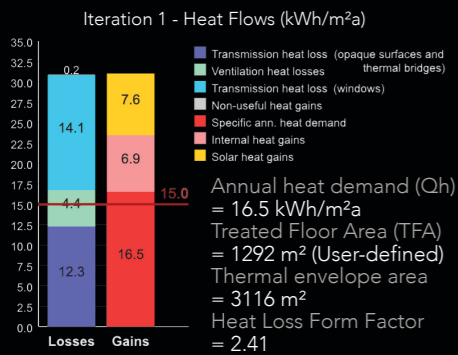
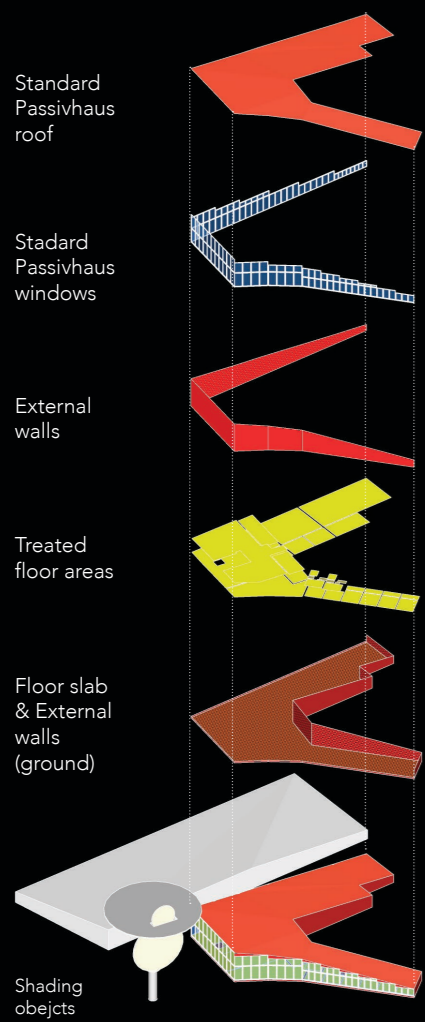
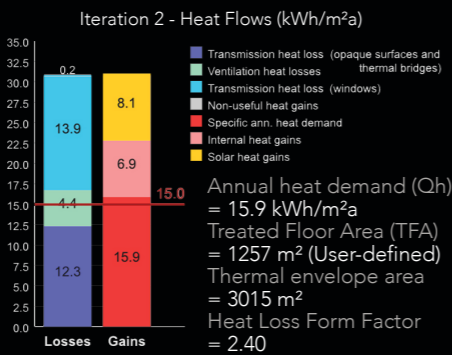
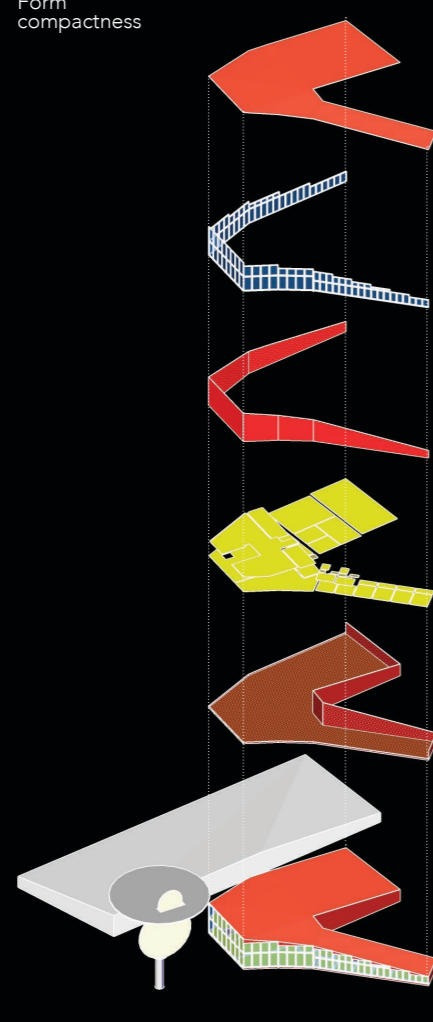


Iteration 1



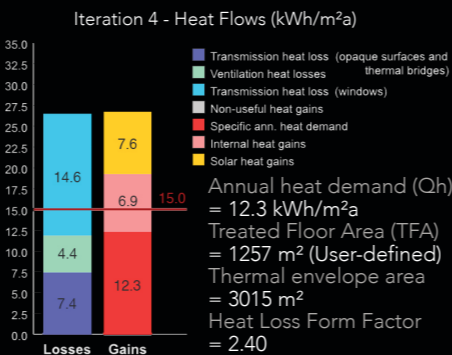
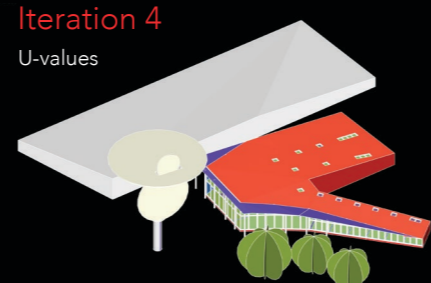
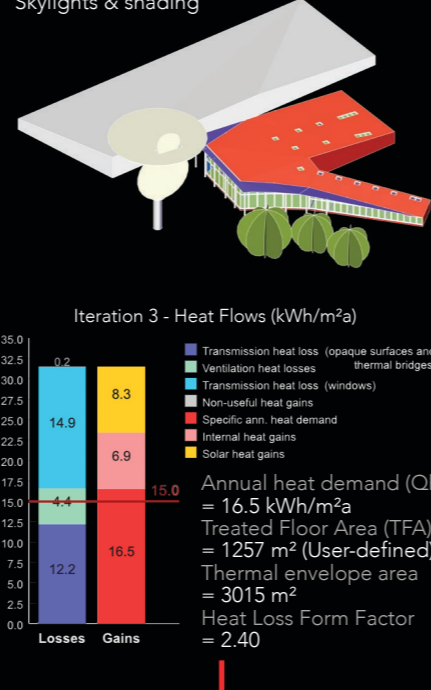
Iteration 2

Form compactness

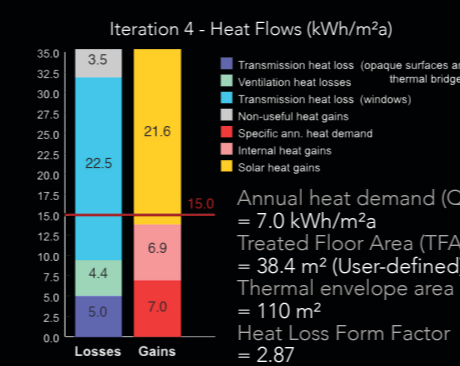
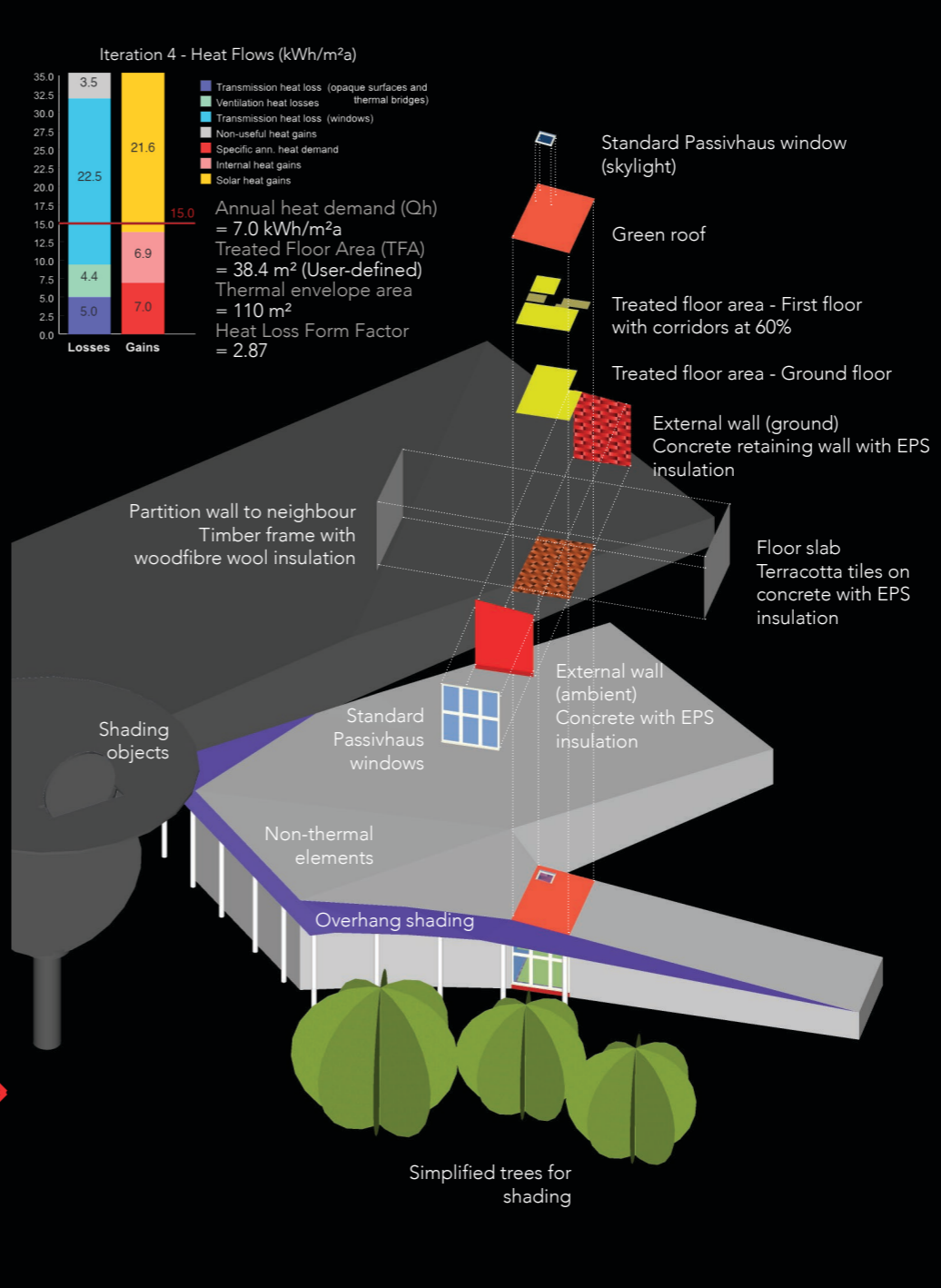


Iteration 3

Skylights & shading



Iteration 4 (accommodation unit)



Iteration 4 - U-values

Component	U-value (W/m ² K)
Green roof	0.079
First floor	0.213
Internal partition wall	0.233
Ground floor	0.080
Retaining wall	0.082

Iteration 5

- Ground level
- Occupancy
- Improve window specification (U-values)

Improve window specification (U-values):

U-Value Window	W/(m ² K)	U-Value Window	W/(m ² K)
0.90	0.71	0.90	0.71
0.90	0.71	0.90	0.71
0.88	0.69	0.91	0.71
0.90	0.71	0.88	0.69
0.91	0.71	0.92	0.79
0.88	0.69		

Ground level: Heated basement or floor slab completely / partially below ground level

Basement wall height below ground level: z = 6.05 m

U-Value wall below ground: U_{wb} = 0.082 W/(m²K)

Occupancy:

Calculation electricity / Internal heat gains

Specific Building Demands	Achieved	Required	Fulfilled?
Heating demand kWh/(m ² a)	19	15	no
Heating load W/m ²	15	10	no
Overall specific space cooling demand kWh/(m ² a)	52	18	no
Cooling load W/m ²	14	10	no

Iteration 4 (in PHPP)

U-values (see designPH p.54)

U-values:

Green roof (0.079 W/m²K)

First floor (0.213 W/m²K)

Internal partition wall (0.233 W/m²K)

Ground floor (0.080 W/m²K)

Retaining wall (0.082 W/m²K)

Iteration 6

- Night ventilation
- Cooling unit

Night ventilation carries accumulated heat out of the building when outdoor ambient temperatures are lower than indoor temperature (see diagram opposite).

Night ventilation:

Secondary calculation: Additional night ventilation for cooling

Description	Value
Reduction factor	1
Climate boundary conditions	1
Temperature diff interior - exterior	1
Wind velocity	0
Window group 1	3
Quantity	1.30
Clear width	2.60
Tilting window (check if appropriate)	x
Opening width (for tilting windows)	0.100
Window group 2 (cross ventilation)	3
Quantity	1.30
Clear width	2.40
Clear height	x
Tilting window (check if appropriate)	x
Opening width (for tilting windows)	0.300
Difference in height to window 1	2.60
Result: Night ventilation values (h)	4.18

Cooling unit:

Supply air cooling check as appropriate

On/Off mode (check as appropriate)	Value
max. cooling capacity (sensible + latent)	0.8 kW
Temperature reduction dry	20.4 K
Seasonal energy efficiency ratio	5

Iteration 7

Add louvres in designPH

Specific Building Demands	Achieved	Required	Fulfilled?
Heating demand kWh/(m ² a)	11	15	yes
Heating load W/m ²	12	10	-
Overall specific space cooling demand kWh/(m ² a)	19	18	no
Cooling load W/m ²	11	-	-

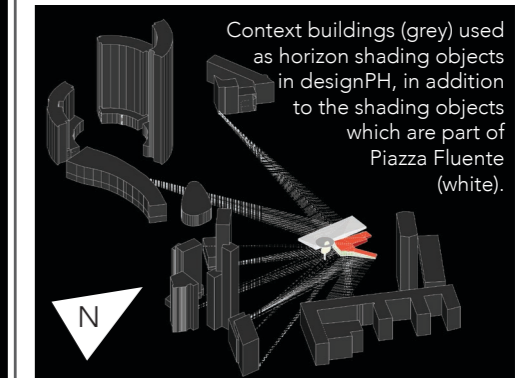


in partnership with

Katie de Silva

Piazza Fluente

Oxford Brookes University



Design & development:

For the initial designPH analysis (iterations 1-4), the main building of Piazza Fluente has been tested as it contains all variants of the programme and has windows facing east, south and west, so will give a good indication of the performance of both buildings. As designPH does not include climate data for Milan, data for Florence (Firenze) has been used. A more detailed designPH & PHPP analysis has been done for guest 1 accommodation unit (iterations 4-7). At this stage climate data was updated for Milan. This unit has been chosen for testing as it includes serviced spaces (kitchen & bathroom), a skylight, east-facing glazing (which is challenging to shade) and both ambient and ground-facing (earth-sheltered) external walls.

