

◆ CNKI 中国期刊全文数据库收录期刊 ◆ 中国核心期刊(遴选)数据库收录期刊
◆ 中文科技期刊数据库收录期刊 ◆ 万方数据——数字化期刊群收录期刊



96-2789

1727/N

QK2249092

工程技术研究

Engineering and Technological Research



西安国际会展中心

XI' AN INTERNATIONAL
EXHIBITION & CONVENTION CENTER

ISSN 2096-2789



9 772096 278229

万方数据

主管单位 广东省冶金工业总公司
主办单位 广州市金属学会
广东工程职业技术学院

2022
总第 125 期



工程技术研究

ENGINEERING AND TECHNOLOGICAL RESEARCH

2016 年创刊（半月刊）

第 21 期 总第 125 期

第 7 卷 2022 年 11 月 10 日

国内外公开发行

主管单位 广东省冶金工业总公司

主办单位 广州市金属学会

广东工程职业技术学院

《工程技术研究》编委会

期刊顾问 毛新平

主任 李烈军

副主任 李绍康 张海

委员 邓孙成 刘宇红 李智彪 邱显扬

(按姓氏笔画排序) 张增兴 陈昌 陈小祝 陈学文

林广明 郑开宏 顾林娜 黄志勇

黄楚华

主编 刘安华

副主编 陈学文

执行副主编 谢友义

编辑 张晶 雷丹 宁雪 张彦然

电话 020-28163491

编辑发行 《工程技术研究》编辑部

地址 广州市天河区凤凰街渔兴路 18 号

投稿邮箱 gczztg@163.com gczztg@126.com

网址 https://yjco.cbpt.cnki.net

邮政编码 510520

定价 人民币 15 元

印刷单位 广州市永祥印务有限公司

ISSN 2096-2789

连续出版物号 CN 44-1727/N

广告经营许可证 440100100002

著作权使用声明

本刊已许可中国知网以数字化方式复制、汇编、发行、传播本刊全文。本刊支付的稿酬已包含中国知网著作权使用费，所有署名作者向本刊提交文章发表之行为视为同意上述声明。如有异议，请在投稿时说明，本刊将按作者说明处理。

目次

工程前沿

某整体式现浇空心板梁静载试验模型对比研究 钟辉武 1

长螺旋钻孔压灌桩技术在砂层地质深基坑支护工程中的应用
——以郑州某地下停车场项目深基坑支护工程为例

袁艳斌, 张新化 4

宁东地区煤矿矿井水处理分析 王晓芃 7

基于潮汐模型与余水位监控法的水位改正法在湛江港航道验收工程中的应用

王德江 10

北京新机场线一期工程富水砂卵石地层联络通道冻结法施工技术研究

项瀚仪, 蒙世宇, 姚银年 13

聊城某大学新建校区建筑工程复合模板保温一体化施工技术研究

倪同涛, 陶毅, 邓春阳, 等 16

基于型钢门式支模体系的盾构超前始发施工技术研究

——以广州某地铁区间左线盾构工程为例

卜 桢 19

体育馆幕墙屋面烟楼式出风口结构施工技术分析

——以四会市体育中心（一期）主体工程为例

李 振 22

复杂地质条件下福州市某新建重型工业厂房桩基础方案选型分析 张建彬 25

菲律宾 C5 高速公路南部软基处理工程中的水泥搅拌桩施工技术研究 蔡 威 28

基于生态发展理论的甘肃引洮供水工程建设研究 宋海萍 31

MBR 工艺在污水处理厂升级改造中的应用 马先芒 34

工程技术与应用

城市道路交叉口加筋网抗车辙路面施工技术分析——以长沙盼盼路提质改造工程项目为例 张 斌 37

成贵铁路兴隆坪隧道缺陷整治处理工程分析 张 硕 40

水磨钻施工技术在房建工程桩基开挖中的应用 陈国毅, 袁春保, 贺道军, 等 43

既有高速公路路基边坡预应力锚索框架拆除技术分析——以漳州至龙岩高速公路改扩建项目 A4 合同段工程为例 陈 勇 46

隧道二次衬砌环向施工缝施工方法改进实践分析 王 杰 49

公路桥梁连续梁挂篮施工技术研究 林立军, 程自强 52

BIM+VR 技术在地铁机电安装工程风险管理中的应用 王龙飞, 张先锋, 谢鹏辉, 等 55

灰土地基换填施工及其环刀法质量检测分析——以陕西省西咸新区秦汉新城秦凤学校项目为例 杨开睿, 王习渊, 胡润东, 等 58

超前支护施工技术在高速公路隧道施工中的应用 李祖荣 61

大跨度输煤栈桥钢桁架分段整体吊装施工技术分析 王美建 64

无损检测技术在混凝土检测中的应用分析 杨 宇 67

智能化技术在电气工程及其自动化中的应用研究 李 颖 70

电气自动化在水利水电工程中的应用——以某水利水电水闸建设工程为例 魏金武, 邹建威, 周宇楠 73

BIM 技术在装配式建筑中的应用现状与发展趋势分析 李耀光, 张兴旺, 张宇航, 等 76

GPS 测量技术在地籍基础测绘中的应用研究 任攀虹, 曾 致 79

工程设备与材料

门楼水库溢洪闸闸墩混凝土碳化检测与柔性修复剂处理实践 姜晓琳, 陈西宁, 陈 亮, 等 82

添加相变材料的沥青混合料融雪路用性能研究 牟 翰 85

深圳莲花立交桥改造设计中超薄沥青罩面的应用分析 杨雅莉 88

珠海市某区综合管廊工程组合带肋塑料模板+独立支撑系统施工技术分析 文湘禹 91

海绵城市建设中彩色透水混凝土的生产与路面施工研究 邹剑锋 94

太原市晋源东区纬三段综合管廊工程模板台车施工技术分析 冯金涛 97

预制 T 梁混凝土外表面气泡的成因及控制措施——以 S320 汉寿新兴至常德经开区何家坪公路 20 m 预制 T 梁项目为例 华 盛 100

工业厂房大跨度钢结构安装要点及质量控制措施探析 雍 飞 103

工程管理

天水市城区引洮供水工程运行管理存在的问题及对策 祁福川 106

金沙江旭龙水电站工程本质安全共同体建设路径分析 吴双江 109

水利工程中远程监控系统的应用研究 周嘉峰 112

基于风险识别的电力工程造价影响因素分析 臧祥庭, 吕雯雯, 董艳红 115

城市建成区高速公路造价影响因素及控制措施研究
叶向华 118

桥梁钻孔灌注桩施工管理分析 刘 登 121

高层房屋建筑施工关键技术及整体施工水平提升策略
分析 陈铁钢 124

新形势下公路工程管理模式的创新措施 刘 斌 127

市政园林景观工程造价控制的问题和改进措施分析
苏 茜 130

建筑工程岩土工程勘察和地基处理工作中的常见问题
及解决方法 童 玲 133

建筑工程不同施工阶段的质量监管措施分析
——以光耀和玺项目工程为例 贺登乾 136

建筑施工塔吊安全事故分析与防护措施研究 王怡山 139

工程教育

基于“1+X”证书制度的职业教育改革研究与实践
——以广东工程职业技术学院为例*
陆晓梅, 徐礼丰 142

新时期高职院校感恩教育的时代价值*
尹国胜, 刘 潇 145

新技术与新媒体推动广东省教育改革研究 王 帅 148

国家安全视域下高校图书馆助力学生信息素养提升举
措分析 陆晓凤 151

机械制造技术基础课程思政教学改革探索与实践*
邹黎明 155

工程设计

襄阳地区地下水源热泵系统设计与应用
钟栋队, 文雪新 158

深圳市龙大高速石岩外环立交改造方案研究 欧开海 161

人民渠(101铁路—西五环路)段河道治理工程设计
研究 李 响, 于书萍, 刘珍珍, 等 164

小半径曲线连续钢箱梁桥设计及计算分析 肖润华 167

广东省南围高架桥设计方案研究 吴红莉 170

基于物联网的G205 鹊岭隧道运营安全监测系统设计与
应用 周满兵, 刘洪涛 173

山区高速公路高填方路基设计分析 李建伟 176

潮汕环线高速公路斜拉桥钢锚梁+钢牛腿组拼系统设
计与施工 王荣贤, 毛雪萍 179

市政工程给排水管网改造设计分析
张 慧, 秦 玥, 杨 娟 182

发展与创新

特大型城市背景下电网输变电工程水土保持工作研究
——以广州市增城区荔城街棠村220 kV挂绿输变电工
程为例 陈宇健 185

高速公路收费新模式下车路协同技术的应用 项 威 188

云南省通海县农村生活污水治理问题与对策研究
李佳钰, 尚正蓉, 杜佳姚, 等 191

环保工程中污水处理思路及方法分析 何天军 194

山西太谷区农谷路网工程中的水准测量作业分析
杨正仓, 杨志强, 李国超, 等 197

某在建水库坝肩山体滑坡性质及形成机制分析
李永松, 赵温亮, 刘宗林 201

沥青路面使用性能预测评价模型构建研究 蔡 辉 204

杭州绕城西复线里庄隧道大变形控制分析
夏 龙, 吴大凯 207

广东省李屋排小净距隧道施工技术研究 徐宗匠 210

重难点项目劳务分包队伍安全管理中存在的问题及对
策 刘 健 213

方案设计阶段建筑幕墙体系的成本控制研究 刘仕杰 216

苏州装配式建筑产业发展现状问题及对策分析
马振宇, 朱 凯, 汪慧琳 219

浅埋隧道地表堰塞湖病害注浆加固施工方案研究
赵小鹏 222

多工法组合下隧道开挖对地层的扰动影响分析*
高 云, 傅鹤林, 彭文轩, 等 225

城市地铁特殊地段暗挖隧道施工技术分析 王 力 228

ENGINEERING AND TECHNOLOGICAL RESEARCH

No. 125 November, 2022

Contents

Engineering Frontier

- Comparative Study on Static Load Test Models of Integral Cast-in-place Hollow Slab Beam ZHONG Huiwu 1
- The Application of Long Spiral Drilling Pressure Grouting Pile Technology in Deep Foundation Pit Support Engineering in Sandy Stratum
—Taking the Deep Foundation Pit Support Project of an Underground Parking Lot in Zhengzhou as an Example YUAN Yanbin, ZHANG Xinhua 4
- Analysis of Coal Mine Water Treatment in Ningdong Area WANG Xiaopeng 7
- The Application of Water Level Correction Method Based on Tidal Model and Residual Water Level Monitoring Method in Zhanjiang Port Waterway Acceptance Project WANG Dejiang 10
- Research on Freezing Method Construction Technology of Connecting Passage in Water-rich Sandy Cobble Stratum for Beijing New Airport Line Phase I Project XIANG Hanyi, MENG Shiyu, YAO Yinnian 13
- Research on Composite Formwork Heat Preservation Integrated Construction Technology in the New Campus Construction Project of a University in Liaocheng NI Tongtao, TAO Yi, DENG Chunyang, et al 16
- Research on Shield Advance Launching Construction Technology Based on Steel Portal Formwork System
—Taking the Left Line Shield Project of a Subway Section in Guangzhou as an Example BU Zhen 19
- Analysis on Construction Technology of Smoke Tower Type Air Outlet Structure in Gymnasium Curtain Wall Roof
—Taking the Main Project of Sihui Sports Center (Phase I) as an Example LI Zhen 22
- Selection Analysis of Pile Foundation Scheme for a New Heavy Industrial Plant in Fuzhou under Complex Geological Conditions ZHANG Jianbin 25
- Research on the Construction Technology of Cement Mixing Pile in the Soft Foundation Treatment Project in the South of C5 Expressway in Philippines CAI Wei 28
- Research on the Construction of Taohe Diversion Water Supply Project in Gansu Based on Ecological Development Theory SONG Haiping 31
- Application of MBR Process in Upgrading of Sewage Treatment Plants MA Xianmang 34

Engineering Technology and Application

- Analysis on Construction Technology of Anti-rutting Pavement with Reinforced Mesh at Urban Road Intersections
—Taking Changsha Panpan Road Quality Improvement and Reconstruction Project as an Example ZHANG Bin 37
- Analysis on Defect Rectification and Treatment Project of Xinglongping Tunnel on Chengdu-Guiyang Railway ZHANG Shuo 40
- Application of Water Grinding Drill Construction Technology in Pile Foundation Excavation of Housing Construction Projects CHEN Guoyi, YUAN Chunbao, HE Daojun, et al 43
- Analysis on Demolition Technology of Prestressed Anchor Cable Frame for Subgrade Slope of Existing Expressways
—Taking A4 Contract Section of Zhangzhou-Longyan Expressway Reconstruction and Expansion Project as an Example CHEN Yong 46
- 万方数据

Analysis on Improvement Practice of Construction Method for Circular Construction Joint of Tunnel Secondary Lining	WANG Jie 49
Research on Continuous Beam Hanging Basket Construction Technology of Highway Bridges	LIN Lijun, CHENG Ziqiang 52
Application of BIM + VR Technology in Risk Management of Subway Electromechanical Installation Engineering	WANG Longfei, ZHANG Xianfeng, XIE Penghui, et al 55
Analysis of Lime Soil Foundation Replacement Construction and Its Quality Detection by Cutting Ring Method —Taking Qinfeng School Project in Qinhan New Town, Xixian New District, Shaanxi Province as an Example	YANG Kairui, WANG Xiyuan, HU Rundong, et al 58
Application of Advance Support Construction Technology in Expressway Tunnel Construction	LI Zurong 61
Analysis on Construction Technology of Large-span Coal Transporting Trestle Steel Truss Segmental and Integral Hoisting	WANG Meijian 64
Application Analysis of Nondestructive Testing Technology in Concrete Detection	YANG Yu 67
Research on Application of Intelligent Technology in Electrical Engineering and Its Automation	LI Ying 70
Application of Electrical Automation in Water Conservancy and Hydropower Projects —Taking a Water Conservancy and Hydropower Sluice Construction Project as an Example	WEI Jinwu, ZOU Jianwei, ZHOU Yunan 73
Analysis of the Application Status and Development Trend of BIM Technology in Prefabricated Buildings	LI Yaoguang, ZHANG Xingwang, ZHANG Yuhang, et al 76
Research on the Application of GPS Measurement Technology in Cadastral Basic Surveying and Mapping	REN Panhong, ZENG Zhi 79

Engineering Equipment and Materials

The Practice of Concrete Carbonization Detection and Flexible Repair Agent Treatment of Spillway Gate Pier in Menlou Reservoir	JIANG Xiaolin, CHEN Xining, CHEN Liang, et al 82
Research on Snow Melting Road Performance of Asphalt Mixture with Phase Change Materials	MU Han 85
Analysis on the Application of Ultra-thin Asphalt Overlay in the Reconstruction Design of Lianhua Interchange in Shenzhen	YANG Yali 88
Analysis on the Construction Technology of Composite Ribbed Plastic Formwork + Independent Support System for the Comprehensive Pipe Gallery Project in a District of Zhuhai	WEN Xiangyu 91
Research on Production and Pavement Construction of Colored Pervious Concrete in Sponge City Construction	ZOU Jianfeng 94
Analysis on Formwork Trolley Construction Technology for Weisan Section Comprehensive Pipe Gallery Project in East Jinyuan District of Taiyuan City	FENG Jintao 97
Causes and Control Measures of Bubbles on the External Surface of Precast T-beam Concrete —Taking 20 m Precast T-beam in Hejiaping Highway Project from S320 Hanshou Xinxing to Changde Economic Development Zone as an Example	HUA Sheng 100
Discussion on Installation Points and Quality Control Measures of Large-span Steel Structure in Industrial Plants	YONG Fei 103

Engineering Management

Problems and Countermeasures in Operation Management of Taohe Water Diversion Supply Project in the Urban Area of Tianshui City	QI Fuchuan 106
Analysis on the Construction Path of Intrinsic Security Community of Xulong Hydropower Station Project on Jinsha River	WU Shuangjiang 109
Research on the Application of Remote Monitoring System in Water Conservancy Projects	ZHOU Jiafeng 112
Analysis of Influencing Factors of Power Engineering Cost Based on Risk Identification	ZANG Xiangting, LYU Wenwen, DONG Yanhong 115
Research on Influencing Factors and Control Measures of Expressway Cost in Urban Built-up Areas	YE Xianghua 118
Analysis on Construction Management of Bridge Bored Piles	LIU Deng 121
Analysis on the Key Technologies of High-rise Building Construction and the Strategies to Improve the Overall Construction Level	CHEN Tiegang 124
Innovative Measures of Highway Engineering Management Mode under the New Situation	LIU Bin 127
Analysis on the Problems and Improvement Measures of the Cost Control in Municipal Landscape Project	SU Qian 130
Common Problems and Solutions in Geotechnical Engineering Investigation and Foundation Treatment of Building Engineering	TONG Ling 133
Analysis of Quality Supervision Measures in Different Construction Stages of Building Engineering —Taking Guangyao Hexi Project as an Example	HE Dengqian 136
Research on Tower Crane Safety Accident Analysis and Protective Measures in Building Construction	WANG Yishan 139

Research and Practice of Vocational Education Reform Based on "1+X" Certificate System

—Taking Guangdong Engineering Polytechnic as an Example*

LU Xiaomei, XU Lifeng 142

The Times Value of Gratitude Education in Higher Vocational Colleges in the New Era*

YIN Guosheng, LIU Xiao 145

Research on New Technology and New Media Promoting Education Reform in Guangdong Province

WANG Shuai 148

Analysis on the Measures Taken by Libraries in Universities and Colleges to Help Students Improve Information Literacy from the Perspective of National Security

LU Xiaofeng 151

Exploration and Practice of Ideological and Political Teaching Reform in the Course of Mechanical Manufacturing Technology Fundamentals*

ZOU Liming 155

Engineering Design

Design and Application of Groundwater Source Heat Pump System in Xiangyang Area

ZHONG Dongdui, WEN Xuexin 158

Research on the Reconstruction Scheme of Shiyuan Outer Ring Interchange of Longda Expressway in Shenzhen

OU Kaihai 161

Research on the Design of River Channel Regulation Project of Renmin Canal (101 Railway-West Fifth Ring Road) Section

LI Xiang, YU Shuping, LIU Zhenzhen, et al 164

Analysis on the Design and Calculation of Small-radius Curved Continuous Steel Box Girder Bridges

XIAO Runhua 167

Research on the Design Scheme of Nanwei Viaduct in Guangdong Province

WU Hongli 170

Design and Application of G205 Queling Tunnel Operation Safety Monitoring System Based on Internet of Things

ZHOU Manbing, LIU Hongtao 173

Analysis on the Design of High Fill Subgrade of Mountainous Expressways

LI Jianwei 176

Design and Construction of Steel Anchor Beam + Steel Corbel Assembly System for Cable-stayed Bridge of Chaoshan Ring Expressway

WANG Rongxian, MAO Xueping 179

Analysis on the Reconstruction Design of Municipal Engineering Water Supply and Drainage Pipe Network

ZHANG Hui, QIN Yue, YANG Juan 182

Development and Innovation

Research on Soil and Water Conservation of Power Grid Power Transmission and Transformation Projects under the Background of Mega Cities

—A Case Study of 220 kV Gualyu Power Transmission and Transformation Project in Tangcun, Licheng Street, Zengcheng District, Guangzhou Province

CHEN Yujian 185

Application of Vehicle-Road Coordination Technology in New Expressway Toll Collection Mode

XIANG Wei 188

Research on Problems and Countermeasures of Rural Domestic Sewage Treatment in Tonghai County, Yunnan Province

LI Jiayu, SHANG Zhengrong, DU Jiayao, et al 191

Analysis of Sewage Treatment Ideas and Methods in Environmental Protection Engineering

HE Tianjun 194

Analysis of Leveling Surveying Operation in Nonggu Road Network Project in Taigu District, Shanxi Province

YANG Zhengcang, YANG Zhiqiang, LI Guochao, et al 197

Analysis on Landslide Properties and Formation Mechanism of Dam Abutment of a Reservoir under Construction

LI Yongsong, ZHAO Wenliang, LIU Zonglin 201

Research on Construction of Asphalt Pavement Performance Prediction Evaluation Model

CAI Hui 204

Analysis on Large Deformation Control of Lizhuang Tunnel on West Double Line around Hangzhou

XIA Long, WU Dakai 207

Research on Construction Technology of Liwupai Small Spacing Tunnel in Guangdong Province

XU Zongjiang 210

Problems and Countermeasures in Safety Management of Labor Subcontracting Teams in Key and Difficult Projects

LIU Jian 213

Research on Cost Control of Building Curtain Wall System in Scheme Design Stage

LIU Shijie 216

Analysis on the Problems and Countermeasures in the Development of Prefabricated Construction Industry in Suzhou

MA Zhenyu, ZHU Kai, WANG Huilin 219

Research on Grouting Reinforcement Construction Scheme for Surface Barrier Lake Diseases of Shallow-buried Tunnels

ZHAO Xiaopeng 222

Analysis of Disturbance Influence of Tunnel Excavation on Stratum under the Combination of Multiple Construction Methods*

GAO Yun, FU Helin, PENG Wenxuan, et al 225

Analysis on Construction Technology of Bored Tunnels in Special Sections of Urban Subway

WANG Li 228



工程技术研究

Engineering and Technological Research

地 址：广州市天河区凤凰街渔兴路 18 号

Address: No. 18, Yuxing Road, Fenghuang Street, Tianhe District,
Guangzhou

投稿邮箱：gczztg@163.com；gczztg@126.com

E-mail: gczztg@163.com; gczztg@126.com

邮政编码：510520

Post Code: 510520

定 价：人民币 15 元

Price: RMB 15