

中国科技核心期刊  
中文核心期刊  
中国科学引文数据库来源期刊

QK2257793

# 建筑科学®

## BUILDING SCIENCE

# 4

# 2023

第39卷 第4期  
VOL.39 NO.4

◆ 中华人民共和国住房和城乡建设部主管

◆ 中国建筑科学研究院有限公司主办

### 可持续建筑 *Sustainable Building*



《中国科学引文数据库》来源期刊  
中文核心期刊  
中国科技核心期刊  
《中国学术期刊(光盘版)》  
检索与评价数据规范》执行优秀期刊



建筑科学

JIANZHU KEXUE

(月刊)

第39卷第4期(总第309期)

2023年4月出版

(1985年创刊)

主 办:中国建筑科学研究院有限公司  
编 辑:《建筑科学》编辑部  
地 址:北京北三环东路30号  
邮 编:100013  
电 话:010-64693291  
电子邮箱(投稿邮箱):bjb365@126.com  
主 编:黄世敏  
副 主 编:徐 伟  
“可持续建筑”编辑组

执行主编:俞英鹤  
责任编辑:俞英鹤  
编 辑:陈 辛

\* \* \* \* \*  
印 刷:北京时捷印刷有限公司  
国内发行:全国各地邮局订阅  
国外发行:中国国际图书贸易总公司  
(北京399信箱)  
邮发代号:2-381  
国外代号:BM4129  
国内统一刊号:CN11-1962/TU  
国外标准刊号:ISSN1002-8528  
零 售:《建筑科学》编辑部发行室  
广告经营许可证:京朝工商广字第0209  
号(101)

## 目 次

### “建筑碳排放”专栏

寒冷气候区近零能耗建筑减碳路径探索

…… 徐 伟,张天平,康一亭,钱登洲,刘瑞捷,王丹阳,于 震,张时聪(1)

建筑景观园林工程生命周期碳排放计算方法研究——以西安市住宅小区为例

…… 罗智星,曹 雨,田瀚元,胡昕月,卢 梅,谢静超(9)

建筑钢结构制造加工车间碳排放量计算方法研究

…… 杨 朔,周学军,刘 哲,王 振,刘学炯(19)

基于保温结构一体化系统的建筑生命周期碳排放研究

…… 罗智星,于运星,卢 梅,王海宁,陈 畅,赵 楠(26)

### “中国国际太阳能十项全能竞赛”专栏

寒冷地区钢结构模块化住宅的夏季热环境实测分析——以“栖居3.0”为例

…… 李 涛,李世萍,陈 静(35)

快速建造导向下的箱式房住宅 DfMA 深化设计策略研究

——以 SDC2021 作品 Aurora 为例

…… 韩冬辰,王思宁,罗 辉,单 超,吴 捷(44)

近零能耗住宅节能技术实际应用研究——以第三届中国国际太阳能

十项全能竞赛作品为例 …… 杨泽宇,李 早,嵇 璇,蔡亦青,薛玉峰(51)

### 理论 & 实验研究

农村住宅电采暖适宜性评价研究

…… 易万娜,张甜甜,韩东亮,谭羽非,杨子娟,张兴梅(57)

湿热地区公交候车亭夏季喷雾降温实验研究

…… 黎 珊,李 琼,毛会军,孟庆林(63)

寒冷地区地铁站秋冬季热湿环境与热舒适实测分析:以西安地铁2号线为例

…… 谷雅秀,马壮壮,王鼎元,黄泽茂,崔 伟,屈长杰,宫泽翔,檀姊静(70)

基于提升老年人体力活动水平的寒地城市公园热舒适性研究

——主观感知和客观监测 …… 冷 红,张钰佳,袁 青(81)

邯郸广府古城民居夏季室内热环境研究

…… 郭会坤,王 岩,费 凡,徐 晨,王路遥(90)

基于不同活动强度的寒冷地区城市公园冬季热舒适研究

…… 王 琨,王雅瑞,薛思寒(97)

局地气候区视角下城市空间形态的热环境效应——以泉州市为例

…… 沈中健,宁 菝,刘骏阳(104)

基于自注意力的非侵入式家庭电力负荷分解模型

…… 赵安军,崔朴方,于军琪,赵 啸,陈一仁(113)

基于湿驱动势的围护结构温湿动态计算方法研究

…… 周志波,郑欣桐,加加林·弗拉基米尔,孙 澄(122)

《中国科学引文数据库》来源期刊  
中文核心期刊  
中国科技核心期刊  
《中国学术期刊(光盘版)》  
检索与评价数据规范》执行优秀期刊



建筑科学

JIANZHU KEXUE

(月刊)

第39卷第4期(总第309期)

2023年4月出版

(1985年创刊)

- 基于效益评价的寒冷地区农宅附加阳光间优化研究  
..... 王朝红, 杨 阳, 魏广龙(130)
- 纳米石墨改性二元石蜡/陶粒复合相变材料制备与热性能研究  
..... 胡琳娜, 徐 晓, 郝文秀(139)
- 直埋球墨铸铁热力管道热动态传热特性分析及保温优化  
..... 李 岩, 王许可, 李金鹏, 李少臣, 郑海武(146)
- 基于双波段紫外光催化杀菌的空气净化器对室内空气污染物的过滤效果验证  
..... 蒯勇智, 汪益名, 刘东海, 梁 凯(152)

### 计算分析

- 城市中心区高耸建筑群影响下的高层板式住宅不等高布局与风环境相关性研究  
——以上海陆家嘴东昌路居住区地块为例  
... 应小宇, 王虹宇, 高 婧, 沈丽颖, 韩鑫裕, 秦小颖, 陈佳卉, 皇甫凡雨(164)
- 超低能耗建筑现浇混凝土内置保温体系外墙层间挑板热桥研究  
..... 陈梦源, 高彩凤, 张晓东, 高佳亮, 马 健(174)
- 近零能耗建筑外百叶遮阳节能采光耦合特性研究  
..... 霍慧敏, 徐 伟, 吴剑林, 李安桂, 吕梦一, 李 怀(183)
- 多冷源环状管网系统水力—热力工况关键影响因素及不确定性分析  
..... 高 成, 王 丹, 王 伟, 孙育英, 谷现良(193)
- 天然气冷热电三联供项目发电盈亏平衡电价分析  
..... 张 蓓, 郝厚站, 康家宁(201)

### 论 坛

- 新加坡 Green Mark 2021 标准解析及启示  
..... 邓月起, 李嘉耘, 孟 冲, 戴瑞焯(205)
- 人员密集型场所细菌真菌气溶胶冬季分布特征及健康影响分析  
..... 张金萍, 左云峰, 张翠林, 尹海全(213)
- 医院手术部洁净空调系统用能评价方法研究 ..... 谢 慧, 申晓东, 郑雅雯(221)
- 暖通空调设计用室外计算参数研究 ..... 安晶晶, 徐稳龙, 潘云钢, 燕 达(227)
- 基于热力学建筑原型转译的建筑气候设计策略研究——以黄河口生态旅游区  
游客服务中心为例 ..... 陶思旻, 李麟学, 张 琪, 乔 灵(241)
- 局地气候分区(LCZ)理论研究进展 ..... 莫 男, 韩 杰(252)
- ISO 3382-3: 2022《声学 室内声学参量测量 第3部分: 开放式办公室》  
标准解读与应用研究 ..... 张媛媛, 欧达毅, 康升娟(263)
- 基于装配式内装体系的住宅弹性设计策略研究  
..... 邓 广, 陈玉昆, 梁祇豪(274)
- 街道峡谷热力特征对局地臭氧生成传播影响的研究 ..... 柳 靖, 侯 珂(279)
- 基于负荷特征识别的地铁站空调智能控制系统研究  
..... 丁天一, 曹 勇, 崔治国, 于晓龙, 汪志辉, 赵东明, 刘亮志(286)
- 基于随机森林改进深度门控循环单元的高校食堂用能预测方法  
..... 郝玉珍, 范慧方, 张 舸, 李 怀, 郝玉秀(295)
- 立体绿化照明中的光源光谱设计——以八宝景天为例  
..... 张晟齐, 赵建平, 王 曼, 张武广(303)

\* \* \* \* \*

[期刊基本参数] CN11-1962/TU \* 1985 \* b \* 16 \* 314 \* zh \* P \* ¥ 15.00 \* 8000 \* 37 \* 2023-04

## BUILDING SCIENCE

(Monthly Journal)

No. 4 Vol. 39, April 2023

(Initial Issue in 1985)

Director: China Academy of Building  
Research

Edited & Published: Editorial Committee of  
BUILDING SCIENCE

Address: 30 Bei San Huan Dong Lu,  
Beijing 100013, China

Tel: 86-10-64693291

E-mail: bjb365@126.com

Chief Editor: HUANG Shimin

Vice Chief Editor: XU Wei

"Sustainable Building" Editorial Team

Executive Chief Editor: YU Yinghe

Responsible Editor: YU Yinghe

Editor: CHEN Xin

\* \* \* \* \*

Distributed in China:

Post Office Code Name 2-381

Distributed Abroad:

China International Book Trading  
Corporation

(GUO JI SHU DIAN)

P.O.Box 399, Beijing, China

## CONTENTS

### Column of Carbon Emission of Building

Research on Carbon Emission Technologic Pathway for Nearly-zero Energy Buildings in Cold Regions ..... XU Wei, ZHANG Tianping, KANG Yiting,

XIAN Dengzhou, LIU Ruijie, WANG Danyang, YU Zhen, ZHANG Shicong ( 1 )

Study on Calculation Method of Architectural Landscape Engineering Life Cycle Carbon Emissions—Case of a Residential Community in Xi' An

..... LUO Zhixing, CAO Yu,

TIAN Hanyuan, HU Xinyue, LU Mei, XIE Jingchao ( 9 )

Research on the Calculation Method of Carbon Emission of Building Steel Structure Manufacturing and Processing Workshop

..... YANG Shuo, ZHOU Xuejun, LIU Zhe, WANG Zhen, LIU Xuotong (19)

Study on Life Cycle Carbon Emission of Building Based on Integrated System of Thermal Insulation and Structure .....

LUO Zhixing, YU Yunxing,

LU Mei, WANG Haining, CHEN Chang, ZHAO Nan (26)

### Column of Solar Decathlon China

Measurement and Analysis of Summer Thermal Environment of Steel Structure Modular House in Cold Regions: Take "QIJU 3.0" as an Example

..... LI Tao, LI Shiping, CHEN Jing (35)

Research of Detailed Design Strategies for the Volumetric House Based on the Theory of Design for Manufacturing and Assembly (Dfma) Oriented to Rapid Construction

—with Aurora in SDC2021 as an Example

..... HAN Dongchen, WANG Sining, LUO Hui, SHAN Chao, WU Jie (44)

Research on the Practical Application of Net-zero Energy Consumption Residential Energy Saving Technology—Take the Works of the 3Rd International Solar Decathlon China Competition as an Example

..... YANG Zeyu, LI Zao, ZHUO Xuan, CAI Yiqing, XUE Yufeng (51)

### Theoretical & Experimental Study

Study on Suitability Evaluation of Electric Heating for Rural Dwellings

..... YI Wanna, ZHANG Tiantian,

HAN Dongliang, TAN Yufei, YANG Zixian, ZHANG Xingmei (57)

A Summer Experimental Study on Mist-spray Cooling of Bus Stops in Hot-humid Regions .....

LI Shan, LI Qiong, MAO Huijun, MENG Qinglin (63)

Field Study on Thermal and Humidity Environment and Thermal Comfort of Metro Station in Cold Regions during Autumn and Winter: A Case Study of Xi' An Metro Line 2 .....

GU Yaxiu, MA Zhuangzhuang, WANG Dingyuan,

HUANG Zemao, CUI Wei, QU Changjie, GONG Zexiang, TAN Zijing (70)

Study on Thermal Comfort of Urban Parks in Cold Regions Based on Improving the Physical Activity Level of the Elderly—Subjective Perception and Objective Monitoring .....

LENG Hong, ZHANG Yujia, YUAN Qing (81)

Research on the Indoor Thermal Environment of Traditional Houses in Handan Guangfu Ancient City in Summer

..... GUO Huikun, WANG Yan, FEI Fan, XU Chen, WANG Luyao (90)

Study on the Thermal Comfort of People with Different Activity Intensities in the Urban Park During Winter in Cold Regions of China

..... WANG Kun, WANG Yarui, XUE Sihan (97)

Effects of Urban Spatial Morphology on Thermal Environment from the Perspective of Local Climate Zone—A Case Study of Quanzhou City

..... SHEN Zhongjian, NING Qiao, LIU Junyang (104)

Non-intrusive Electric Load Disaggregation Model for the Household Based on Self-attention

..... ZHAO Anjun, CUI Pufang, YU Junqi, ZHAO Xiao, CHEN Yiren (113)

Study on Dynamic Calculation Method of Temperature and Humidity of Envelope Structure Based on Wet Driving Potential

..... ZHOU Zhibo, ZHENG Xintong, GAGARIN Vladimir, SUN Cheng (122)

## BUILDING SCIENCE

(Monthly Journal)

No. 4 Vol. 39, April 2023

(Initial Issue in 1985)

- Study on the Optimization of Additional Sunspace of Rural Residences in Cold Regions Based on Benefit Evaluation ..... WANG Chaohong, YANG Yang, WEI Guanglong (130)
- Preparation of Binary Paraffin/Ceramsite Composite Phase Change Materials Modified by Nano Graphite and Thermal Performance Study ..... HU Linna, XU Xiao, HAO Wenxiu (139)
- Thermal Dynamic Heat Transfer Characteristics Analysis and Insulation Optimization of Direct Buried Ductile Iron Heat Pipes  
..... LI Yan, WANG Xuke, LI Jinpeng, LI Shaochen, ZHENG Haiwu (146)
- Verification of Filtering Effect of Air Cleaner Based on Dual-band UV Photocatalysis on Indoor Air Pollutants ..... LIN Yongzhi, WANG Yiming, LIU Donghai, LIANG Kai (152)

### Computational Analysis

- Study on the Correlation Between Unequal Height Layout of High-rise Slab Houses and Wind Environment Under the Influence of Towering Building Clusters in City Center—A Case Study of Dongchang Road Residential Site in Lujiazui, Shanghai  
..... YING Xiaoyu, WANG Hongyu, GAO Jing, SHEN Liying,  
HAN Xinyu, QIN Xiaoying, CHEN Jiahui, HUANGFU Fanyu (164)
- Study on the Thermal Bridge at the Interlayer Extension Slab of the Ultra-low Energy Building with a Built-in Insulation System of Cast-in-place Concrete  
...CHEN Mengyuan, GAO Caifeng, ZHANG Xiaodong, GAO Jialiang, MA Jian (174)
- Study on Energy Saving and Daylighting Coupling Characteristics of External Venetian Blind Shading for Near-zero Energy Residential Buildings  
.....HUO Huimin, XU Wei, WU Jianlin, LI Angui, LVY Mengyi, LI Huai (183)
- Identification of the Key Factor and Uncertainty Analysis of Hydraulic-thermal Conditions of Multi-cold Source Looped Network System  
..... GAO Cheng, WANG Dan, WANG Wei, SUN Yuying, GU Xianliang (193)
- Analysis of Break-even Electricity Price for Power Generation of a Natural Gas Combined Cooling, Heating, and Power Project  
..... ZHANG Bei, CHI Houzhan, KANG Jianing (201)

### Forum

- Analysis and Enlightenment from Singapore's Green Mark 2021  
..... DENG Yuechao, LI Jiayun, MENG Chong, DAI Ruiye (205)
- Distribution Characteristics and Health Impact Assessment of Bacterial and Fungal Aerosols in Densely Populated Places in Winter  
..... ZHANG Jinping, ZUO Yunfeng, ZHANG Cuilin, YIN Haiquan (213)
- Study on Energy Evaluation Method of Clean Air Conditioning System in Hospital Operation Department ..... XIE Hui, SHEN Xiaodong, ZHENG Yawen (221)
- Study on Outdoor Design Conditions for Heating Ventilation and Air Conditioning Design ..... AN Jingjing, XU Wenlong, PAN Yungang, YAN Da (227)
- Research on the Architectural Climatic Design Strategy of Buildings Based on Thermodynamic Prototype Translation—A Case Study of the Tourist Service Center of Huanghekou Ecological Zone  
..... TAO Simin, LI Linxue, ZHANG Qi, QIAO Ling (241)
- Research Progress of Local Climate Zone Theory ..... MO Nan, HAN Jie (252)
- Interpretation and Application of ISO 3382-3 : 2022 Acoustics-Measurement of Room Acoustic Parameters-Part 3: Open-plan Offices  
..... ZHANG Yuanyuan, OU Dayi, KANG Shengxian (263)
- Study on Residential Elastic Design Strategy Based on the Fabricated Interior Fit-out System ..... DENG Guang, CHEN Yukun, LIANG Zhihao (274)
- Study on the Influence of Thermal Characteristics of Street Canyon on Local Ozone Generation and Dispersion ..... LIU Jing, HOU Ke (279)
- Application Research on the Intelligent Control of Subway Station Air Conditioning System Based on Load Splitting ..... DING Tianyi, CAO Yong,  
CUI Zhiguo, YU Xiaolong, WANG Zhihui, ZHAO Dongming, LIU Liangzhi (286)
- Prediction Model of Building Energy Consumption in University Canteens Based on RF-GRU ..... HAO Yuzhen, FAN Huiyang, ZHANG Ge, LI Huai, HAO Yuxiu (295)
- Spectral Design of Light Source in Three-dimensional Greening—A Case Study of Hylotelephium Spectabile  
..... ZHANG Shengqi, ZHAO Jianping, WANG Man, ZHANG Wuguang (303)



建筑科学®

ISSN 1002-8528

刊号: ISSN 1002-8528  
CN 11-1962/TU

代号: 国内邮发 2-381  
国外 BM4129

国内定价: 15.00元/期  
180.00元/年



万方数据