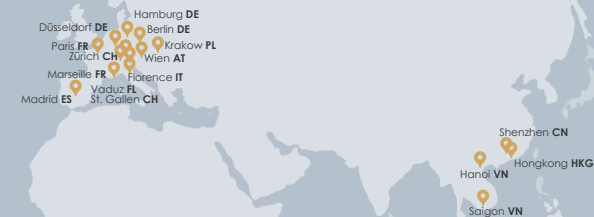




baumschlager eberle  
architekten

## Offices Locations





## Use the things you have!

### Climate

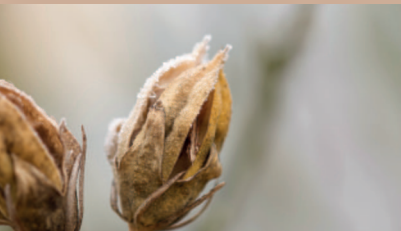
- Temperature
- Wind
- Air quality (**400** ppm CO<sub>2</sub>)
- Radiation

### People

- Heating
- Oxygen consumption
- Sweating

### Appliances

- Lights
- White goods
- IT equipment
- ...



# Factors influencing

comfort & thermal performance of buildings

## Internal influences

caused by human

**70 %**

1 t CO<sub>2</sub> / year through respiration

**100 W** body heat emissions/ person/ hour

**20 - 25 m<sup>3</sup>** fresh air/ hour/ person

**1 - 5 l** moisture loss/ day

## External influences

**30 %**

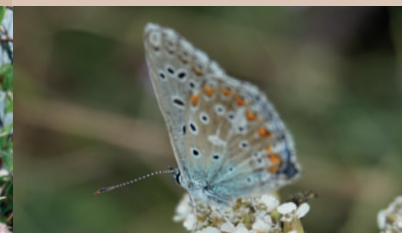
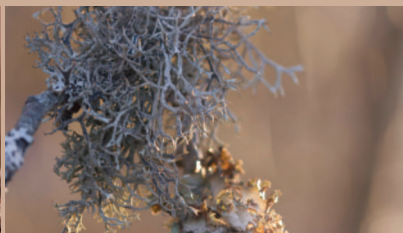
Wind

External temperature

External influences result in

- heat transmission losses
- heat transmission gains

Radiation



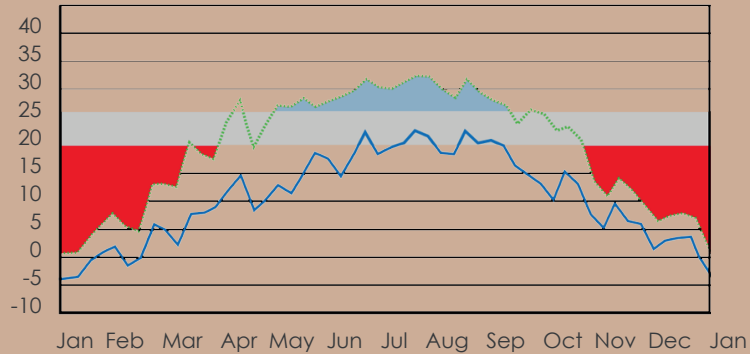
# Energy flows

in buildings

## Transmission

Building according to standard

temperature (°C)

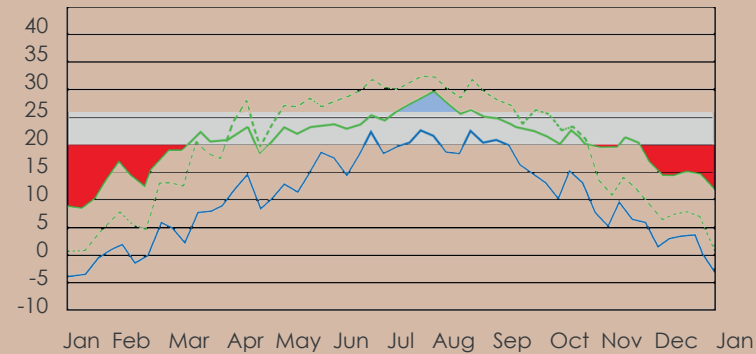


- internal temperature to norm (°C)
- external temperature (°C)
- comfortable temperature range (°C)

## Ventilation losses after optimizing the building

Optimized building

temperature (°C)

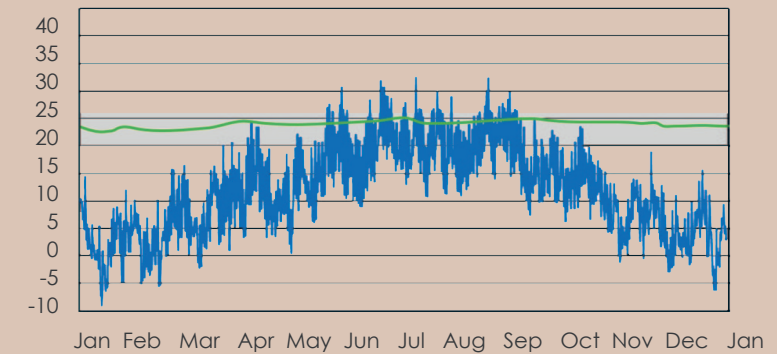


- internal temperature to norm (°C)
- optimised internal to norm (°C)
- external temperature (°C)
- comfortable temperature range (°C)

## Heat capacity and the impact of the control system

22 · 26

temperature (°C)



- internal temperature (°C)
- external temperature (°C)
- comfortable temperature range (°C)

The optimization is only an architectural question.



# Focus

on the following phenomenons:

## Architecture

- Geometric proportions

## Materiality

- U - values
- G - values
- Thermal storage capacity
- Air tightness

## Software

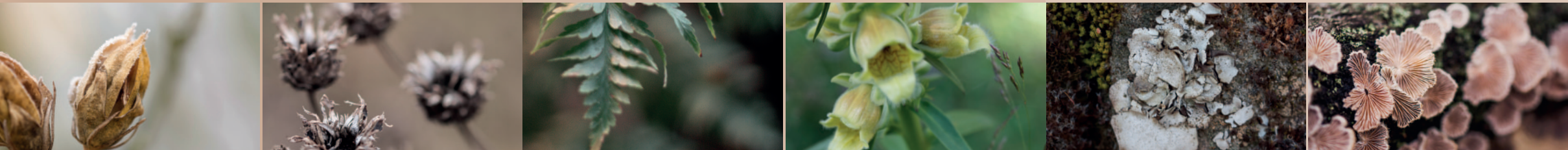
- Dynamic building simulation
- Sensor technology
- Control system

## Windows

- Shading
- Electrically controlled windows

## Back-up systems

- Electricity
- Air-handling systems
- Water-handling systems



# Architecture

Geometry - Materiality - Windows

## Geometry

- Envelope/ net floor area **0,6 -0,9**
- Windows/ net floor area **15 - 18 %**
- Analysis of the sunning and shading circumstances of your building in relation to the context

## Materiality

### Thermal storage capacity

> **200** kg/ m<sup>2</sup> n.f.

### U-values of all the envelope

- Wall **0,2**
- Roof **0,1 - 0,15**
- Ground slab **0,2**
- Windows **0,5 - 0,8**

### Airtightness

- Blower - Door - Test < **0,5 air changes/ h**

## Windows

### Shading

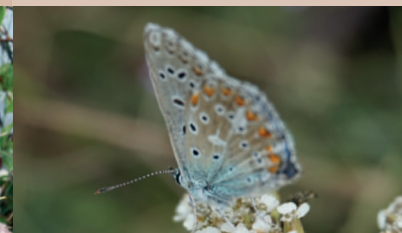
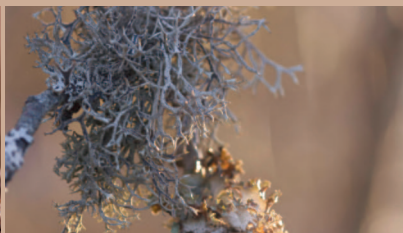
G-value **0,2**  
**No** mechanical stirred shading devices

### Ventilation type in the window

Vertical – **Never** horizontal  
Planning the airflow within a room

### Electrical motorization

- Chain drive
- Spindle drive (more efficient & longer lifetime than chain drive)



# Software

From simulation to control

## Dynamic building simulation

The dynamic building simulation has to include a time period of **1 year** (including **all the changes of** • temperature, • cloud cover, • heat capacity, • the physical value of the building and • the use of the building for people).

**Every calculation** has to be done **according to norm but in addition** to increase all the values by **30 %** and reduce the values by **30 %** to control the solidity of the simulation in a wide range including the **expected temperature changes** in the next **50 yrs.** The result has to be under **7 kWh/m<sup>2</sup> p.a.** with inner temperature range between **22 and 26 °C.**

## Sensor technology

**In every room** sensors have to be installed measuring **the following conditions:**

- Outdoor temperature
- Inside temperature
- CO<sub>2</sub>
- Relative humidity
- Brightness

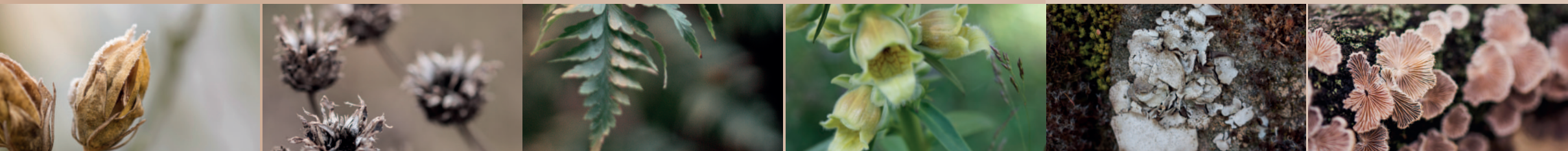
## Control System

The control system has to **operate the behaviour of the ...**

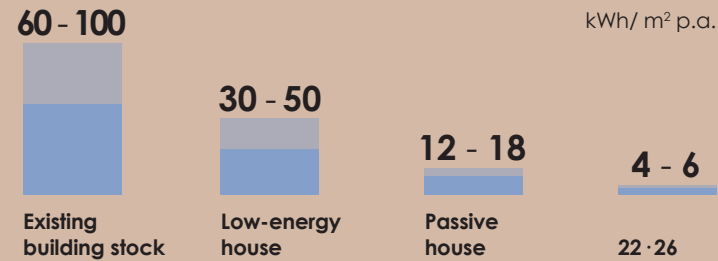
- windows
- lights
- back-up system

**... according to the measurements** of the sensors used in every room.

This control system is developed and owned by the **be company** and is protected by an European patent.



# Back-up systems



## Electricity

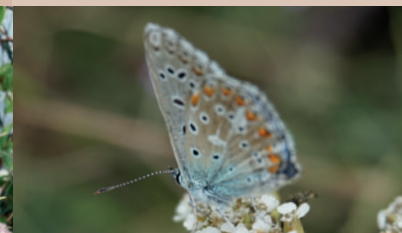
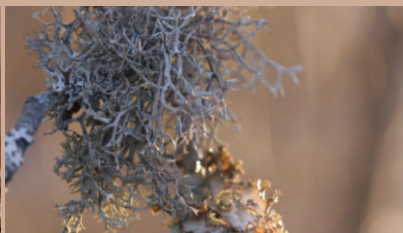
- Infrared panels
- Heating paper

## Water-handling systems

- Existing heating system
- TABS (Thermally activated building systems)
- Floor heating
- Wall heating

## Air-handling systems

- Decentralized ventilation unit with heat recovery

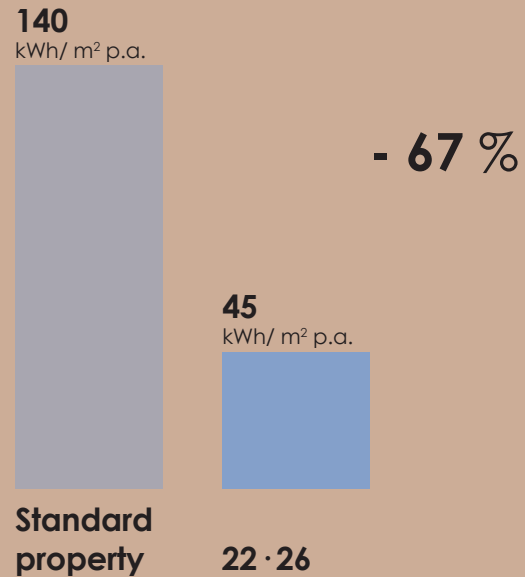






## What do we reach?

Energy consumption  
for light appliances, heating & cooling

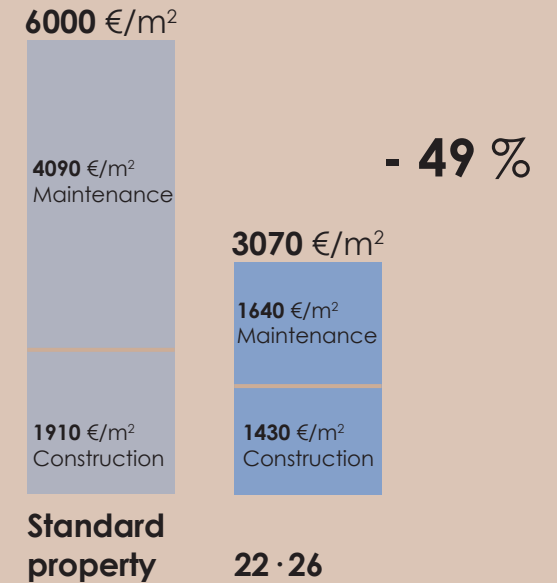


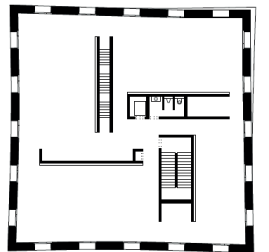
Construction costs



Life Cycle Costs (LCC)

calculation from 2015



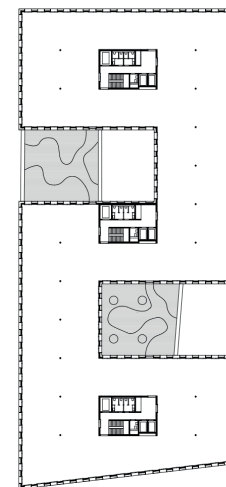




Lingenau, AUT | 2016  
Office



Schlieren, CH | 2018  
JED  
Office

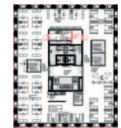




**Wien, AUT | 2019**  
Seeparkquartier Robin  
Office

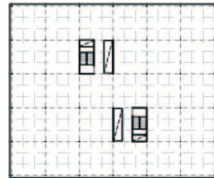


**Kriens, CH | 2020**  
Office  
Gigon Guyer Architekten

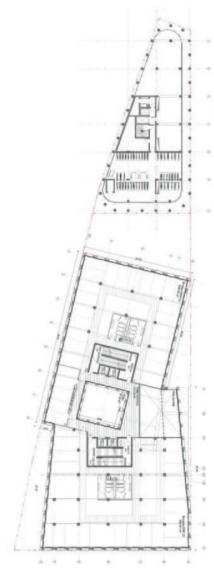




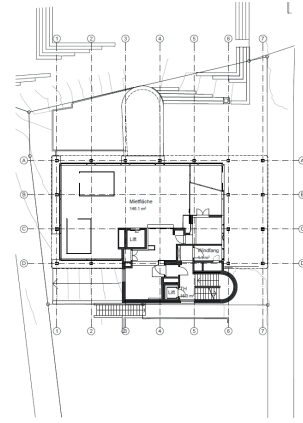
**Berlin, DE**  
*Havelwerke*  
Office



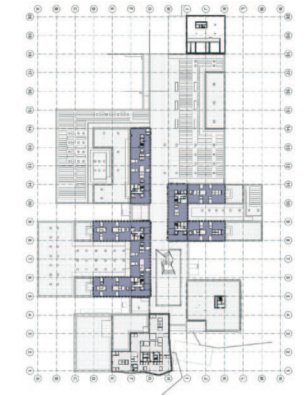
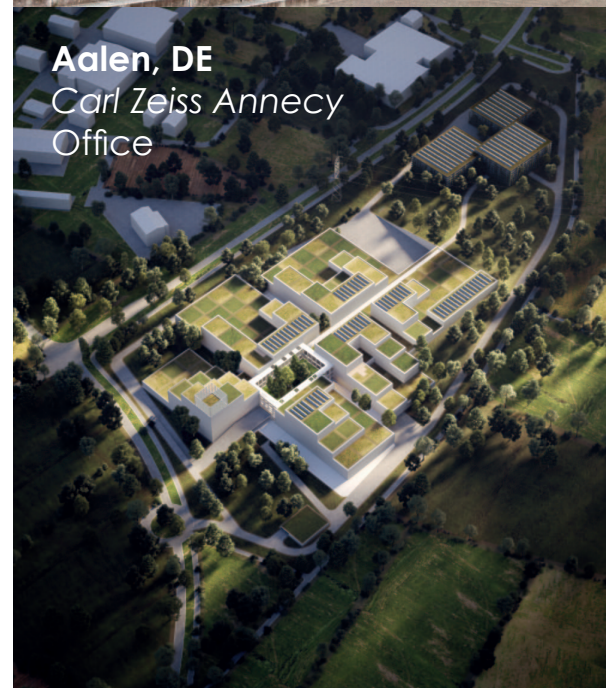
**Bordeaux, FR | 2022**  
*Amédée Sud SNCF*  
Office



**Zürich, CH | 2022**  
*Sanierung Universitätsstraße* Amber  
Office



**Aalen, DE**  
*Carl Zeiss Annecy*  
Office





Bettembourg, LU | 2023  
Office



Amsterdam, NL  
Office  
OZ Architects



Lustenau, AUT  
Housing





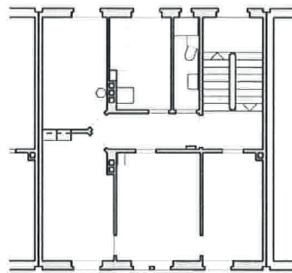
Dornbirn, AUT | 2019  
Housing



Tirol, AUT  
Neue Heimat Tirol Navis  
Housing



Oerlikon, CH | 2022  
Housing  
Atelier M Architects

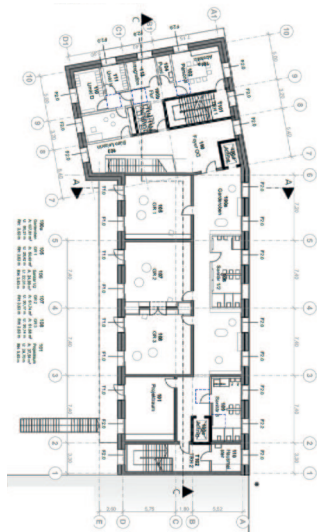


Ingoldstadt, DE  
Housing  
NB und M Architects

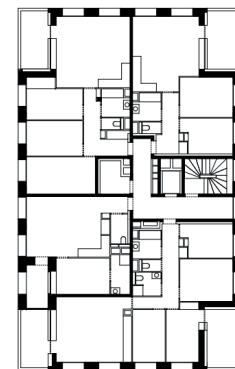




**Leipzig, DE**  
Housing, Kindergarden



**Lyon, FR**  
Confluence Lyon C1  
Mixed-use



**Zuchwil, CH**  
Riverside B2  
Mixed-use

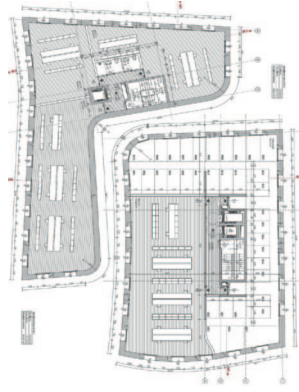


**Berlin, DE**  
Neubau Kirchliches Verwaltungsamt  
Mixed-use





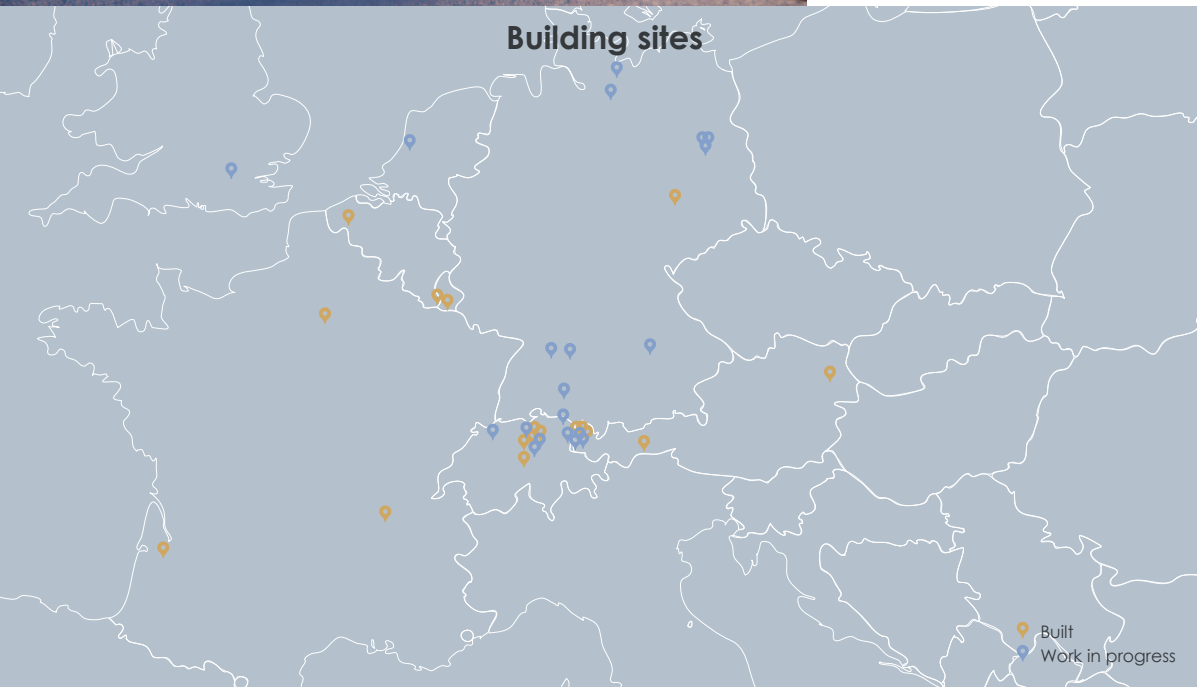
Lustenau, AUT | 2016  
Bürohaus Lustenau Turm  
Mixed-use



Romanshorn, CH  
Stadthaus  
Mixed-use



Building sites



Use the things you have!



Thank you  
for your attention!