting method; display effect; resource input; BIM model integration; competitiveness

Intelligent Municipal Infrastructure with Scalable Metadata and Data Dictionary LI Tianyi (245)

Abstract: With the development of the concept of smart cities, the digitalization and intelligence level of municipal infrastructure have been continuously improving. However, the interoperability between the different devices and systems as well as the complexity of data exchange poses a challenge. To address these issues, the scalable metadata and data dictionaries have become the key tools for smart municipal infrastructure, which provide a common language and standards that make the different suppliers and systems easier integrate and share data. Furthermore, the scalable metadata and data dictionaries enhance the data quality and consistency of smart municipal infrastructure, thereby supporting more accurate and reliable decision-making and city management. The design and implementation methods of the scalable metadata and data dictionaries are studied in conjunction with the applications in the five major categories of municipal facilities.

Keywords: scalable metadata; major urban municipal infrastructure; data exchange; municipal infrastructure; digitization

Feasibility Analysis on Application of Photovoltaic Sound Barriers in Urban Expressway LI Yangyang (248)

Abstract: Combined with the Shijiazhuang Huai'an Road Viaduct West Extension Project, under two schemes of conventional components and color components of photovoltaic sound barriers, the electrical system, power generation, full life cycle cost and benefit of the off-grid system and the grid-connected system are studied respectively, and the feasibility analysis is carried out. The conclusion shows that

under the condition that the cost of energy storage devices cannot be significantly reduced, and it is economically infeasible to use the photovoltaic sound barriers under the off-grid systems for lightning. The photovoltaic sound barriers of colored components will affect the power generation efficiency. At the same time, the cost is higher, which is economically infeasible. The conventional components of photovoltaic sound barriers are economically feasible and have certain social benefits under grid-connected systems.

Keywords: photovoltaic sound barriers; urban expressway; off-grid system; grid-connected system; feasibility analysis

Research on Visualization Technology of Road Red Line HE Yong (251)

Abstract: With the rapid development of computer image processing software (Boujou, Adobe Illustrator, Adobe After Effects, Adobe Premiere Pro) and drone technology, the visualization technology has been widely applied in road design, which greatly improve the efficiency and quality of traditional design. For example, in the early stage of road design, the application exploration of road red line visualization technology is to use the drone aerial photography technology and the above computer image processing software to draw the planned red line in aerial photo video or images in order to better display the planning scope and land acquisition of the projects and more truthfully and intuitively display information of building demolition and intersecting roads of the projects.

Keywords: drone aerial photography; visualization; road red line

THE RELATIVE SPECIALITIES

Selection of Mining Method Tunnel Supporting Schemes for Undercrossing Existing Tunnels at Close Range TIAN Shuai (254)

Abstract: With the continuous advance in the construction of urban infrastructure, the construction of underground tunnel has become an important part. However, in cities with the complex geological conditions and dense existing tunnels, the tunnel construction often faces various challenges, especially it is more difficult to undercross the existing tunnels in the close range by the mining method. In this construction, the design technological scheme, supporting measures and construction scheme are required to consider. Taking a project under construction in Guiyang as an example, starting from the design technical scheme and construction requirements, combined with the finite element analysis and the on-site monitoring data, the problem how to achieve the safe construction in close range to undercross the existing small-distance tunnel under the mudstone formation condition is discussed. The aim is to provide the reference and guidance for similar projects.

Keywords: mudstone; mining method tunnel; close-range undercrossing; design scheme; supporting selection

Groundwater Control Technology for Ultra Deep Foundation Pit near Maglev Area in Airport Hub ZHANG Ning (258)

Abstract: In the complex transportation hub area of urban airports, how to comprehensively and effectively control the composite confined aquifer appearing in ultra-deep foundation pits has become a key technical problem that must be solved in the excavation construction of ultra-deep foundation pits in Shanghai. Pudong Airport Station of the airport liaison line in Shanghai is located directly below the main road - Yingbin Avenue of the airport in the core area of the transportation hub of Shanghai Pudong Airport. The stratum in the range of the project foundation pit is affected by the cutting of ancient river channels, and the north-south geological conditions fluctuate greatly. Layers ⑥ and ⑧ are missing, and layers ⑦ and ⑨ are connected by confined water. The distance between the main structure of the station and the adjacent pile foundation of the maglev is only 26.5 m, and the surrounding environmental

protection requirements are also very high. In order to meet the dual safety of the foundation pit and the environment, the integrated design of enclosure and dewatering for the composite confined aquifer group is carried out in the project, and then is verified and analyzed through the pumping tests to ensure the reliability of the implementation of the dewatering scheme. Through the dynamic control in the excavation stage of the foundation pit, the expected goal to control the confined water is finally achieved.

Keywords: control of confined water; composite confined aquifer; integrated design of enclosure and dewatering; dewatering of foundation pit

Analysis of Ultrasonic Detection of Obstacles in Soil Based on Acoustic Spectrum Characteristics

..... YANG Lijun, ZHU Tiao (264)

Abstract: In order to explore the detection effect of ultrasonic method on the obstacles in soil, an indoor experiment is designed by using the cohesive soil in an area of Shanghai as the medium. The influence of different factors on the ultrasonic detection effect is studied by changing the soil moisture content and ultrasonic detection distance. The experimental results are analyzed for the spectral characteristics by using Fourier transform. The spectral changes of the received signals are analyzed from three aspects of moisture content, detection distance and obstacle to investigate the effects of various influencing factors. The research results show that with the increase of moisture content, the degree of distortion in the received signal spectrum decreases, and the number of abrupt changes on the curve decreases. With the increase of detection distance, the degree of distortion in the received signal spectrum increases, and the number of abrupt changes on the curve increases. When the moisture content is low, the presence of obstacles has the negligible effects on the received signal spectrum. However, when the moisture content is high, the presence of obstacles can cause an increase in the degree of distortion in the received signal spectrum, which can be recognized from the spectrum analysis.

Keywords: ultrasonic method; boulder detection; spectrum characteristics; Fourier transform

[illegible]

Excellent Journal of the Ministry of Housing and Urban-Rural Development, PRC

Urban Roads, Bridges & Flood Control

Monthly

Number 1,2024 (Total Number 297)

Publication on January 15th, 2024

Start Publication in 1984 Issuance Scope: Domestic and International Issuance

Governing Body: Ministry of Housing and Urban-Rural Development, PRC

Sponsor: Shanghai Municipal Engineering Design Institute (Group) Co., Ltd.

Edition and Publication: Editorial Office of "Urban Roads, Bridges & Flood Control"

Editor-in-chief: ZHAO Xiaoyan

Address: 901 Zhongshan Bei Er Road, Shanghai, China

P.C.: 200092

Tel.: (021)55008850

Fax: (021)55008850

Website: <http://www.csdqyfh.com>

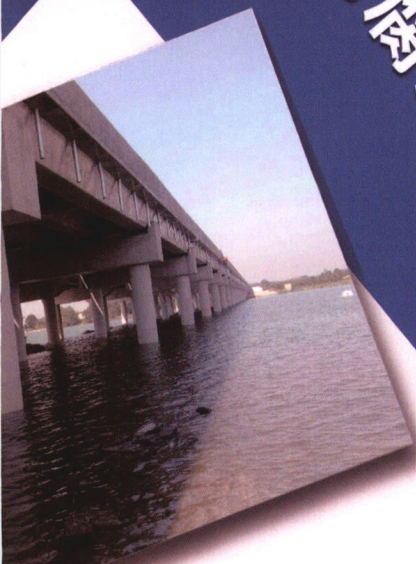
E-mail: cdq@smedi.com

China Standard Serial Numbering: $\frac{\text{ISSN } 1009-7716}{\text{CN } 31-1602/\text{U}}$

Domestic Price: RMB 25 Yuan

润邦®

桥梁防腐涂装 请找青岛润邦



»» 公司简介

青岛润邦防水建材有限公司是一家集科研、生产、施工、服务于一体的复合型发展的民营科技企业。拥有国家防水防腐保温工程专业承包一级资质，致力于建筑防水防腐材料、路面养护材料的研究开发和应用。公司以优质的防水材料为基础，积累了二十几年的防水施工经验，培养了大批防水施工专家。现可承接各种大型建筑防水防腐工程，以及公路、铁路桥梁防水防腐、路面养护等工程。

»» 主营产品

路桥防水养护材料：

- ◎ JBS环保型桥梁防水涂料
- ◎ JBS-C沥青路面养护涂料
- ◎ JBS-1500高渗透结晶型硅烷防水剂
- ◎ FYT-1改进型沥青防水涂料
- ◎ RBS速熔快通路面灌缝胶
- ◎ 牢巴路瓶装尖嘴式冷灌缝胶

硅烷防水防腐系列产品：

- ◎ GW-301异丁基三乙氧基硅烷浸渍液
- ◎ GW-302膏体硅烷
- ◎ 硅烷防腐防水涂料
- ◎ 环氧基硅烷改进型浸渍液
- ◎ SHJS高渗透改性环氧聚碳硅氧烷系列产品

邮编：266321
传真：0532-86202378
地址：青岛胶州市洋河工业区
官网：<http://www.runbang.cn/>
E-mail: runbang2008@163.com
专家咨询：0532-86200474
客服电话：0532-86200051
0532-86201314

广告

ISSN 1009-7716
CN 万方数据 02/U

国内发行：《城市道桥与防洪》编辑部
国外发行：中国国际图书贸易总公司（代号：BM 1859）

定价：25.00元



本刊公众号