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# Sun Space Winter Garden Conservatory

**B12 Conservatories**  
**Source of free heat, overheating,  
a drain on energy or all of the above?**

# This Presentation on GBE:

- Find this file on GBE website at:
- <https://GreenBuildingEcyclopaedia.uk/?P=294>



**HHP Hockerton Housing Project, Newark, Nottinghamshire**

# Green Houses & Conservatories: Summer Ventilation

- Glass permit the passage of the rays from the sun to warm the interior
- This can be:
  - trapped in winter by closing windows
  - released in summer by ventilation
- Victorians understood the need for opening vents low in the walls and high in the roofs to release the heat in the summer, high enough to exploit the stack effect, catch any breeze and ensure heads do not cook.
- Most PVC conservatories only have windows in the sides, a real problem
  - New offering is to have opaque roof replace the existing glazing



# Green Houses & Conservatories: Winter Solar gains

- **Glass permit the passage of the rays** from the sun to warm the interior
- **Close all opening vents, doors and windows capture the heat**
- **This can be exploited in winter**
  - **Grow plants that would otherwise perish**
  - **Dry clothing**
  - **Indoor workspace/living room/playroom**

# Green Houses and Conservatories: Exploiting heat

- **Thermal mass is where the construction materials are usually dense, close to the surface have large surface area, can absorb and store heat, insulated from the ground**
- **Conservatories can capture heat in sunny but cold weather**
- **Intelligent use of thermal mass in floors and rear walls can exploit the captured heat by storing it and saving it until the sun has disappeared and release it to warm the occupants of the conservatory.**

# Hockerton & BedZED

- Conservatories are double glazed and Low Emissivity coated to allow the heat in, prevent it escaping and trap the heat for use
- Doors and windows from conservatory to house are triple glazed Low E for the same reason
- The doors and windows are closed not letting any heat from building out into conservatory
- Until the conservatory is hot enough then windows and doors are opened to let a burst of heat into the building to heat up the fabric



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# Hockerton HHP

## Conservatories

# Zero Energy Development



**Reduce demand  
for artificial  
light and  
heating:  
Outdoor living  
Conservatory  
life  
Sunny warm  
cave to retreat  
into from the  
cold of night**

**Hockerton Newark Nottinghamshire**



**Low level  
windows and  
doors  
HL roof light  
Ventilation  
for summer  
No heating  
Solar gain  
Exposed  
thermal mass  
Windows and  
Doors to house**



**Hot house  
in the middle  
of winter on  
sunny days  
Wind free  
work place all  
year round  
Clothes drying  
No-underfloor  
heating (radiant  
heat)  
Wood stove**

# **Lean-to Conservatories: warm the house**

- **Once a conservatory attached to a building is warmed**
- **it can then be used to heat the interior of the attached building by opening doors and windows between them to let the heat into the building**
- **The building's thermal mass can be warmed and heat stored for release into the building later after the sun has gone**





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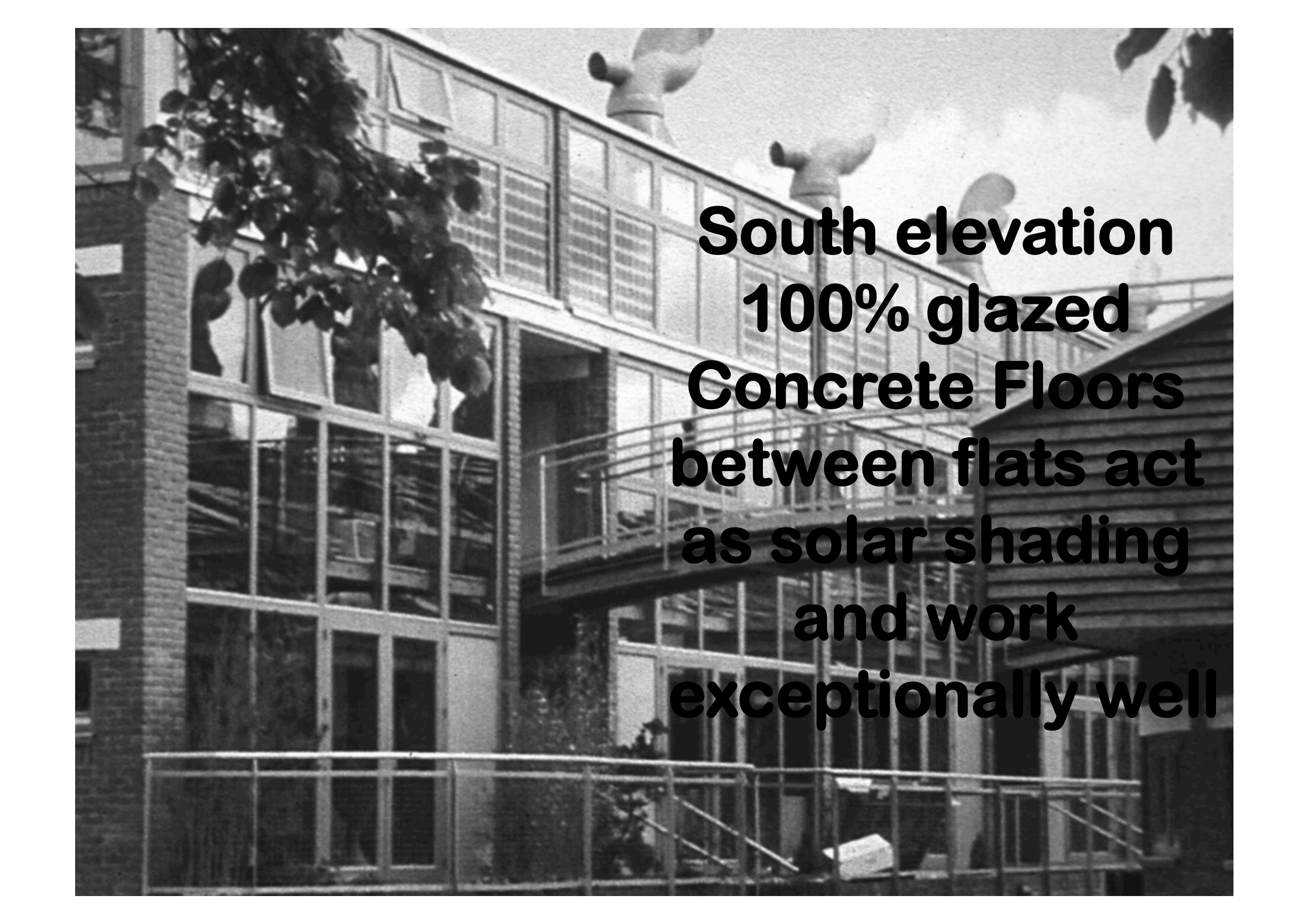
# BedZED

## Sun Spaces

# Zero (Fossil Fuel) Energy Development



**BedZED Beddington Sutton Architect: Dr Bill Dunster**



**South elevation  
100% glazed  
Concrete Floors  
between flats act  
as solar shading  
and work  
exceptionally well**



**Sunroom on South face captures the sun**



**Heavy building elements store the heat and release it later**



**Profile:**  
to ensure sun  
penetration  
over roofs reaches  
sill  
of office space  
windows  
Sun rooms on  
south side  
Thermally massive  
floors walls  
and roofs store  
heat until required

**Top floor glass  
roof lets in too  
much heat top  
floor overheats**







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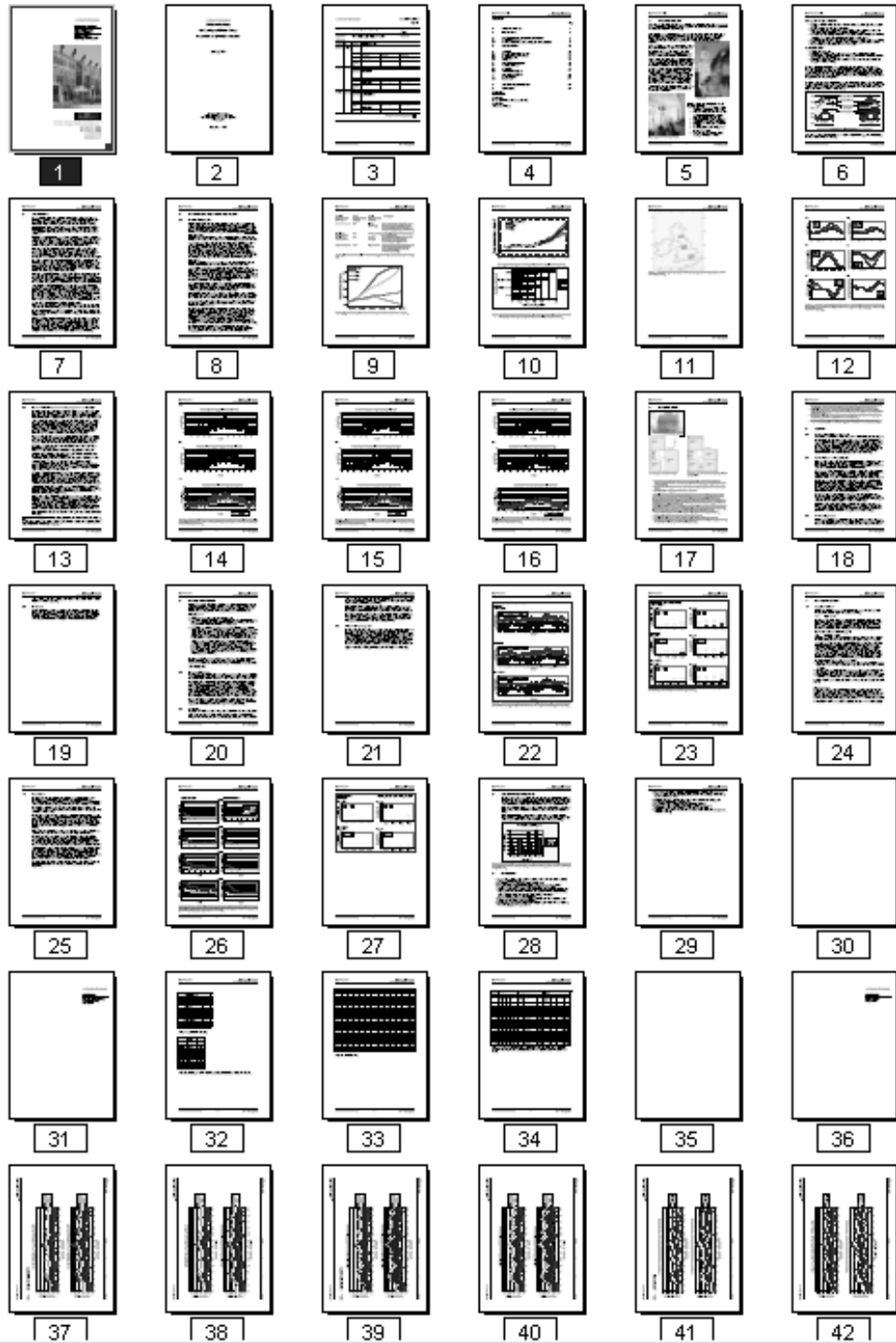
# Thermal Mass

Ventilation, warmth and coolth

# Heat movement in buildings

- **ARUP/B Dunster Report on need for Thermal mass in buildings to cope with climate change global warming**
- **Recommend internal doors are self closing to hold heat energy where it is created or collected**
- **All partitions to be insulated**
- **Then actively move heat wherever you may want it or leave it where it is**





ArupResearch+Development

Bill Dunster Architects

UK Housing and  
Climate Change

Heavyweight vs.  
lightweight construction





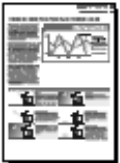

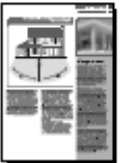


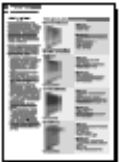
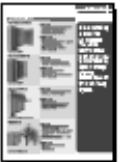





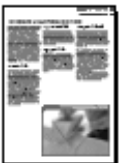

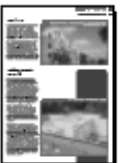

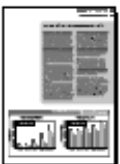




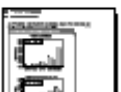




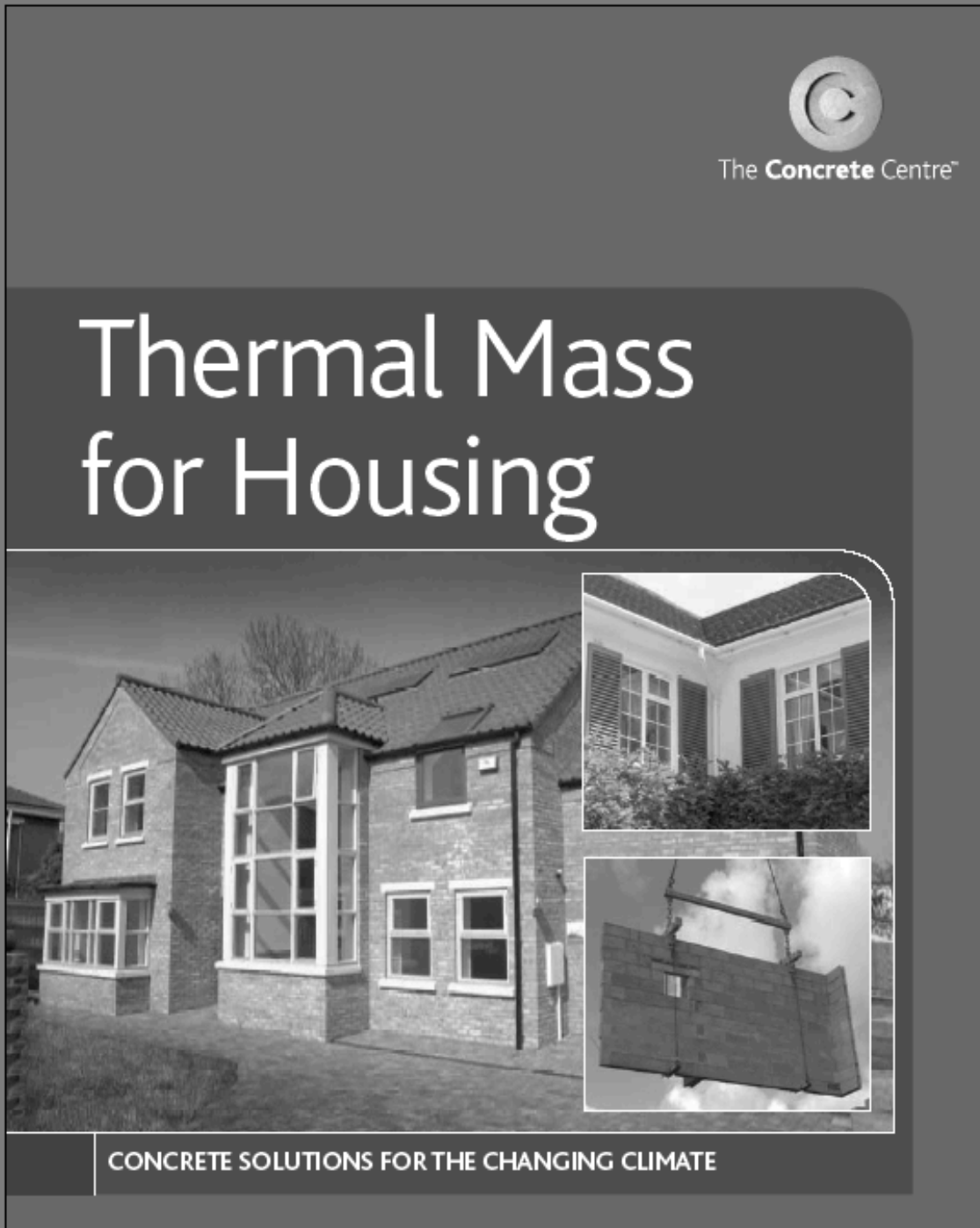
Feilden Clegg Bradley Architects LLP

RIBA 

ARUP

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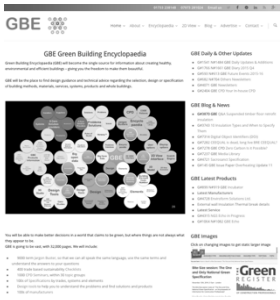
The Concrete Centre™

# Thermal Mass for Housing

CONCRETE SOLUTIONS FOR THE CHANGING CLIMATE

# Exploiting thermal mass

- If the building has high thermal mass and its surfaces are exposed
- they can be exploited in both heating and cooling
- In winter the mass can be heated in the day the heat stored for exploitation in the night
- In summer the mass can be cooled in the night and exploited in the day

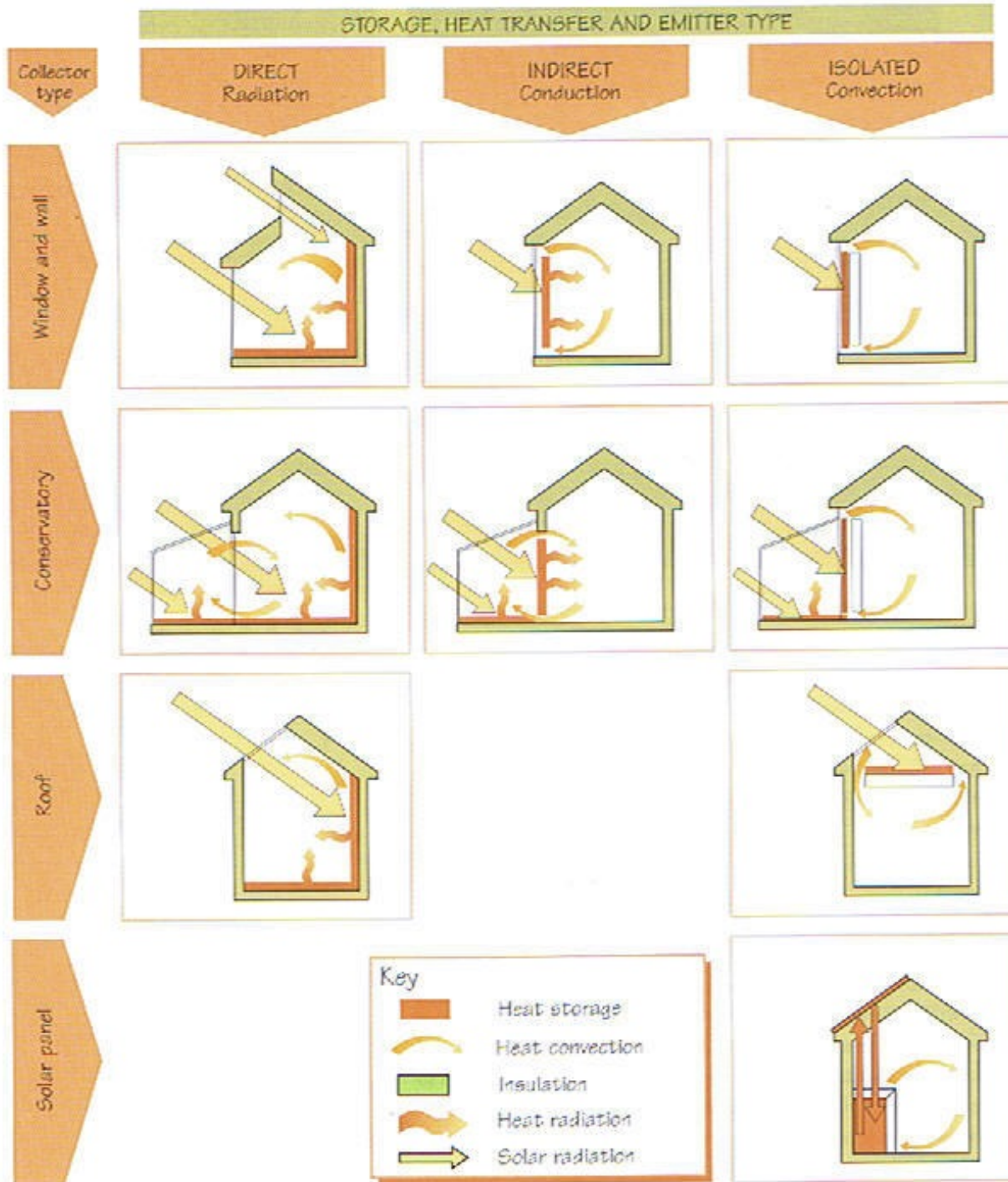
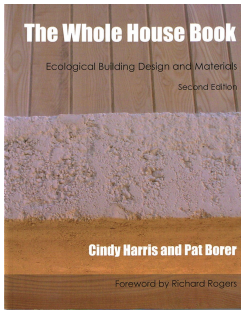


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# Thermal mass

- Large surface areas are best
- Thickness closest to surface is used in daily cycles,
- Full thicknesses and more used over annual cycles
- Higher density material is best
- Exposed to the space not hidden above ceilings or below floors
- Exposed to the sun's rays is good
- Embedded pipes can be exploited to move warmth and coolth around building or into storage





**Sunroom on South face captures the sun**



**Heavy building elements store the heat and release it later**



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# Gallions HA

## Conservatories



**Gallions Housing Association:  
Tenants would not choose the  
conservatory but now they have it  
would not give it up**







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# Conservatories Gone Wrong

In the real world

# Conservatories gone wrong

- Heated Conservatories (why not Solar?)
- Radiant Heated Conservatories (under floor heating) radiates upwards to warm objects
- If there is nothing to hit, the heat goes up and out the glass roof
- Electrically Heated Conservatories (+++CO<sub>2</sub>)
- Conservatories open to remainder of building (Heat gain or heat loss)
- Conservatories without ventilation (over-heating)

# **90% UK conservatories heated**

- **Underfloor Radiant heating**
- **In terms of fuel use they are like a gushing tap over a gulley**
- **Significant number have no doors or windows to separate from the rest of the house**
- **Despite the Building Regulations**
  - **Winter: Heat loss from house**
  - **Summer: Heat gain to house**
- **No hope then**

# Conservatory Gone Wrong

- No boundary between conservatory and accommodation beyond
- No thermal mass wall or floor to hold the heat
- No entry or exit ventilation in glazed roof
- No Solar shading (externally is best)
- Tenant fitted Air Conditioning



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# Swaffham Wind Turbine Visitors Centre

Conservatory design gone wrong



**South facing  
lean-to solar heat  
gain  
External shading  
helps  
No ventilation  
Thermal mass  
flooring on show  
between  
furniture**

**No thermal  
mass in back  
wall  
plasterboard  
partitions  
No ventilation  
Tenant fitted  
Air-  
conditioning**





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# 1 INTEGER @ BRE

## Intelligent & green

**Not very intelligent Conservatory:  
Secure all-weather garden  
single glazed and double to house but open at top floor  
Some solar shading, some planting**



**1NTEGER house  
conservatory at  
BRE is not all that  
it could be  
Single glazed  
No thermal mass  
back wall,  
open to living  
accommodation  
on top floor.  
Just sheltered  
outdoor space**





**Opening vents  
in side walls of  
conservatory  
but only half  
way up the  
height of the  
conservatory**



**Thermostat control piston actuated vents  
Thermostat at high level? Vents at mid level**



**Doors:  
provide low level  
ventilation  
Windows:  
none at top  
Internal solar  
shading: internal  
radiant heating &  
thermal stress in  
glass**



**Solar Thermal ET for Hot Water  
Roof window & minimal PV**





**Internal Solar  
shading generates  
heat in  
conservatory air  
Timber  
weatherboarding  
no thermal mass on  
rear wall  
Concrete or stone  
paving  
some thermal mass  
on floor**



**Top floor open to hottest part of conservatory**



**Internal solar  
shading:  
catches solar  
radiation  
heats up and  
re-radiates  
heat inwards.  
Energy  
efficient light  
fittings?**





**Top floor open to conservatory and  
ventilation at high level  
an oven for hobby or TV room**



**Bedrooms face South & open onto the warm conservatory, no escape**

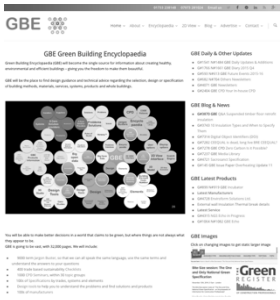


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# Feedback

- **These files are created by generalists with a big dollop of green flavour**
- **These files are updated from time to time**
- **We are not experts so from time to time these file may get out of date or may be wrong.**
- **If you feel that we have got it wrong please let us know so we can put it right**



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