**建筑****能效测评报告书**

居住建筑

|  |  |
| --- | --- |
| 工程名称 | 鸟径成屏-大学宿舍改造 |
| 工程地点 | 河南-开封 |
| 设计编号 | GX20400 |
| 建设单位 | 河南大学土木建筑学院 |
| 设计单位 | 河南大学土木建筑学院 |
| 设 计 人 |  |
| 校 对 人 |  |
| 审 核 人 |  |
| 设计日期 | 2020年1月4日 |



|  |  |
| --- | --- |
| 采用软件 | 能耗计算BESI2020 |
| 软件版本 | 20190808 |
| 研发单位 | 北京绿建软件有限公司 |
| 正版授权码 | T18238212080 |

**目 录**

[1 建筑概况 3](#_Toc25996)

[2 设计依据 3](#_Toc10086)

[3 围护结构 3](#_Toc25206)

[3.1 工程材料 3](#_Toc4763)

[4 围护结构概况 4](#_Toc29858)

[5 标识建筑 5](#_Toc29655)

[5.1 房间类型 5](#_Toc20555)

[5.1.1 房间表 5](#_Toc3815)

[5.1.2 作息时间表 5](#_Toc28829)

[5.2 系统类型 5](#_Toc26254)

[5.3 供暖系统 5](#_Toc6253)

[5.3.1 多联机/单元式热泵能耗 5](#_Toc22762)

[6 比对建筑 6](#_Toc8602)

[6.1 房间类型 6](#_Toc17347)

[6.1.1 房间表 6](#_Toc22664)

[6.1.2 作息时间表 6](#_Toc6317)

[6.2 系统类型 6](#_Toc19536)

[6.3 供暖系统 6](#_Toc18149)

[6.3.1 热水锅炉能耗 6](#_Toc411)

[6.3.2 热水循环水泵能耗 6](#_Toc20806)

[7 计算结果 6](#_Toc9549)

[8 附录 8](#_Toc22740)

[8.1 工作日/节假日人员逐时在室率(%) 8](#_Toc1370)

[8.2 工作日/节假日照明开关时间表(%) 8](#_Toc26794)

[8.3 工作日/节假日设备逐时使用率(%) 9](#_Toc2434)

[8.4 工作日/节假日空调系统运行时间表(1:开,0:关) 10](#_Toc30288)

# 建筑概况

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 工程名称 | 鸟径成屏-大学宿舍改造 | | | | |
| 工程地点 | 河南-开封 | | | | |
| 气候子区 | 寒冷B区 | | | | |
| 建筑面积 | 地上2885㎡ 地下0㎡ | | | | |
| 建筑层数 | 地上6 地下0 | | | | |
| 建筑高度 | 23.1m | | | | |
| 北向角度 | 90 | | | | |
| 结构类型 |  | | | | |
| 采暖期天数（d） | 88 | | | | |
| 采暖期室外平均温度（C°） | 2.50 | | | | |
| 太阳总辐射平均强度（W/㎡） | 水平99 | 南106 | 北33 | 东56 | 西56 |

# 设计依据

1. 《建筑能效标识技术标准》(JGJ/T 288-2012)

2. 《河南居住建筑节能设计标准(寒冷地区)》DBJ41/062-2017

3. 《民用建筑热工设计规范》GB50176

# 围护结构

## 工程材料

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| 材料名称 | 导热系数λ | 蓄热系数S | 密度ρ | 比热容Cp | 蒸汽渗透系数u | 备注 |
| W/(m.K) | W/(㎡.K) | kg/m3 | J/(kg.K) | g/(m.h.kPa) |
| 水泥砂浆 | 0.930 | 11.370 | 1800.0 | 1050.0 | 0.0210 | 来源：《民用建筑热工设计规范》GB50176-2016 |
| 石灰砂浆 | 0.810 | 10.070 | 1600.0 | 1050.0 | 0.0443 | 来源：《民用建筑热工设计规范》GB50176-2016 |
| 钢筋混凝土 | 1.740 | 17.200 | 2500.0 | 920.0 | 0.0158 | 来源：《民用建筑热工设计规范》GB50176-2016 |
| 混凝土多孔砖(190六孔砖） | 0.750 | 7.490 | 1450.0 | 709.4 | 0.0000 |  |
| 防水层(沥青油毡、油毡纸) | 0.170 | 3.302 | 600.0 | 1470.0 | 0.0000 |  |
| 挤塑聚苯乙烯泡沫板（XPS）(ρ=30) | 0.030 | 0.540 | 30.0 | 4455.3 | 0.0000 |  |
| 水泥珍珠岩找坡层 | 0.490 | 10.408 | 1600.0 | 1900.0 | 0.0000 |  |
| 石灰水泥砂浆（混合砂浆） | 0.870 | 10.750 | 1700.0 | 1050.0 | 0.0975 |  |
| 加气砼砌块 | 0.200 | 3.000 | 1800.0 | 388.7 | 0.0000 |  |
| 矿棉、岩棉、玻璃棉板(ρ=80-200) | 0.045 | 0.748 | 140.0 | 1220.0 | 0.4880 |  |
| 钢筋混凝土 | 1.740 | 17.060 | 2500.0 | 920.0 | 0.0000 |  |
| 水泥砂浆 | 0.930 | 11.306 | 1800.0 | 1050.0 | 0.0000 |  |
| 沥青油毡、油毡纸 | 0.170 | 3.302 | 600.0 | 1470.0 | 0.0000 |  |
| 膨胀矿渣珠混凝土(ρ=2000) | 0.770 | 10.369 | 2000.0 | 960.0 | 0.0000 |  |
| 挤塑聚苯板 | 0.033 | 0.347 | 28.0 | 1790.0 | 0.0000 |  |
| 胶粉聚苯颗粒保温砂浆 | 0.060 | 0.950 | 230.0 | 900.0 | 0.0000 |  |
| 岩棉板(用于外墙外保温) | 0.040 | 0.833 | 140.0 | 1703.9 | 0.0000 |  |
| 多孔砖 | 0.580 | 7.209 | 1400.0 | 880.0 | 0.0000 |  |

# 围护结构概况

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
|  | | 标识建筑 | | | 比对建筑 | | |
| 体形系数S | | 2.16 | | | － | | |
| 屋顶传热系数K [W/(m2·K)] | | 0.34 | | | － | | |
| 外墙（包括非透明幕墙）传热系数K [W/(m2·K)] | | 0.40 | | | － | | |
| 屋顶透明部分传热系数  K [W/(m2·K)] | | － | | | － | | |
| 屋顶透明部分遮阳系数 | | － | | | － | | |
| 底面接触室外的架空或外挑楼板传热系数K [W/(m2·K)] | | 0.30 | | | － | | |
| 楼板K [W/(m2·K)] | | 2.98 | | | － | | |
| 分户墙K [W/(m2·K)] | | － | | | － | | |
| 外窗（包括透明幕墙） | 朝向 | 窗墙比 | 传热  系数 | 遮阳  系数 | 窗墙比 | 传热  系数 | 遮阳  系数 |
| 南向 | 0.11 | 3.90 | 0.75 | － | － | － |
| 北向 | 0.09 | 3.90 | 0.75 | － | － | － |
| 东向 | 0.03 | 3.90 | 0.75 | － | － | － |
| 西向 | 0.22 | 3.90 | 0.73 | － | － | － |

# 标识建筑

## 房间类型

### 房间表

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| 房间类型 | 空调温度 ℃ | 供暖温度 ℃ | 新风量 | 人员密度 | 照明功率 密度 | 电器设备 功率 |
| 封闭阳台 | － | － | 0.5(次/h) | 32(㎡/人) | 6(W/㎡) | 5(W/㎡) |
| 楼梯间 | － | － | 0(m3/h.人) | 0(㎡/人) | 0(W/㎡) | 0(W/㎡) |
| 空房间 | － | － | 0(m3/h.人) | 0(㎡/人) | 0(W/㎡) | 0(W/㎡) |
| 走廊 | － | － | 0(m3/h.人) | 0(㎡/人) | 0(W/㎡) | 0(W/㎡) |
| 起居室 | 26 | 18 | 0.5(次/h) | 32(㎡/人) | 6(W/㎡) | 5(W/㎡) |

### 作息时间表

详见附录

## 系统类型

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 系统编号 | 系统类型 | 供冷 能效比 | 供热 能效比 | 面积(㎡) | 包含的房间 |
| 默认 | 单元式房间空调器 | 2.30 | 1.90 | 3561.03 | 所有房间 |

## 供暖系统

### 多联机/单元式热泵能耗

|  |  |  |  |
| --- | --- | --- | --- |
| 系统 | 能效比 | 耗热量(kWh) | 耗电量(kWh) |
| 默认 | 1.90 | 190356 | 100187 |

# 比对建筑

## 房间类型

### 房间表

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| 房间类型 | 空调温度 ℃ | 供暖温度 ℃ | 新风量 | 人员密度 | 照明功率 密度 | 电器设备 功率 |
| 封闭阳台 | － | － | 0.5(次/h) | 32(㎡/人) | 6(W/㎡) | 5(W/㎡) |
| 楼梯间 | － | － | 0(m3/h.人) | 0(㎡/人) | 0(W/㎡) | 0(W/㎡) |
| 空房间 | － | － | 0(m3/h.人) | 0(㎡/人) | 0(W/㎡) | 0(W/㎡) |
| 走廊 | － | － | 0(m3/h.人) | 0(㎡/人) | 0(W/㎡) | 0(W/㎡) |
| 起居室 | 26 | 18 | 0.5(次/h) | 32(㎡/人) | 6(W/㎡) | 5(W/㎡) |

### 作息时间表

同标识建筑

## 系统类型

|  |  |  |  |
| --- | --- | --- | --- |
| 系统类型 | 供冷 能效比 | 供热 能效比 | 包含房间 |
| 单元式热泵 | － | 1.00 | 所有房间 |

## 供暖系统

### 热水锅炉能耗

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 燃料类型 | 容量/峰值负荷 (MW) | 台数 | 锅炉 热效率 | 外网热 输送效率 | 累计 热负荷 (kWh) | 热/电系数 (kWh/kWh) | 折合电耗 (kWh) |
| 烟煤II | 0.02 | 1 | 0.73 | 0.92 | 46698 | 2.93 | 23724 |

### 热水循环水泵能耗

|  |  |  |  |
| --- | --- | --- | --- |
| 耗热量指标 (W/㎡) | 供暖天数 | 耗电输热比 EHR | 水泵电耗 (kWh) |
| 10.6 | 88 | 0.00433 | 208 |

# 计算结果

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 能耗分类 | 能耗子类 | 标识建筑 | 比对建筑 | 备注 |
| 热  源  能  耗 | 耗热量指标 (W/㎡) | - | 10.6 |  |
| 采暖天数 Z（天） | - | 88 |  |
| 累计热负荷 *Qh* (kWh/㎡) | - | 22.4 |  |
| 锅炉/市政 热效率 | - | 0.73 |  |
| 外网热输送效率 | - | 0.92 |  |
| 热/电折算系数(kWh/kWh) | - | 2.93 |  |
| 折算电耗*E*1h (kWh/㎡) | **-** | **11.38** |  |
| 单元式/多联机热泵(kWh/㎡) | **48.06** | **-** |  |
| 输配  能耗 | 水泵耗电输热比 EHR | - | 0.00433 |  |
| 水泵电耗*E*2h (kWh/㎡) | **-** | **0.10** |  |
| 合计 | *E*h (kWh/㎡) | **48.06** | **11.47** |  |
| 节能率 | 相对于比对建筑 | **118.91%** | |  |
| 相对于基础建筑 | **46.62%** | |  |

# 附录

## 工作日/节假日人员逐时在室率(%)

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 房间类型 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 |
| 封闭阳台 | 16 | 16 | 16 | 15 | 16 | 24 | 31 | 19 | 15 | 14 | 14 | 19 | 22 | 19 | 13 | 14 | 18 | 35 | 49 | 54 | 50 | 35 | 21 | 15 |
| 14 | 13 | 13 | 13 | 13 | 18 | 22 | 24 | 29 | 32 | 34 | 37 | 35 | 32 | 26 | 28 | 33 | 39 | 44 | 47 | 45 | 34 | 23 | 16 |
| 楼梯间 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 空房间 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 走廊 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 |
| 起居室 | 16 | 16 | 16 | 15 | 16 | 24 | 31 | 19 | 15 | 14 | 14 | 19 | 22 | 19 | 13 | 14 | 18 | 35 | 49 | 54 | 50 | 35 | 21 | 15 |
| 14 | 13 | 13 | 13 | 13 | 18 | 22 | 24 | 29 | 32 | 34 | 37 | 35 | 32 | 26 | 28 | 33 | 39 | 44 | 47 | 45 | 34 | 23 | 16 |

注：上行：工作日；下行：节假日

## 工作日/节假日照明开关时间表(%)

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 房间类型 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 |
| 封闭阳台 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 100 | 100 | 100 | 100 | 100 | 50 |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 100 | 100 | 100 | 100 | 100 | 50 |
| 楼梯间 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 0 |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 0 |
| 空房间 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 0 |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 0 |
| 走廊 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 0 |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 0 |
| 起居室 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 100 | 100 | 100 | 100 | 100 | 50 |
| 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 100 | 100 | 100 | 100 | 100 | 50 |

注：上行：工作日；下行：节假日

## 工作日/节假日设备逐时使用率(%)

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 房间类型 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 |
| 封闭阳台 | 23 | 23 | 23 | 23 | 23 | 23 | 23 | 23 | 23 | 23 | 23 | 23 | 69 | 69 | 23 | 23 | 23 | 23 | 23 | 100 | 100 | 100 | 100 | 69 |
| 23 | 23 | 23 | 23 | 23 | 23 | 23 | 23 | 23 | 23 | 23 | 23 | 69 | 69 | 23 | 23 | 23 | 23 | 23 | 100 | 100 | 100 | 100 | 69 |
| 楼梯间 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| 空房间 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| 走廊 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 | 100 |
| 起居室 | 23 | 23 | 23 | 23 | 23 | 23 | 23 | 23 | 23 | 23 | 23 | 23 | 69 | 69 | 23 | 23 | 23 | 23 | 23 | 100 | 100 | 100 | 100 | 69 |
| 23 | 23 | 23 | 23 | 23 | 23 | 23 | 23 | 23 | 23 | 23 | 23 | 69 | 69 | 23 | 23 | 23 | 23 | 23 | 100 | 100 | 100 | 100 | 69 |

注：上行：工作日；下行：节假日

## 工作日/节假日空调系统运行时间表(1:开,0:关)

采暖期：

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 系统编号 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 |
| 默认 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |

供冷期：

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 系统编号 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 |
| 默认 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |

注：上行：工作日；下行：节假日