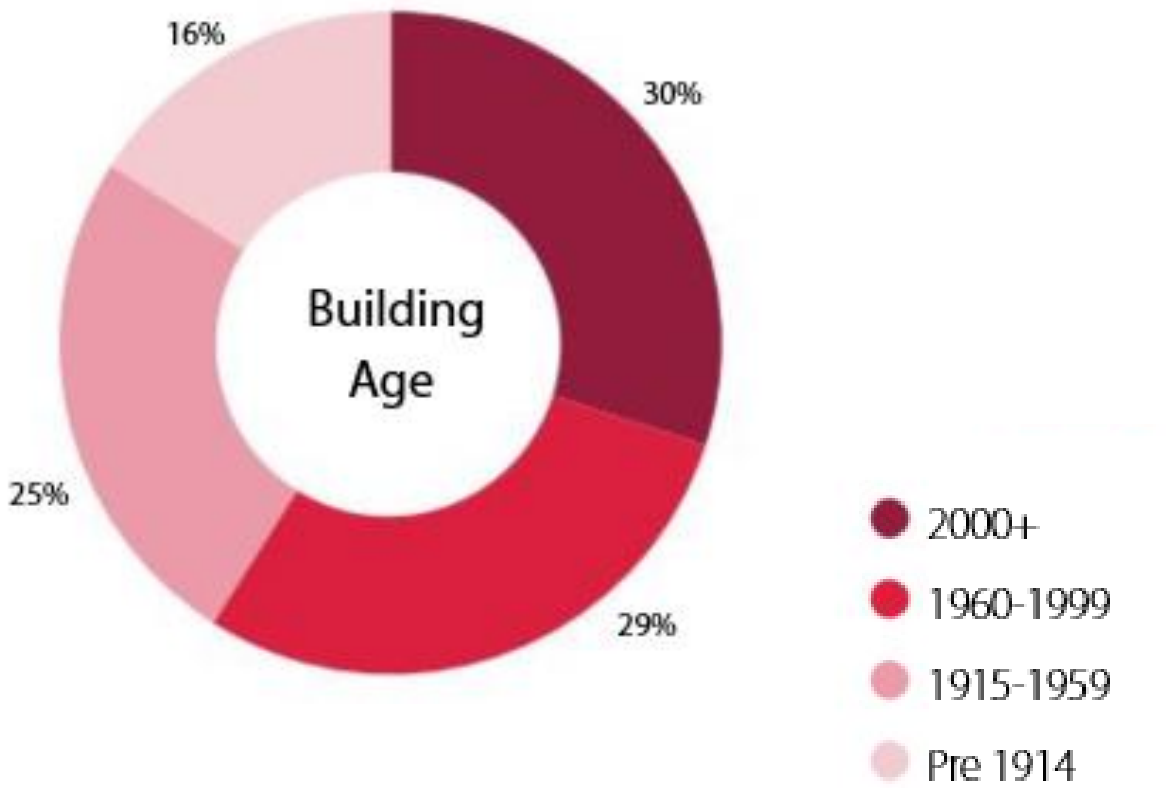
#UKPHC19

1 Regent Street, Cambridge

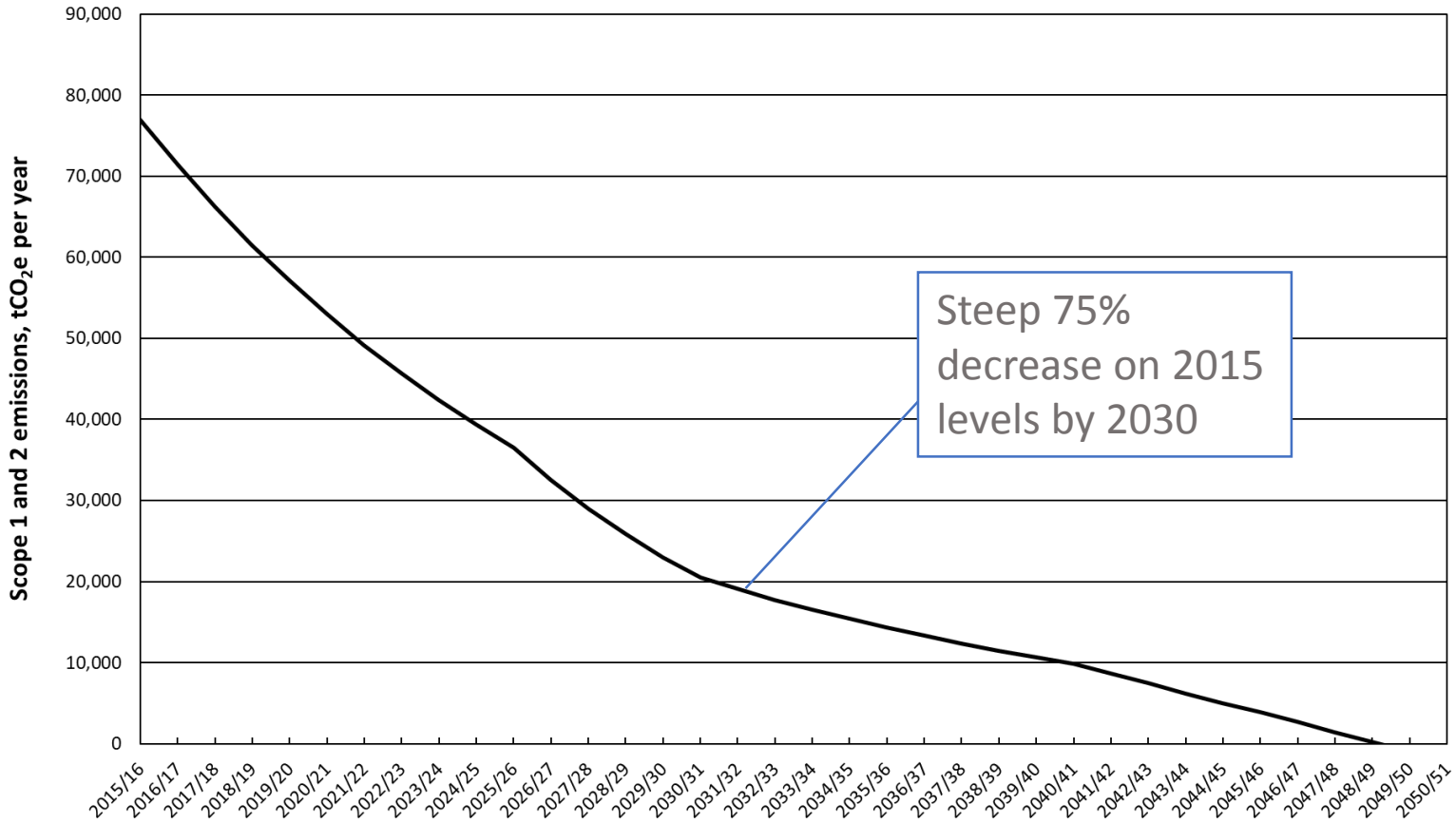
Wendy Bishop : Architype

Alex Reeve: University of Cambridge

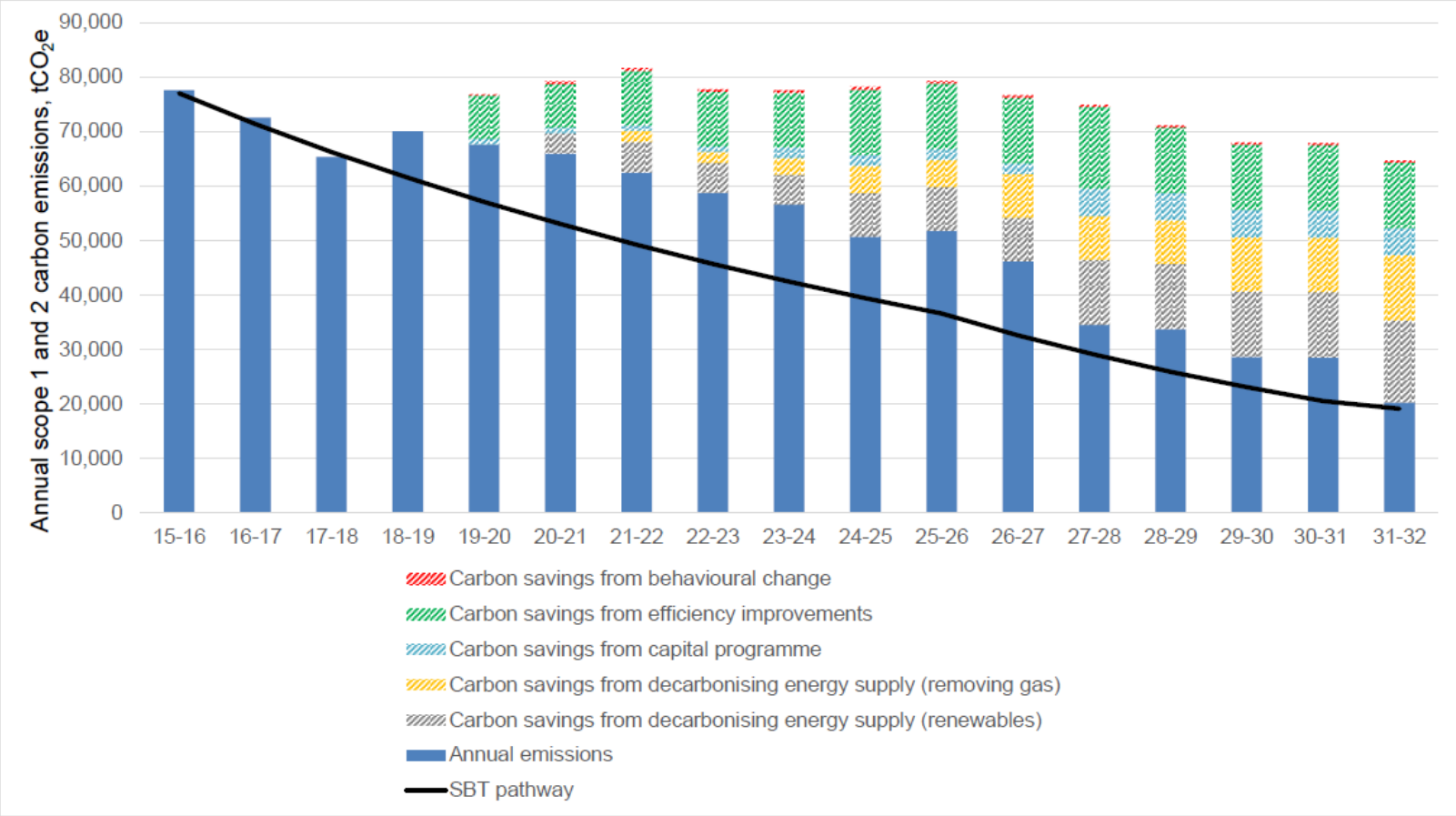
University of Cambridge's Estate



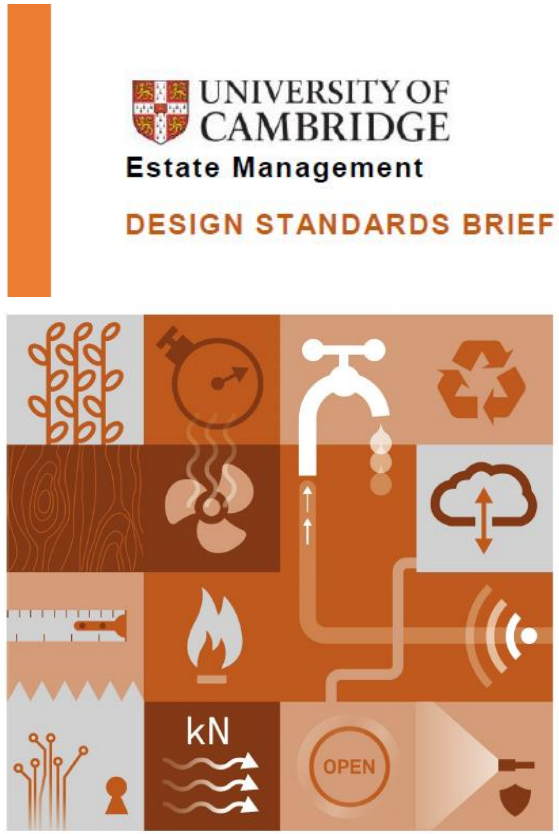
Science Based Target for carbon reduction



a sample carbon reduction pathway

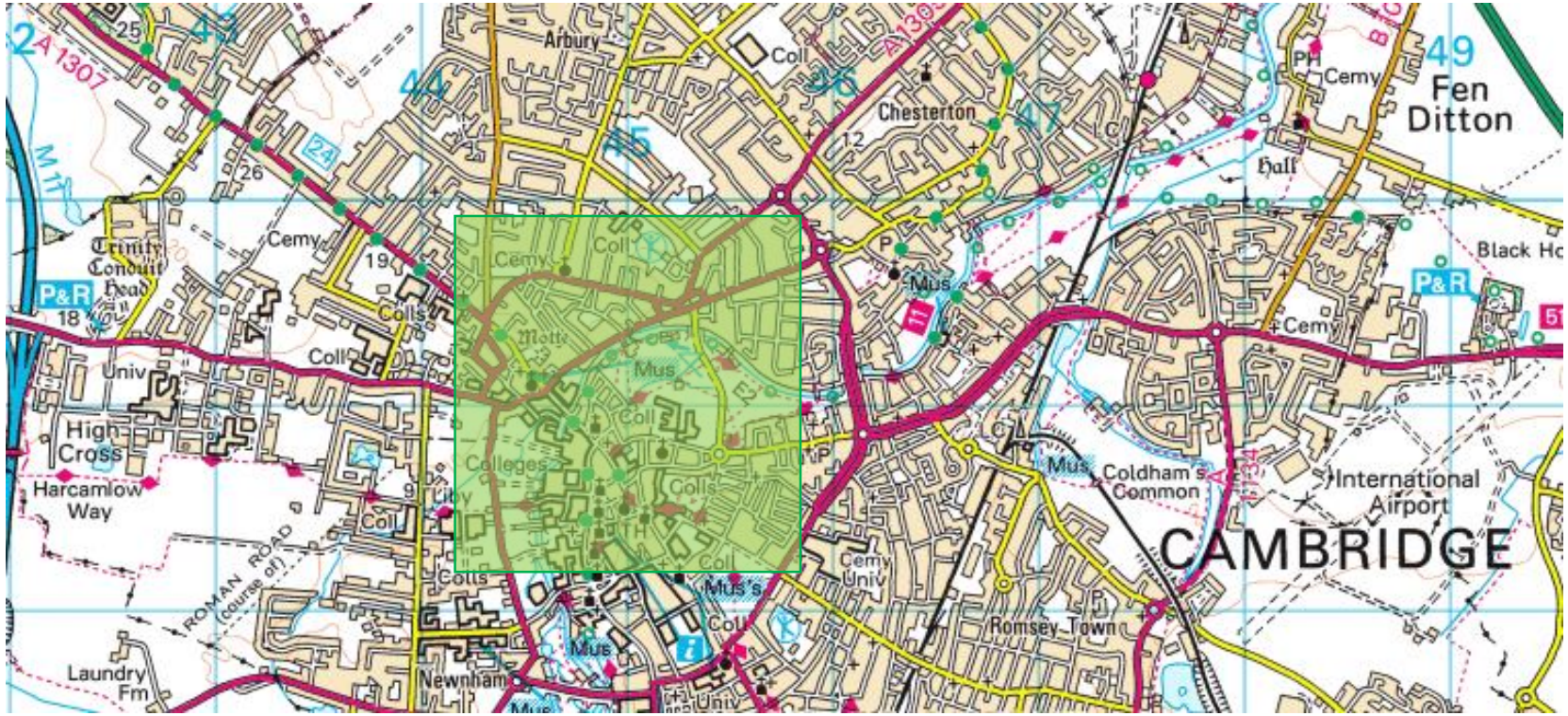


our current design standards



- BREEAM Excellent
- natural ventilation
- passive cooling
- embodied energy?

value for money

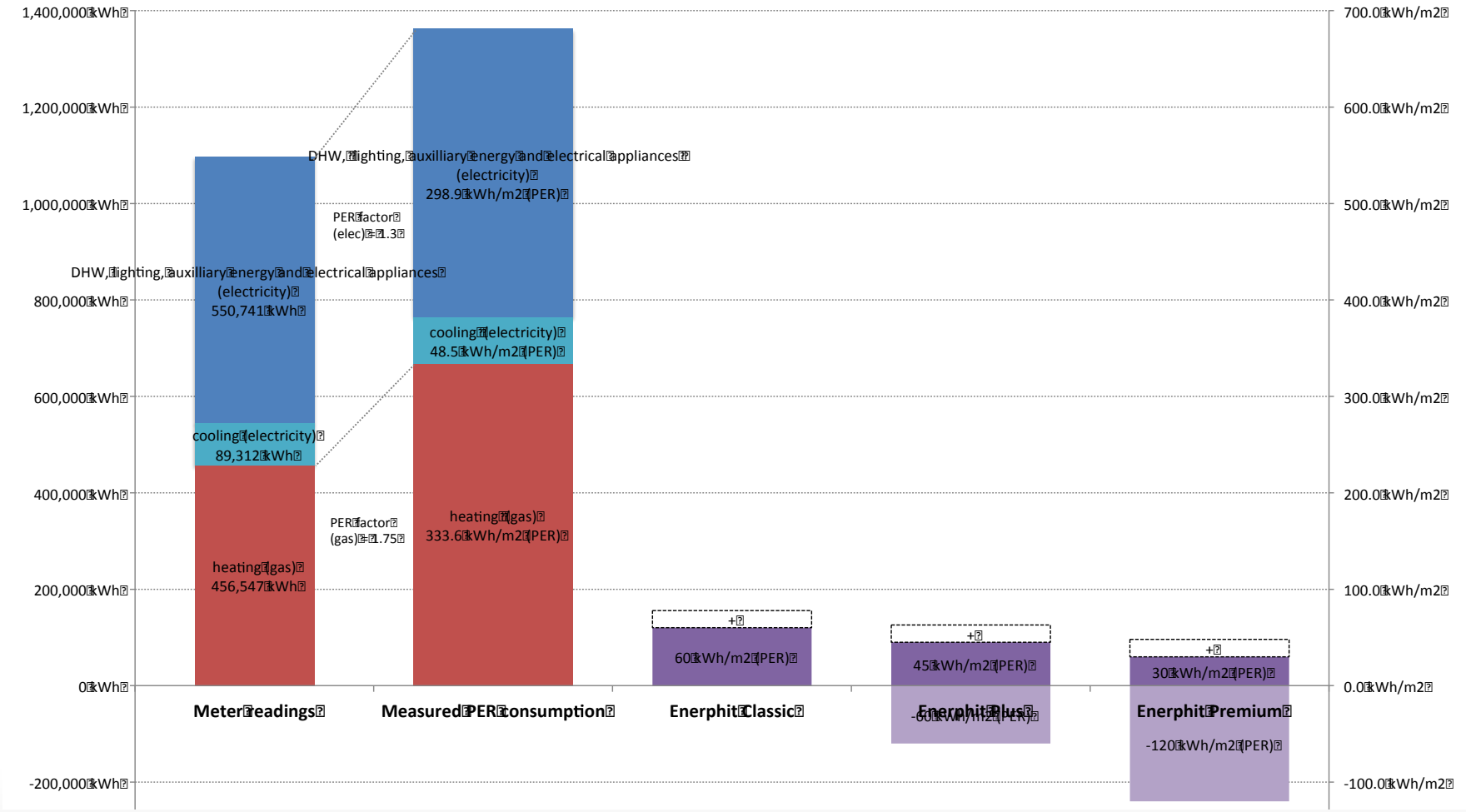


value for money

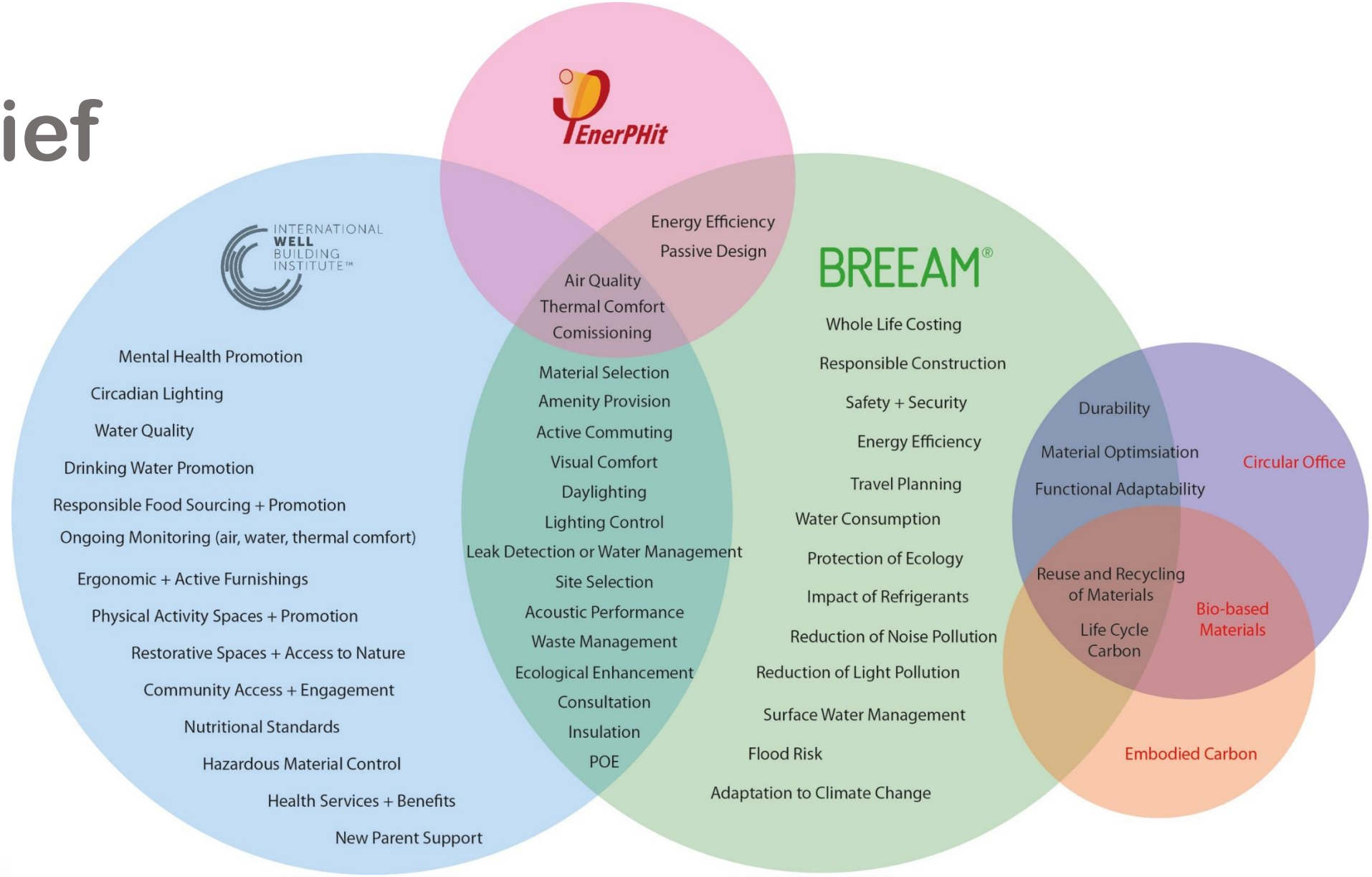
1 Regent Street

College
King's College
Corpus Christi College
St Catherine's College
Emmanuel College
Pembroke College
Peterhouse
Peterhouse
Downing College
Parker's Piece
Regent Street

Scale of change



Brief


EnerPHit
INTERNATIONAL WELL BUILDING INSTITUTE™
BREEAM®
Energy Efficiency
Passive Design
Air Quality
Thermal Comfort
Comissioning
Mental Health Promotion
Circadian Lighting
Water Quality
Drinking Water Promotion
Responsible Food Sourcing + Promotion
Ongoing Monitoring (air, water, thermal comfort)
Ergonomic + Active Furnishings
Physical Activity Spaces + Promotion
Restorative Spaces + Access to Nature
Community Access + Engagement
Nutritional Standards
Hazardous Material Control
Health Services + Benefits
New Parent Support
Material Selection
Amenity Provision
Active Commuting
Visual Comfort
Daylighting
Lighting Control
Leak Detection or Water Management
Site Selection
Acoustic Performance
Waste Management
Ecological Enhancement
Consultation
Insulation
POE
Whole Life Costing
Responsible Construction
Safety + Security
Energy Efficiency
Travel Planning
Water Consumption
Protection of Ecology
Impact of Refrigerants
Reduction of Noise Pollution
Reduction of Light Pollution
Surface Water Management
Flood Risk
Adaptation to Climate Change
Durability
Material Optimsiation
Functional Adaptability
Circular Office
Reuse and Recycling of Materials
Life Cycle Carbon
Bio-based Materials
Embodied Carbon

Small power

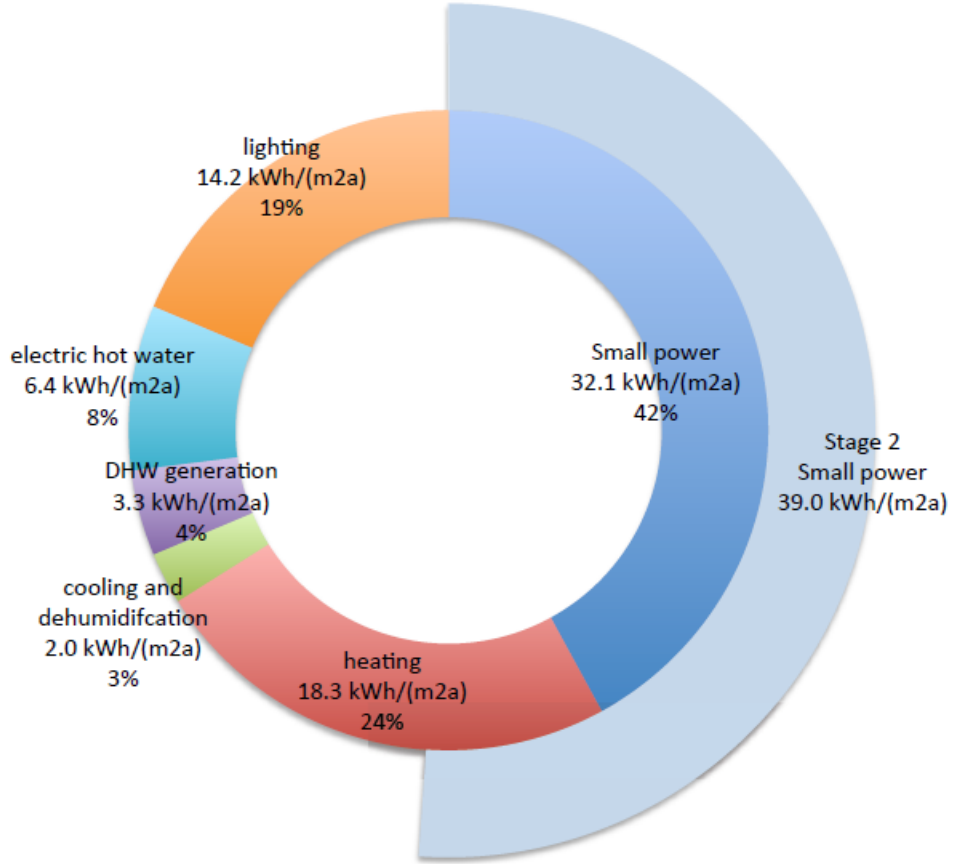


Diagram showing the Stage 1 split of PER primary energy use (the inner doughnut), with the current Stage 2 estimate of PER energy for small power shown for comparison (partial outer doughnut).

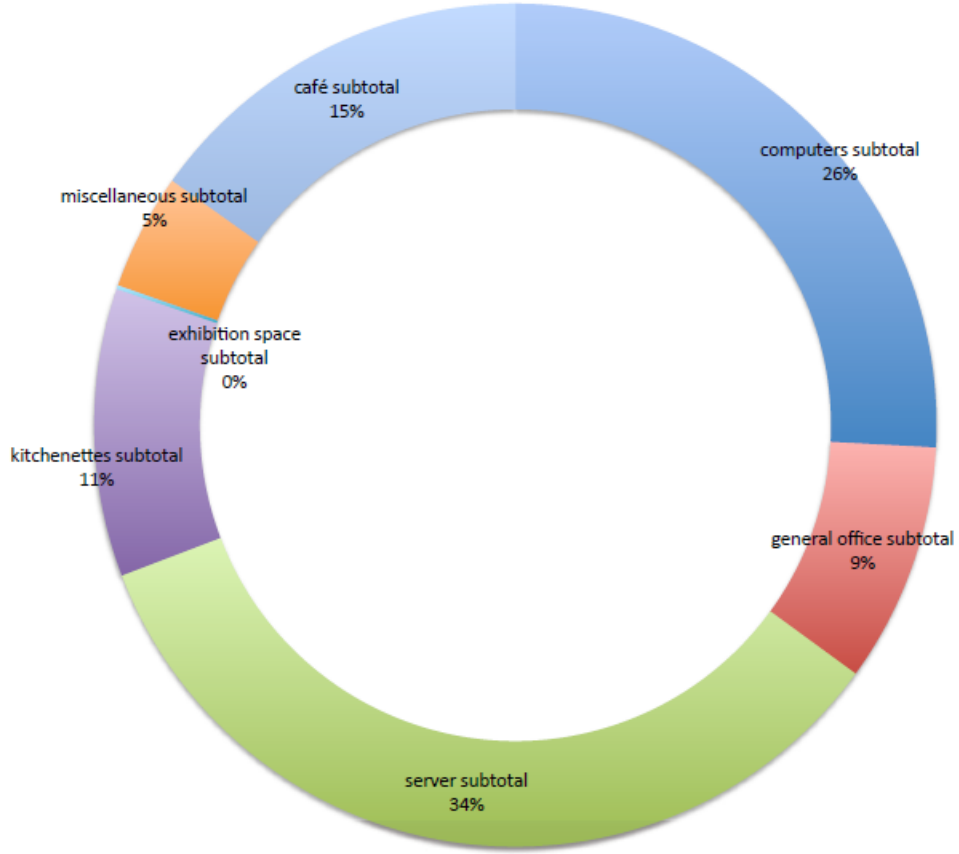
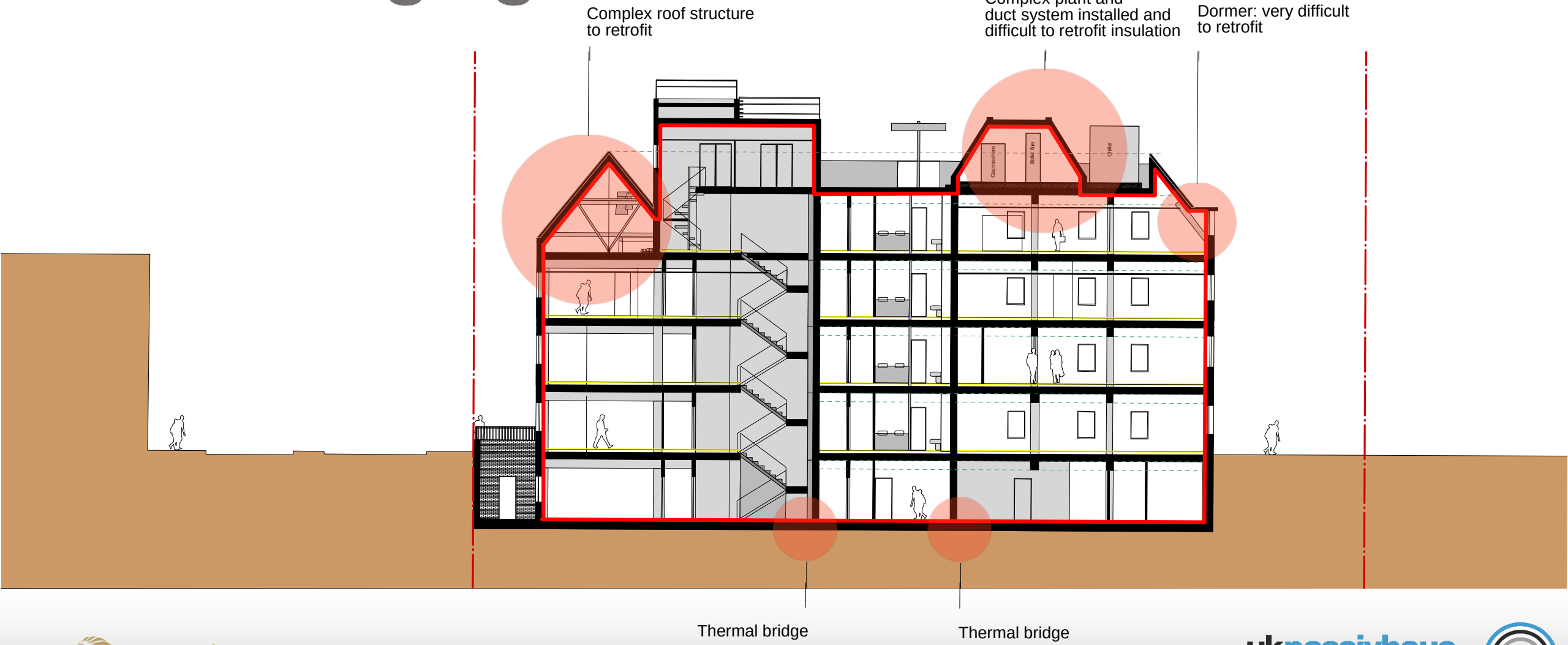
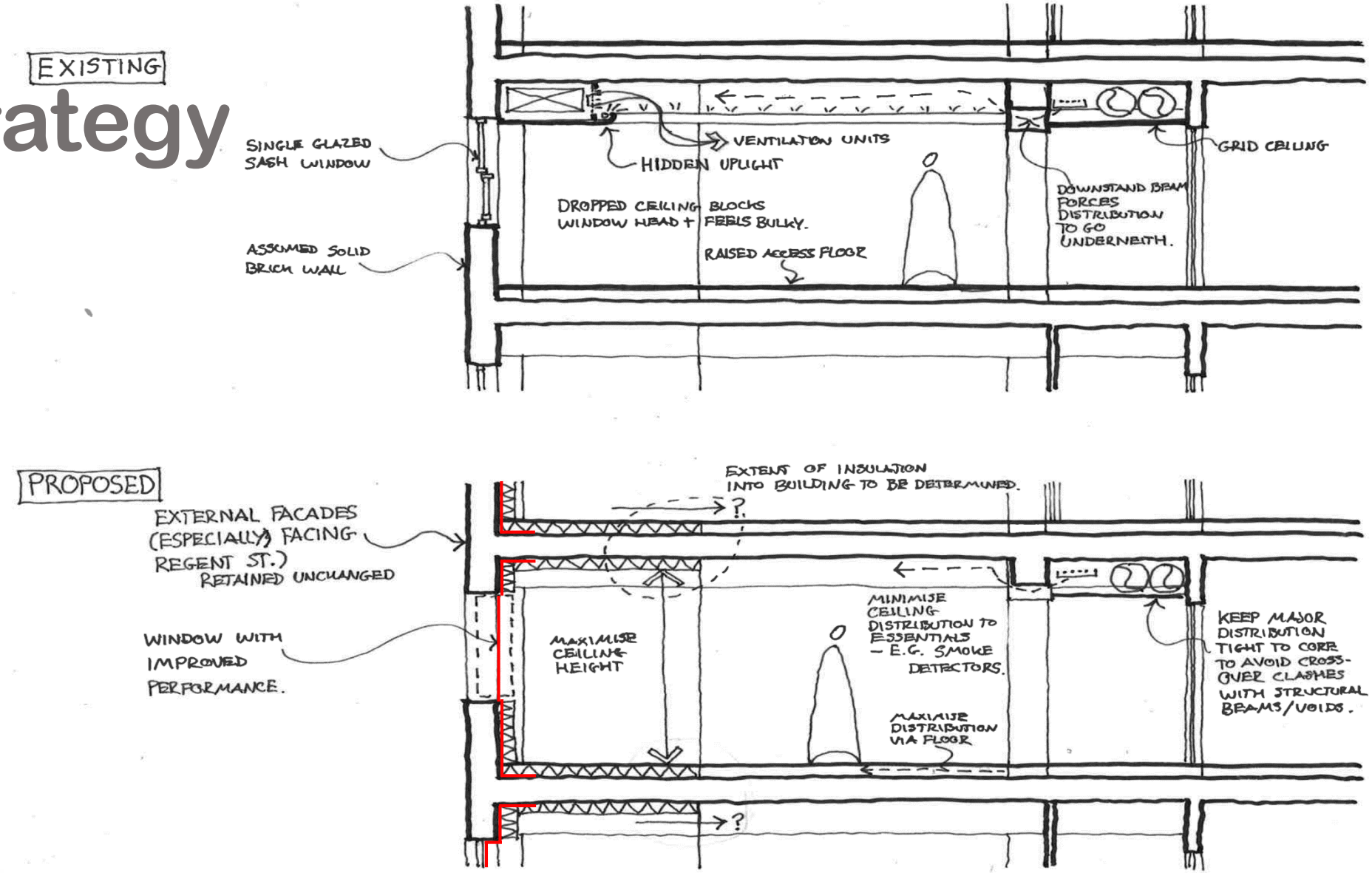


Diagram showing the Stage 2 split of PER small power energy use between types of equipment.

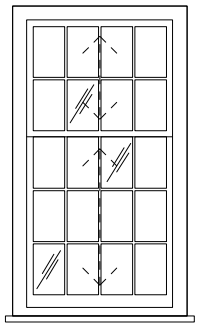
Challenging details



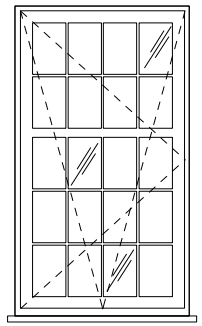
Strategy

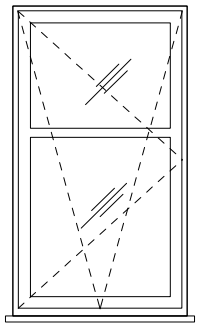

EXISTING
SINGLE GLAZED SASH WINDOW
ASSUMED SOLID BRICK WALL
VENTILATION UNITS
HIDDEN UPLIGHT
DROPPED CEILING BLOCKS WINDOW HEAD + FEELS BULKY.
RAISED ACCESS FLOOR
DOWNSTAND BEAM FORCES DISTRIBUTION TO GO UNDERNEATH.
GRID CEILING
PROPOSED
EXTERNAL FACADES (ESPECIALLY) FACING REGENT ST.) RETAINED UNCHANGED
WINDOW WITH IMPROVED PERFORMANCE.
EXTENT OF INSULATION INTO BUILDING TO BE DETERMINED.
MAXIMISE CEILING HEIGHT
MINIMISE CEILING DISTRIBUTION TO ESSENTIALS – E.G. SMOKE DETECTORS.
MAXIMISE DISTRIBUTION VIA FLOOR
KEEP MAJOR DISTRIBUTION TIGHT TO CORE TO AVOID CROSS-OVER CLASHES WITH STRUCTURAL BEAMS/VOIDS.

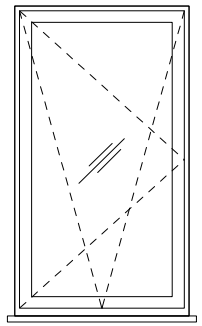
Windows

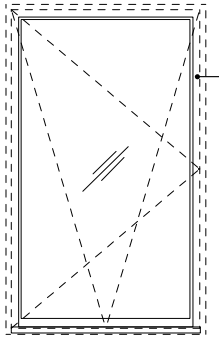


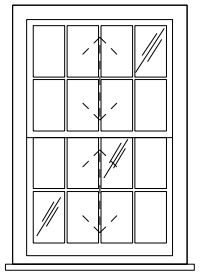
Typical first floor windows



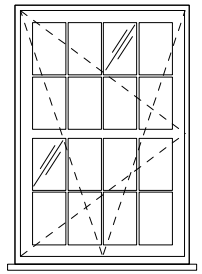


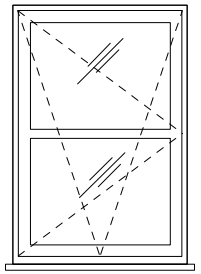


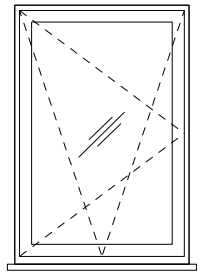


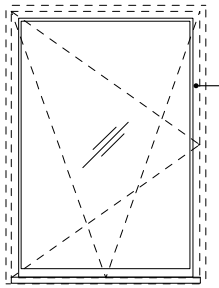


Typical ground floor windows









Option 1
Double glazed sliding sash

Average glazed area: 57.0%

U-value*:
U(w) 1.5 W/(m²K)

Option 2
Triple glazed mock sash - central horizontal glazing bar with subdividing mullions & transoms

Average glazed area: 61.5%

U-value*:
U(w) 0.95 W/(m²K)

Option 3
Triple glazed mock sash- central horizontal glazing bar only

Average glazed area: 66.2%

U-value*:
U(w) 0.93 W/(m²K)

Option 4
Triple glazed tilt and turn Passivhaus window (open-in)

Average glazed area: 69.3%

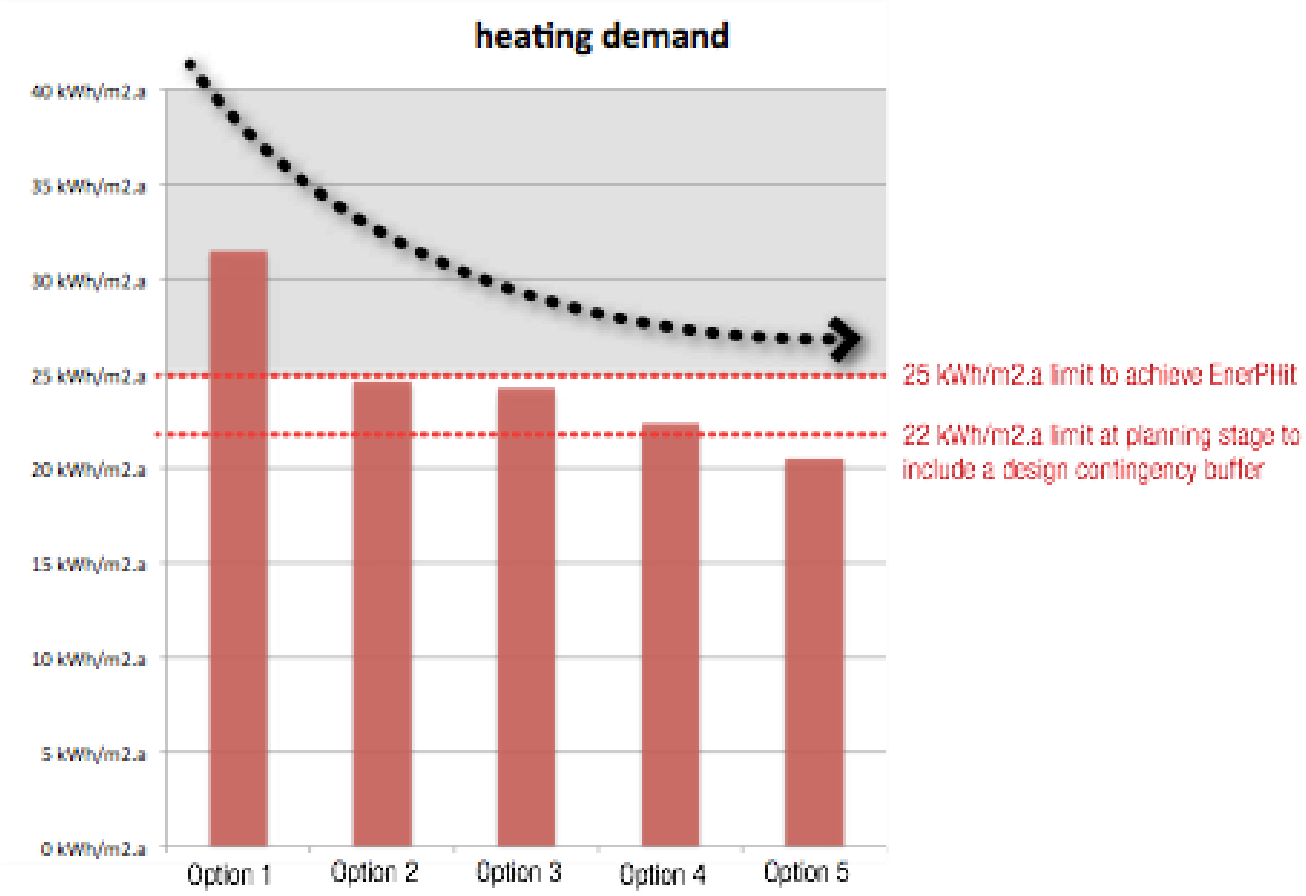
U-value*:
U(w) 0.76 W/(m²K)

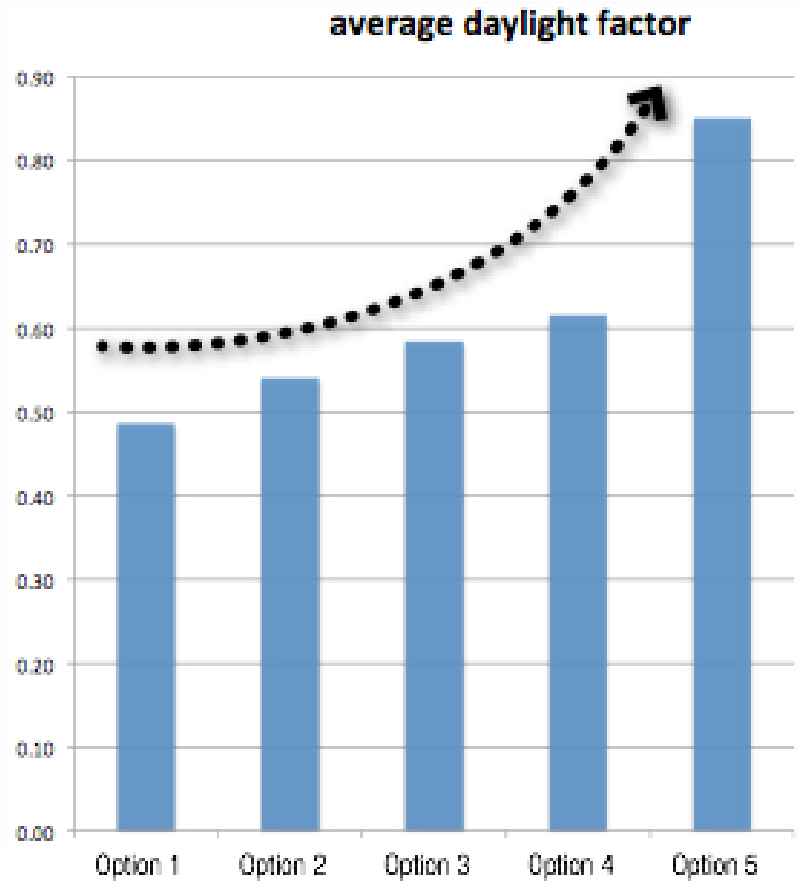
Option 5
Triple glazed tilt and turn Passivhaus window with frame overlapping wall (open-in)

Average glazed area: 92.4%

U-value*:
U(w) 0.69 W/(m²K)

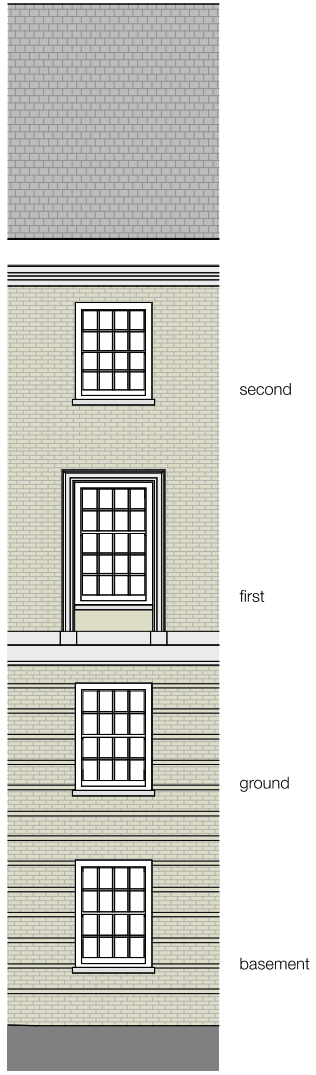
Windows


heating demand
40 kWh/m2.a
35 kWh/m2.a
30 kWh/m2.a
25 kWh/m2.a
20 kWh/m2.a
15 kWh/m2.a
10 kWh/m2.a
5 kWh/m2.a
0 kWh/m2.a
Option 1
Option 2
Option 3
Option 4
Option 5
25 kWh/m2.a limit to achieve EnerPHit
22 kWh/m2.a limit at planning stage to include a design contingency buffer


average daylight factor
0.90
0.80
0.70
0.60
0.50
0.40
0.30
0.20
0.10
0.00
Option 1
Option 2
Option 3
Option 4
Option 5

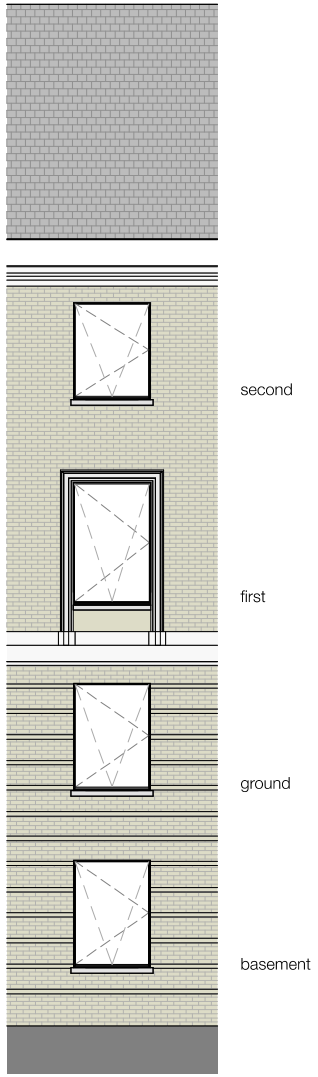
Windows

3D View - Existing Window Bay



Elevation - Existing Window Bay
1:100

3D View - Proposed Window Bay



Elevation - Proposed Window Bay
1:100

Windows

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Thank you…