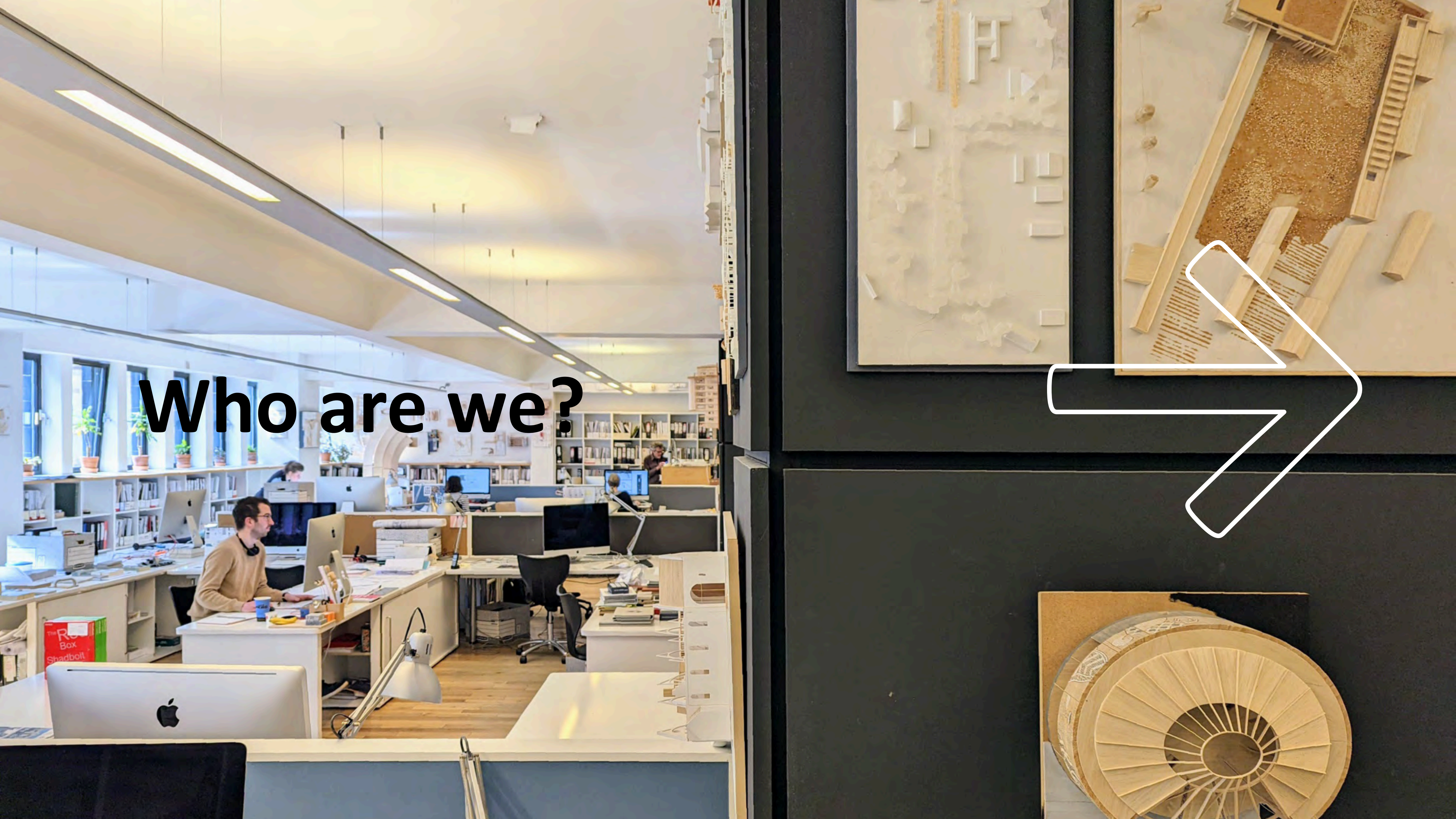

PAGE\PARK
hello
Green Homes Festival

Who are we?



Our team

Image credit, Glagowtimes.co.uk

We excel in the creative reuse of existing buildings. Always focussing on building resilience

Retrofit where possible. The greatest asset an organisation has is its built fabric, both in *spatial* and *carbon* terms

We have learnt how to tread lightly designing to have a low carbon impact.

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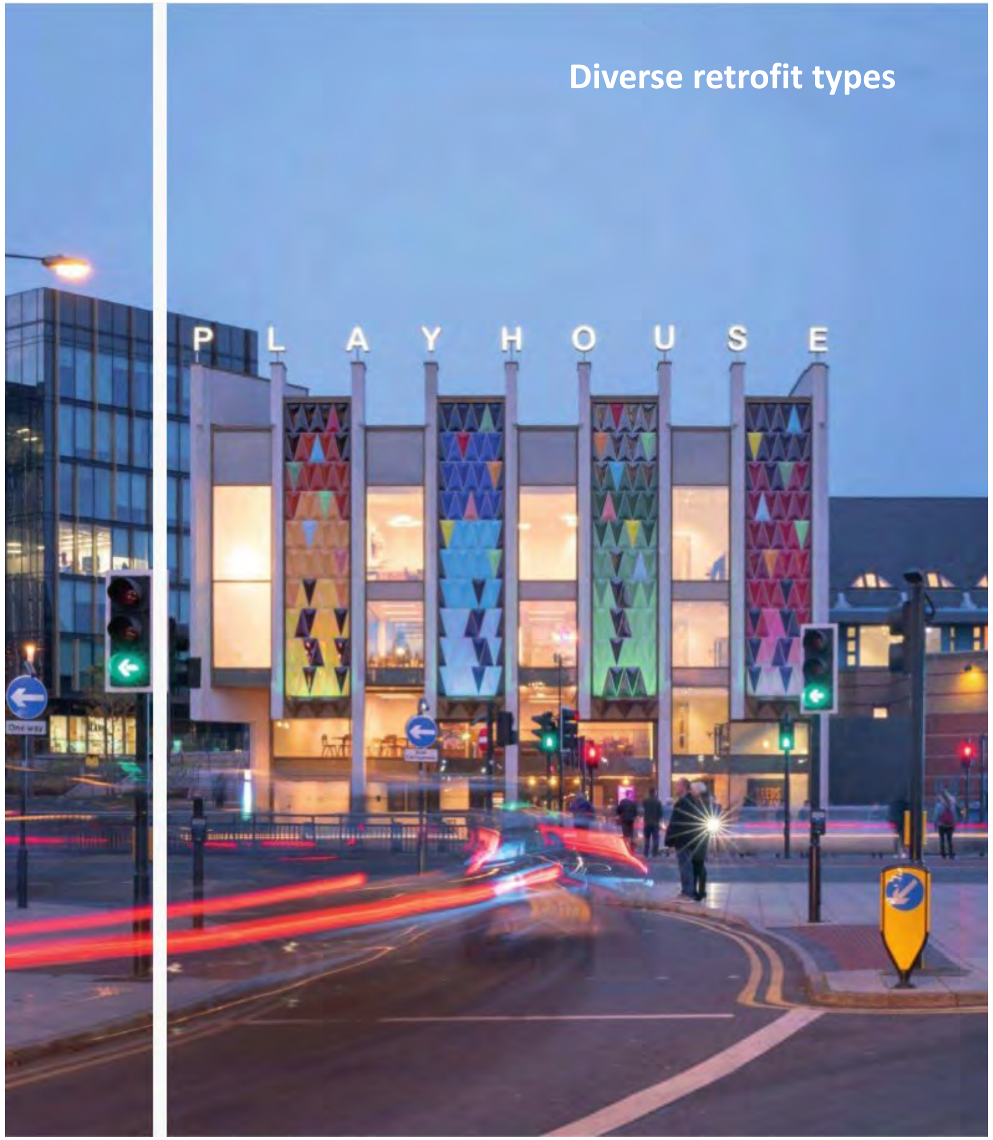
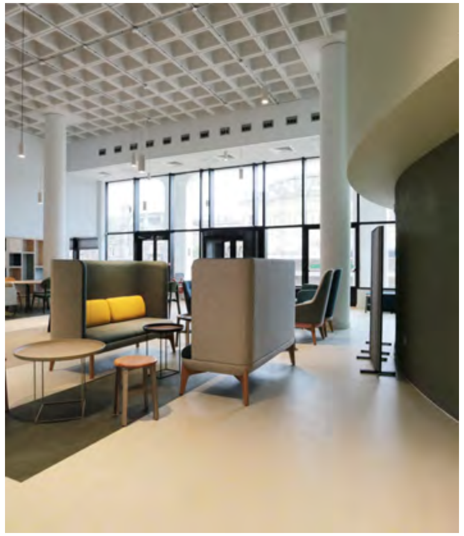
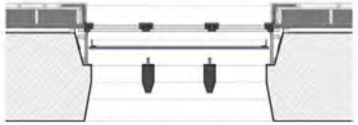
Diverse retrofit types

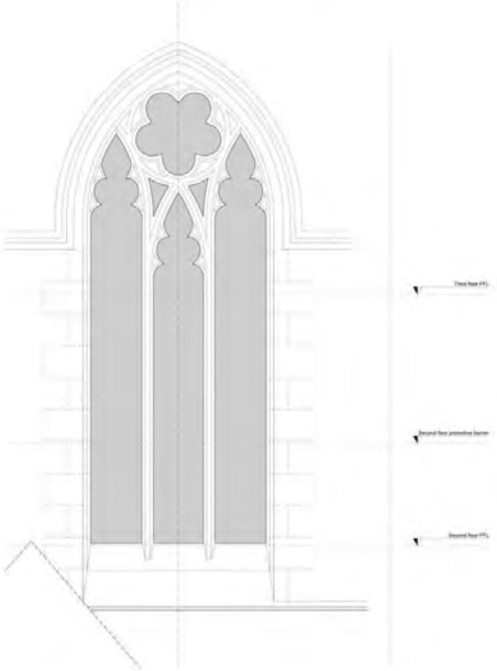


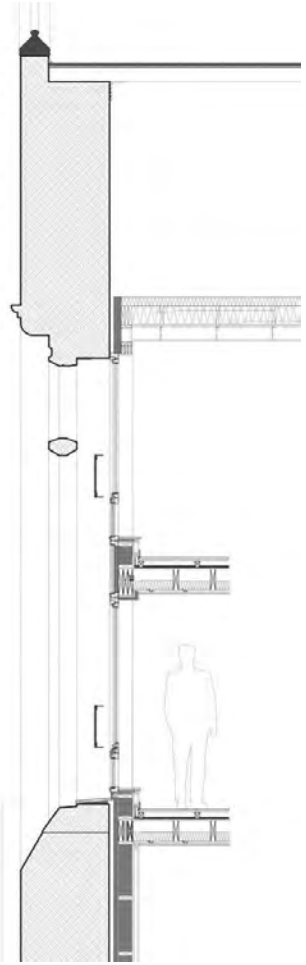


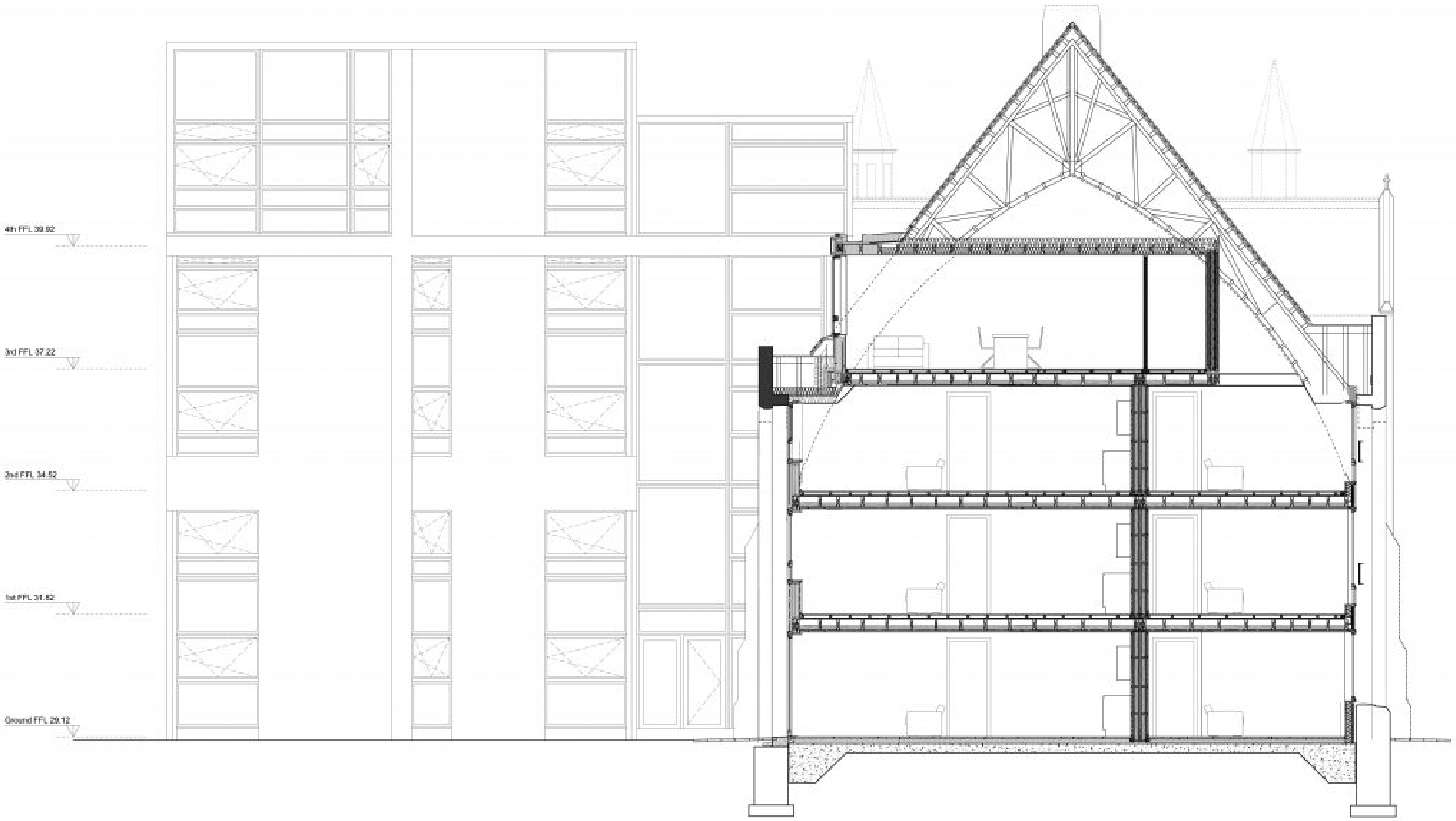
Cunningham House →


SHETTLESTON RD
R STORES

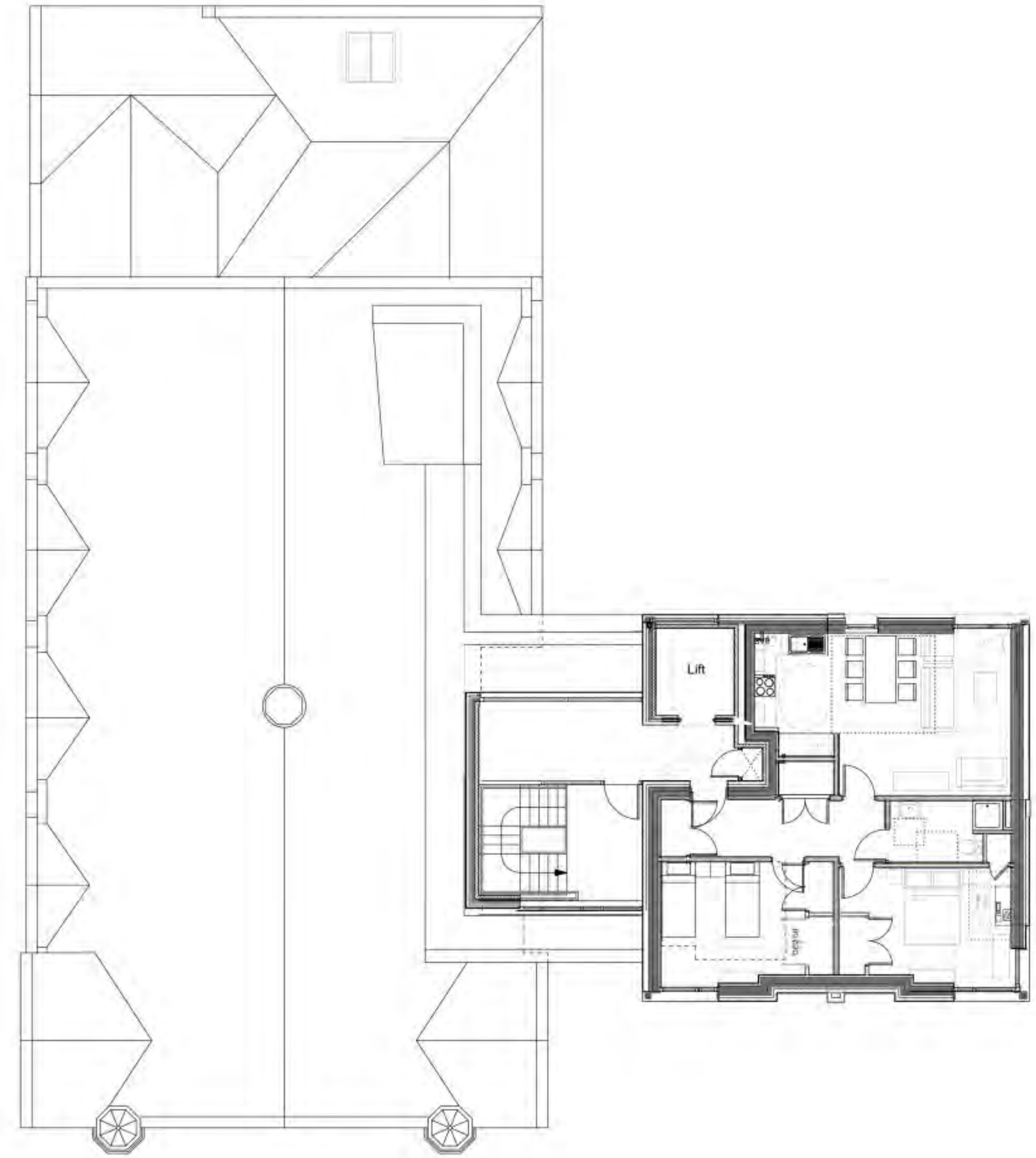




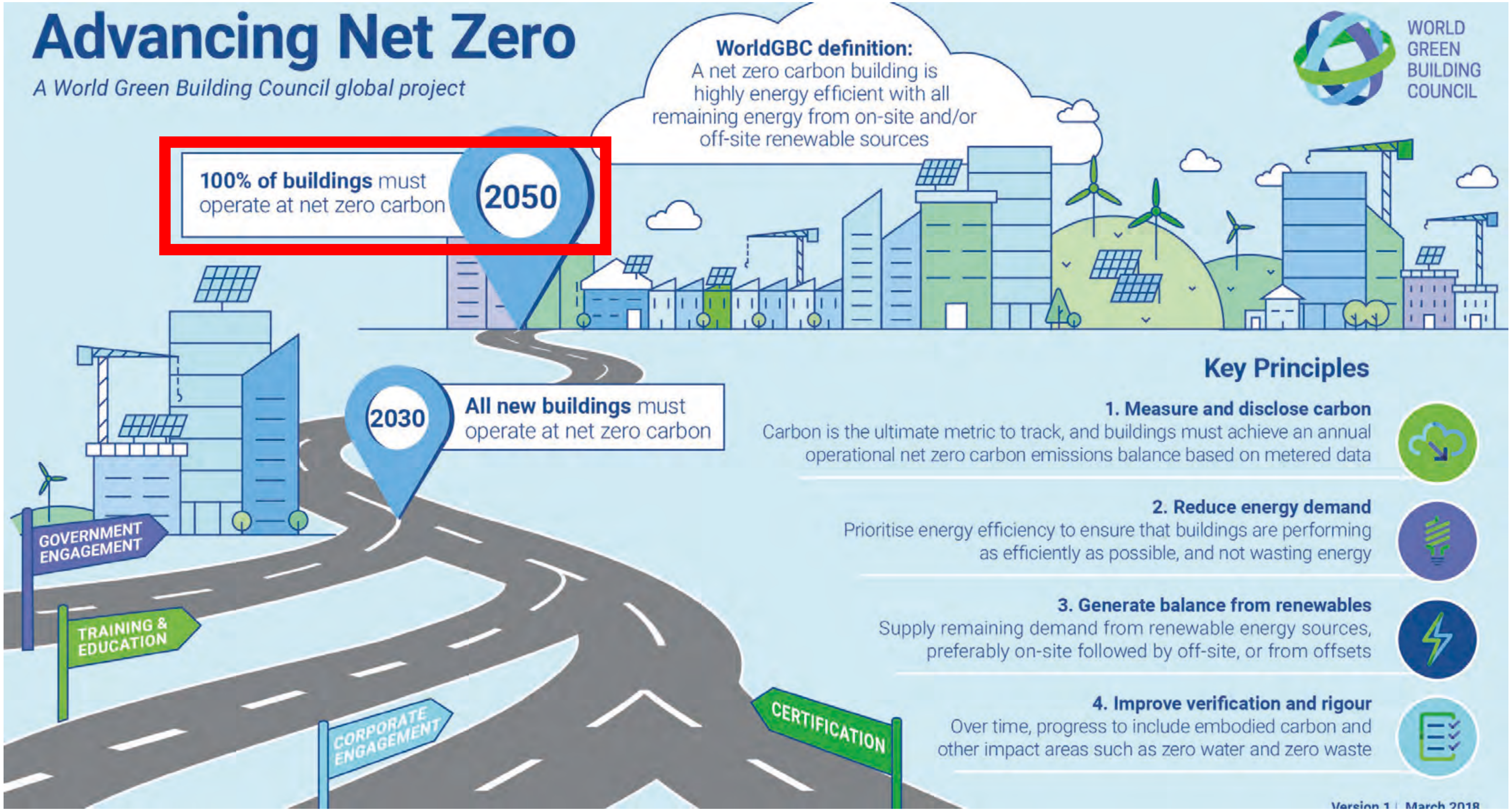



4th FFL 39.92
3rd FFL 37.22
2nd FFL 34.52
1st FFL 31.82
Ground FFL 29.12


New press cupboard
New press cupboard
Lift
Dry Riser
Elec Meter
Gas Meter


Lift

The Climate Emergency


Advancing Net Zero
A World Green Building Council global project
WorldGBC definition:
A net zero carbon building is highly energy efficient with all remaining energy from on-site and/or off-site renewable sources
WORLD GREEN BUILDING COUNCIL
100% of buildings must operate at net zero carbon
2050
2030
All new buildings must operate at net zero carbon
Key Principles
1. Measure and disclose carbon
Carbon is the ultimate metric to track, and buildings must achieve an annual operational net zero carbon emissions balance based on metered data
2. Reduce energy demand
Prioritise energy efficiency to ensure that buildings are performing as efficiently as possible, and not wasting energy
3. Generate balance from renewables
Supply remaining demand from renewable energy sources, preferably on-site followed by off-site, or from offsets
4. Improve verification and rigour
Over time, progress to include embodied carbon and other impact areas such as zero water and zero waste
GOVERNMENT ENGAGEMENT
TRAINING & EDUCATION
CORPORATE ENGAGEMENT
CERTIFICATION
Version 1 | March 2018

Operational +

“Net Zero Carbon”

\+ Embodied

Why focus on retrofit?

80% of the homes we will be living in by 2050 will
have already been built

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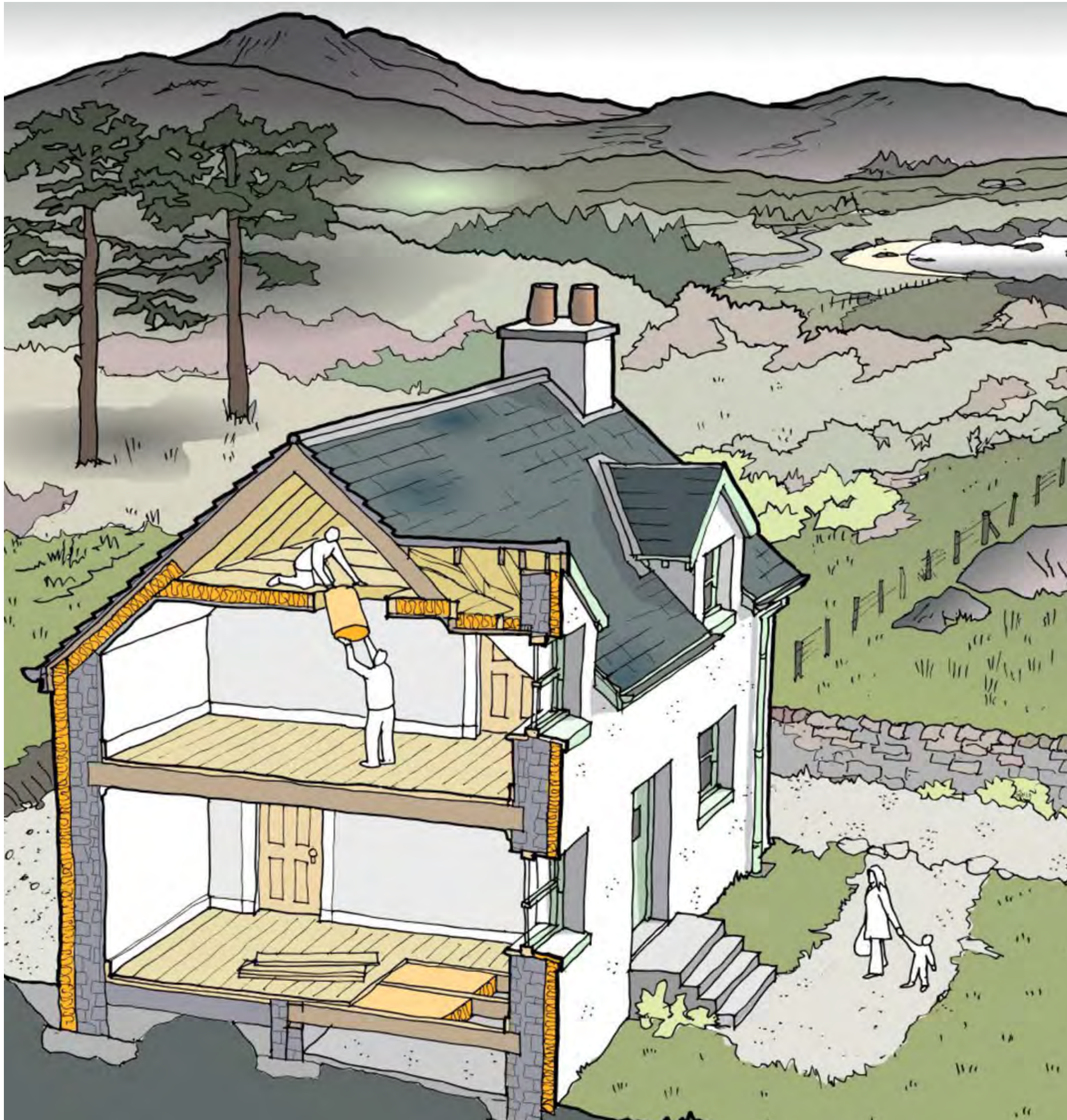
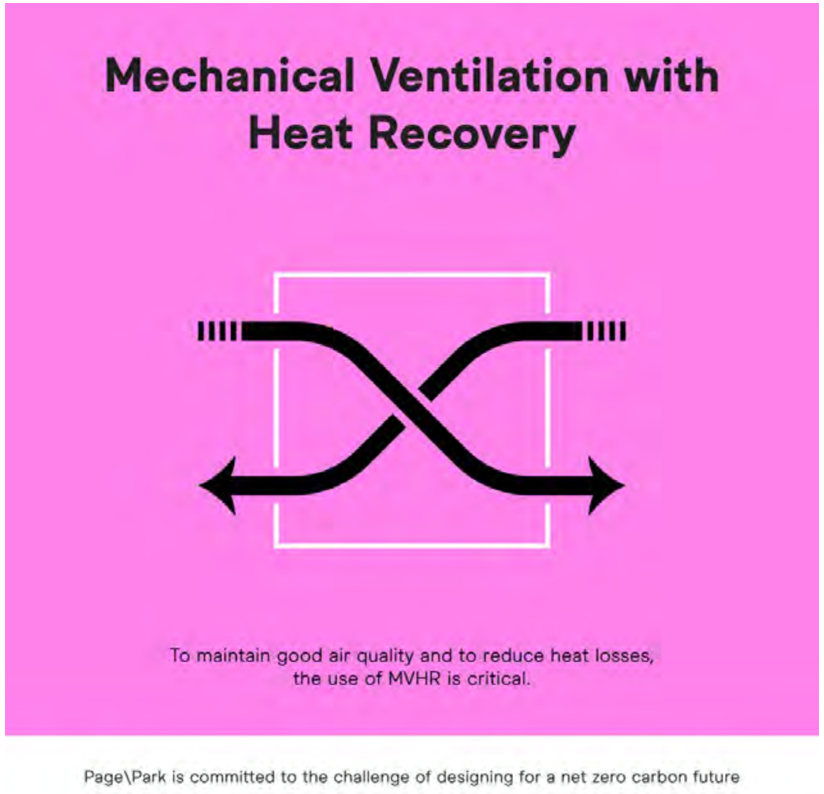
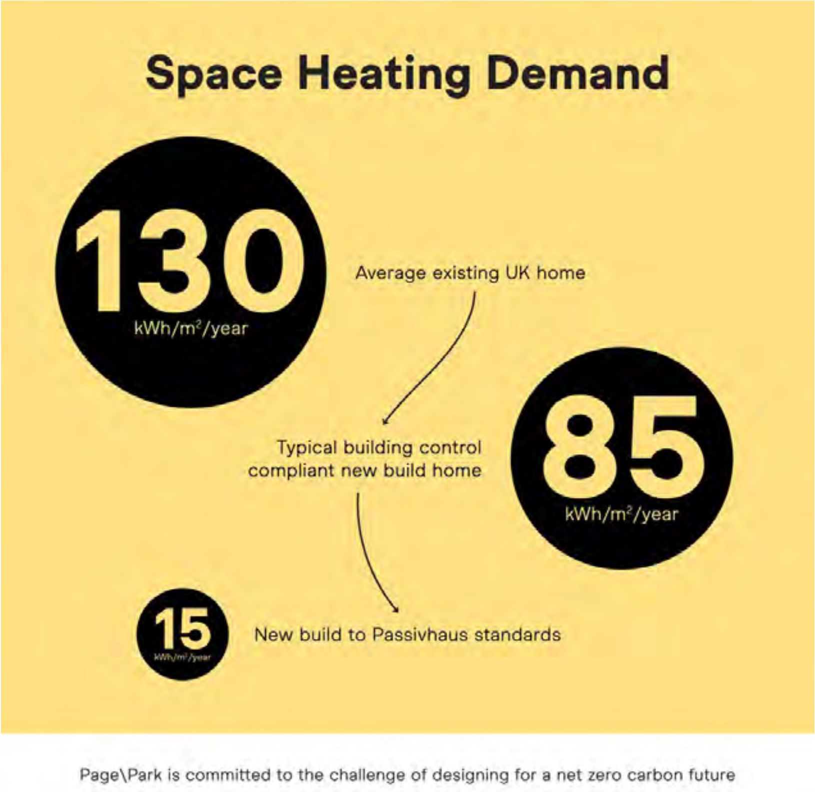


Key Passive House principles





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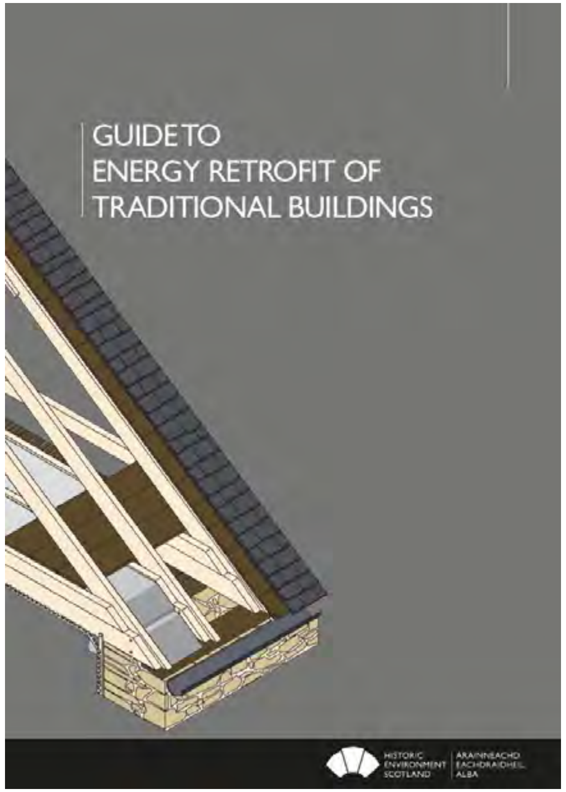
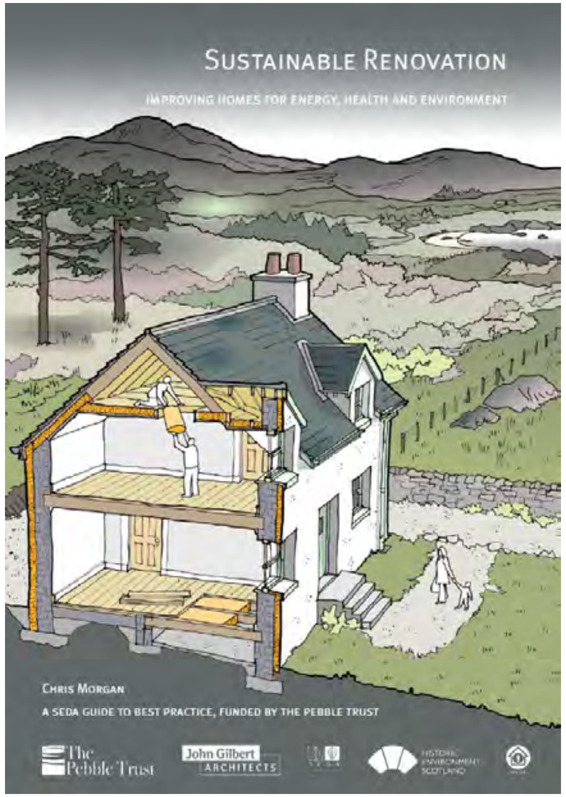
Best practice





EnerPHit

Certified Retrofit

Passive House Institute

The unintended consequences of piecemeal upgrades:

Poorer Comfort & Health of Occupants

Weakened Condition & durability of building

Negative value of building

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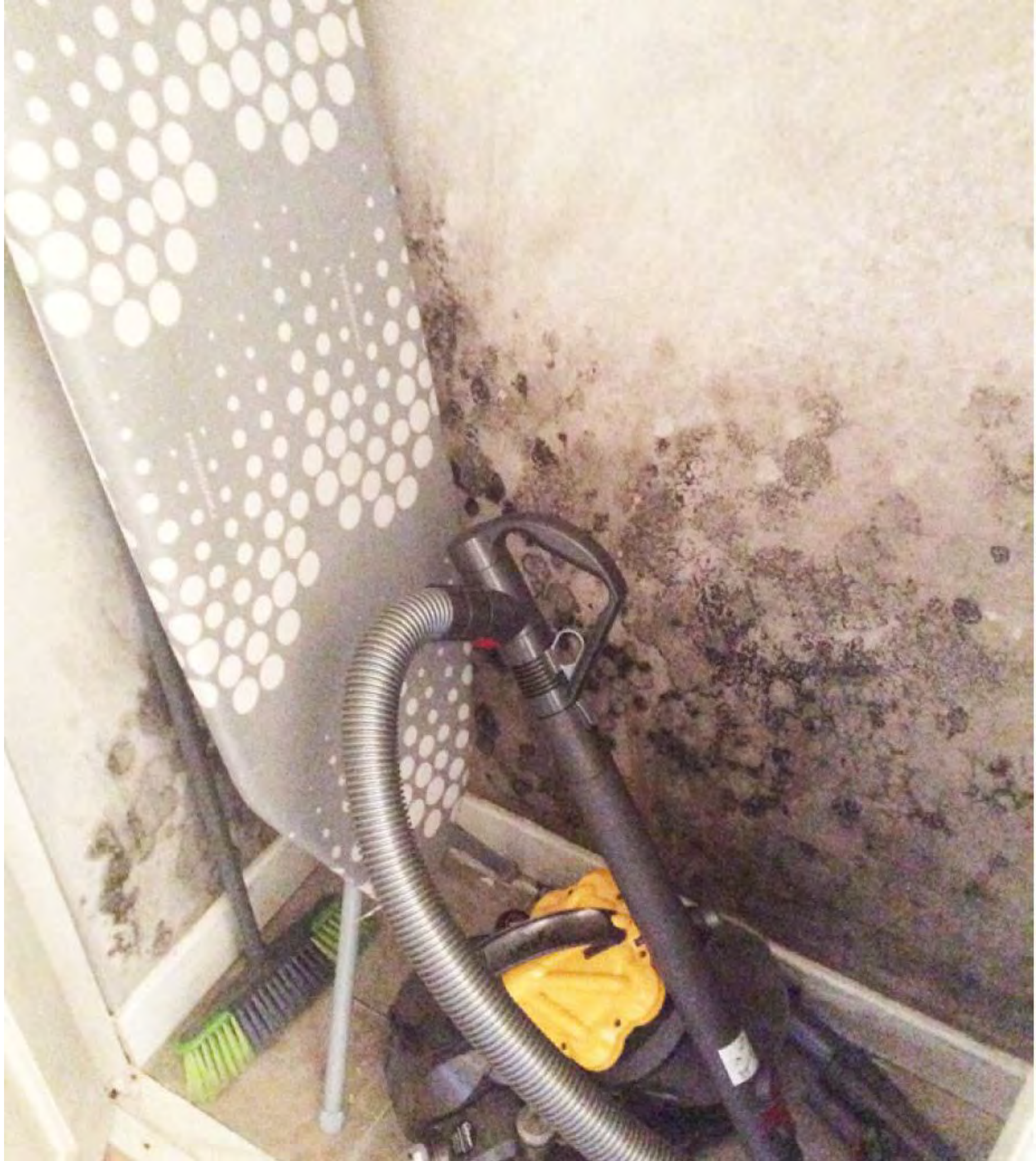

Different construction principles and materials

older buildings manage moisture quite differently

most older buildings were built to be flexible (modern construction rigid and brittle)

older buildings tended to use fewer elements, many of which provided a number of roles in the building

traditional buildings used a limited palette of mainly natural materials

maintenance of internal and external finishes was assumed in traditional buildings.

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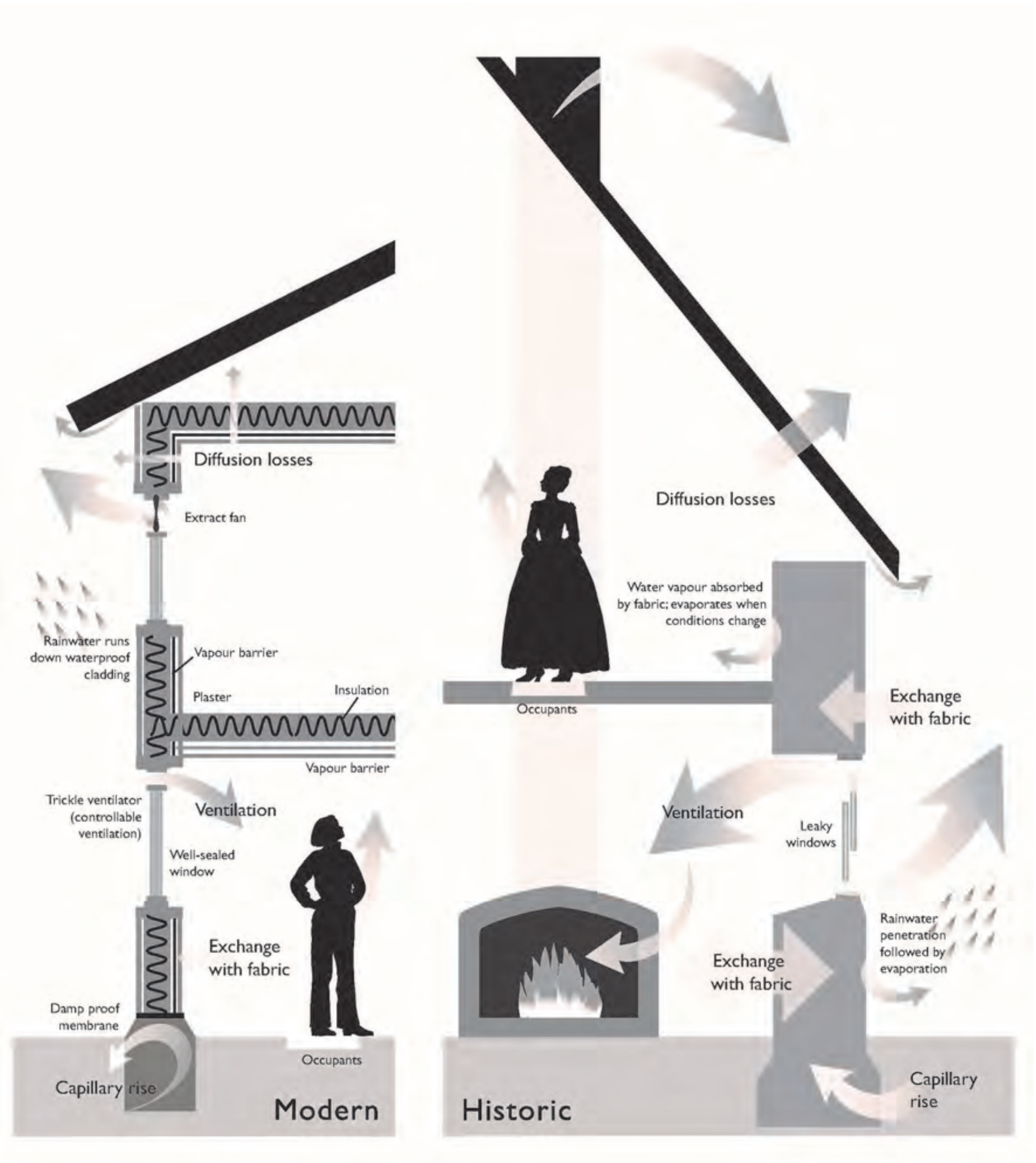

How to implement a successful Retrofit?

A holistic evaluation process such as PAS 2035:2019

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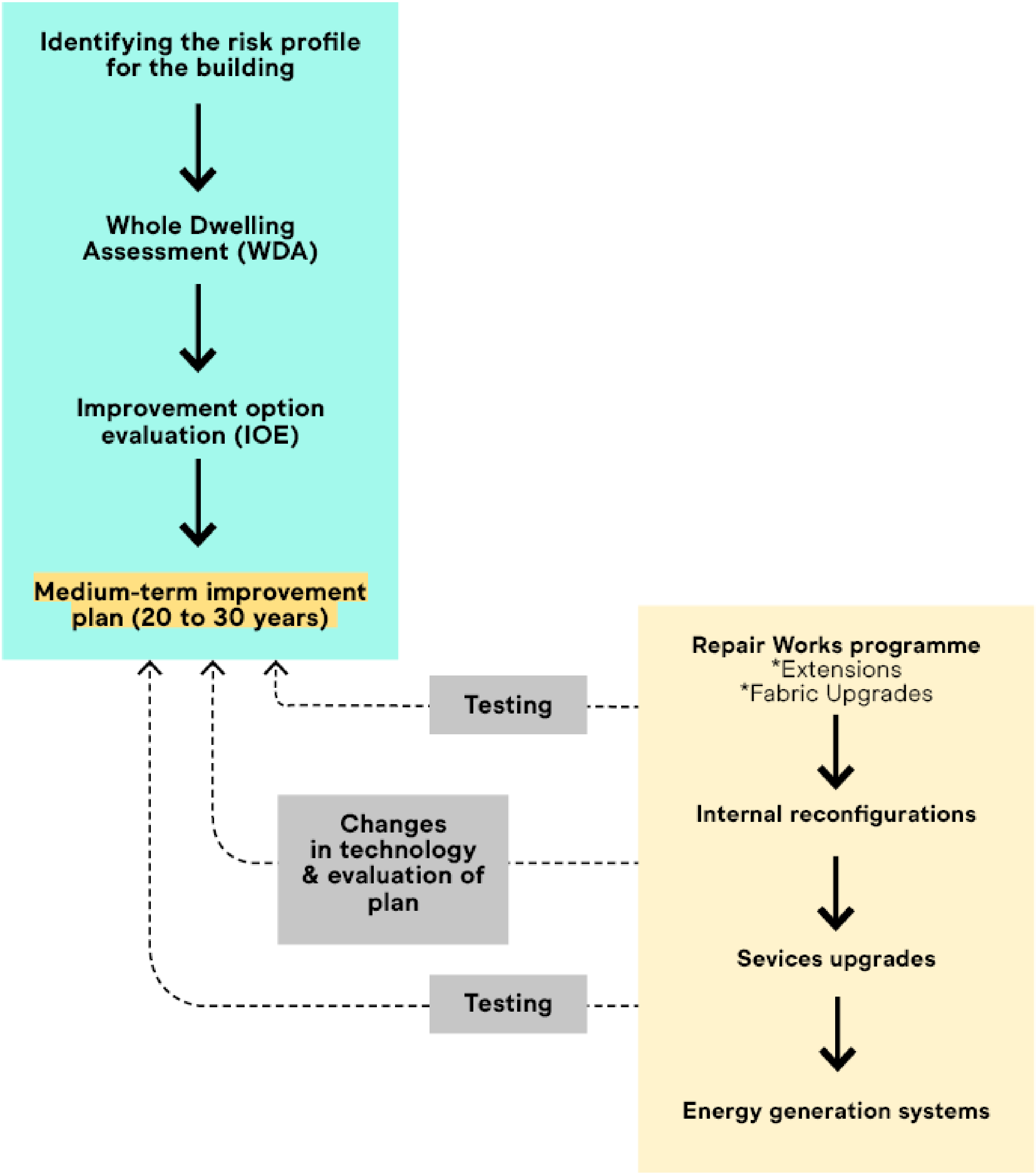

Nansen Street →

Retrofit of a Glasgow Tenement

Identifying performance requirements

Understanding how the building performs now

Applying PAS2035 Principles to curate retrofit options(using a Cost/Benefit analysis)

Understanding the Heating options

Setting out an **upgrade roadmap**

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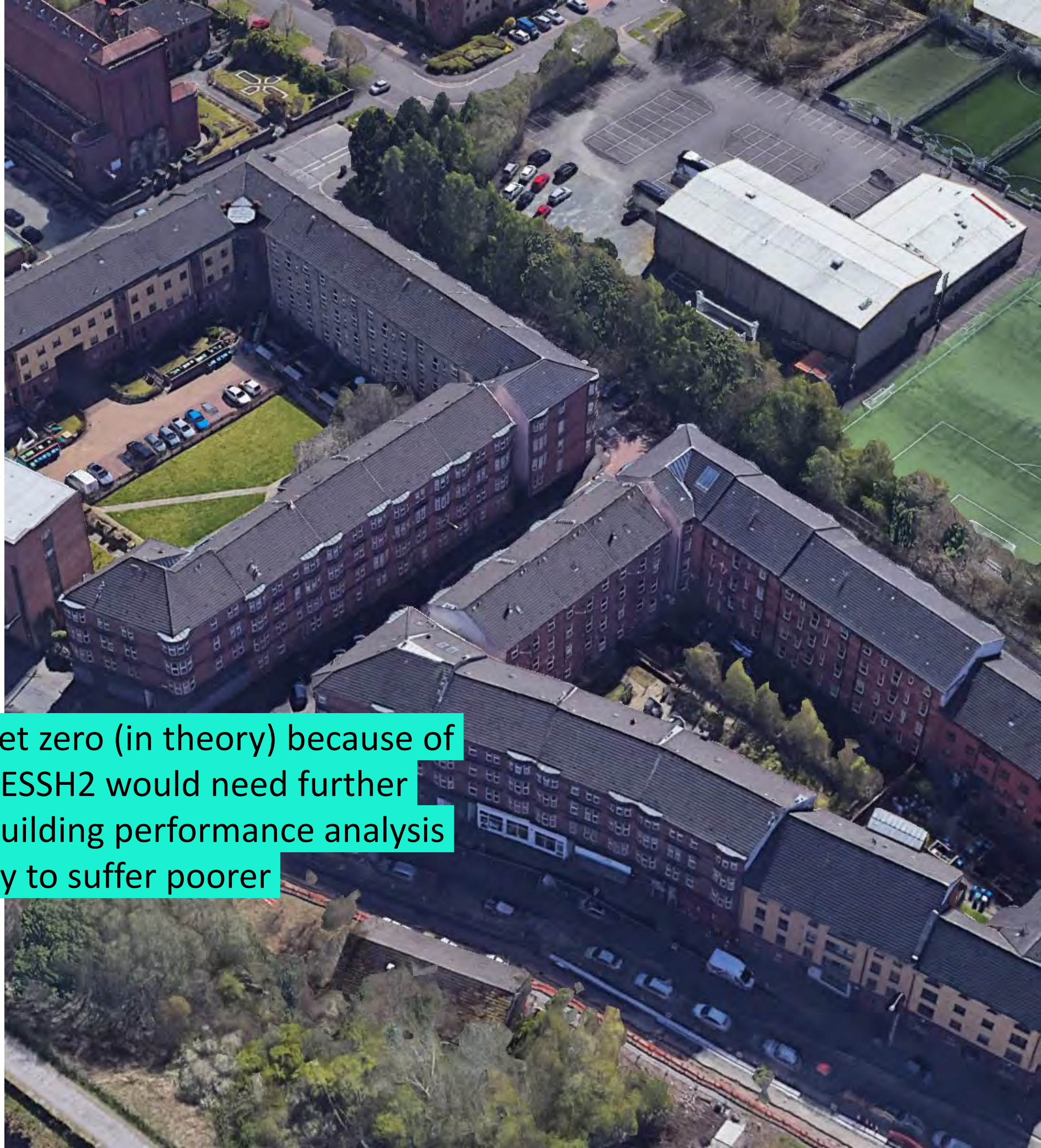
EnerPHit

OR

The Energy Efficiency Standard for Social Housing (EESSH2)



"....only the EnerPHit options reaches or approaches net zero (in theory) because of the significant energy cost savings associated with it. EESSH2 would need further investment to bridge that gap. It is also the case that building performance analysis tends to suggest that less rigorous retrofit is more likely to suffer poorer performance over time."

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Capital cost and carbon effectiveness

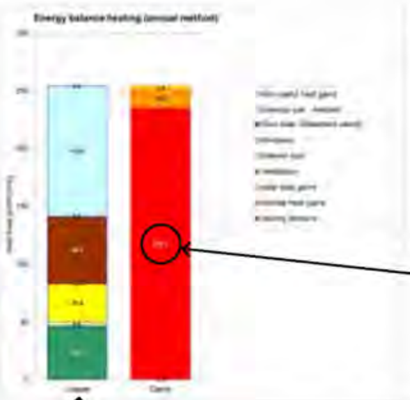
Outline options 58 59

Element	Existing Condition and build-up assumptions	Estimated Age	Assumed Performance	Retrofit Options	Leti target (constrained)	Carbon Impact Value	Cost	Disruption
Walls								
External	600mm stone, uninsulated, finished with plaster on laths or 600mm stone, uninsulated, drylined with plasterboard	**Heritage**	1.1 ±0.2 W/m2K 0.9 ±0.2 W/m2K	1. Insulating internally (on prominant elevation) 2. Insulating externally (on secondary elevation)	**0.32 W/m2K**	High	High	High
Internal	Stud partition, uninsulated, plasterboard and skim finish	-	potential upgrade of boarding to service spaces to provide acoustic comfort			Low	Low	Medium
Close Walls	140mm brick, uninsulated, finished with plaster on lath, tiled to lower floor on external face	**Heritage**	1.7-2.4 W/m2K	1. Insulating internally (on prominant facades)	**0.32 W/m2K**	High	Medium	High
Floors								
Ground Floor	Suspended timber floor on timber joists, 125 rigid insulation on mesh, various finishes	**Heritage**	0.26 W/m2K *insulation to be confirmed	Increased insulation depth sub floor	**0.20 W/m2K**	Medium	Medium	Medium
Parti-floors	floorboards on timber joists, various finishes	**Heritage**	-	Insulate between joists	**0.20 W/m2K**	Medium	Medium	Medium
Doors								
External	Security doors, seals and ironmongery in various condition	**no record**	unknown	1. repair and upgrade seals 2. Replace with thermally efficient alternative	**1.0 W/m2K**	Medium	Low	Low
Windows								
Traditional format & bay	PVC double glazed, assumed 12mm air gap	**21 years**	2.8 W/m2K	1. Replace with higher performing casements. 2. Refurbish with new glazing, and draught proofing	**1.36 W/m2K**	Medium	Medium	Medium
Roof								
Main Pitch	Traditional slate & timber cold roof construction, insulation laid above ceiling	**Heritage**	0.4-1.14 W/m2K	Increased insulation above ceiling	**0.12 W/m2K**	High	Medium	Low
Bay Window	leadwork, on timber rafters, potential inconsistent thermal and moisture bridges	**Heritage**	unknown	Identify and rectify thermal bridges, increase insulation performance and/or depth to detail	^	High	Medium	Low
Heating & Ventilation								
Heating	Gas boilers, primary pipework and radiators	**16 years**	SEBUK 'B' typically 1.1 COP(*)	1. Install air source heat pump system (***) 2. Insulate primary pipework 3. Replace with improved boiler unit - able to support solar input in later phases 4. Install new hybrid boilers - able to switch to green hydrogen	**typically 2 COP (***)**	High	High	High
Ventilation General	No mechanical control systems	-	-	1. Install air source heat pump system (***)	**typically 2 COP (***)**	High	High	High
Ventilation Localised	mechanical extract to kitchen & bathrooms	**22 years**	-	1. Install air source heat pump system (***)	**typically 2 COP (***)**	High	High	High
Energy Generation								
Photovoltaic Generation	-	-	-	1. Rooftop installation - maximising orientation where possible	**40% roof coverage**	High	High	High
Solar thermal	-	-	-	1. Rooftop installation. If heat pumps not installed - the most efficient alternative for hot water	**40% roof coverage**	High	High	High

*** Assumed performance based on technical paper figures discussed in appendix**

** Target performance figures taken from LETI best practice - target U-values_Constrained retrofit LETI Climate Emergency Retrofit Guide

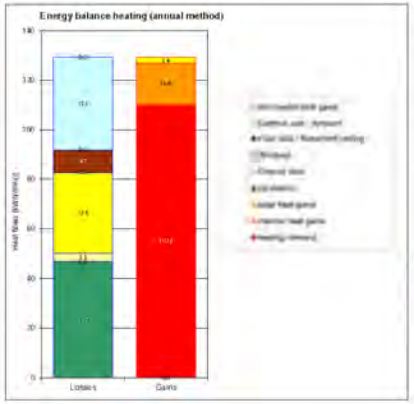
*** Heat pump installation implications explored in the Chapter 6 CTI Options



Existing annual heating demand
= 235.2 kWh/(m²a)

Annual heating demand in kWh/(m²a)

Heat loss through building elements (walls/windows/doors etc.)

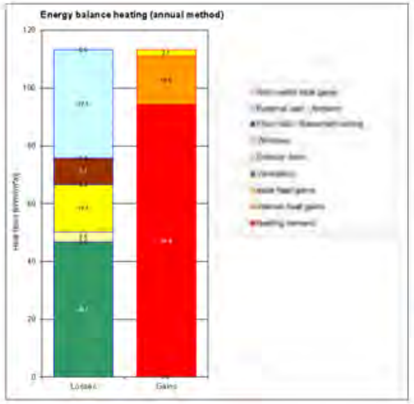


Potential annual heating demand
=110.2 kWh/(m²a)

Upgrades

- Internal wall insulation to external walls (100mm Pavatherm)
- Internal wall insulation to close walls (50mm Pavatherm)
- Insulation between suspended timber joists (165mm Pavatherm)

53% annual heating demand improvement on the existing fabric (kWh/(m²a))



Potential annual heating demand
=94.4 kWh/(m²a)

Upgrades

- Internal wall insulation to external walls (100mm Pavatherm)
- Internal wall insulation to close walls (50mm Pavatherm)
- Insulation between suspended timber joists (165mm Pavatherm)
- New high performance low-E double glazed windows

60% annual heating demand improvement on the existing fabric (kWh/(m²a))

Heating Options

Onsite renewables such as heat pumps to electrify heat demand

Air source heat pumps

or

Ground source heat pumps

or

Water source heat pumps

...OR?

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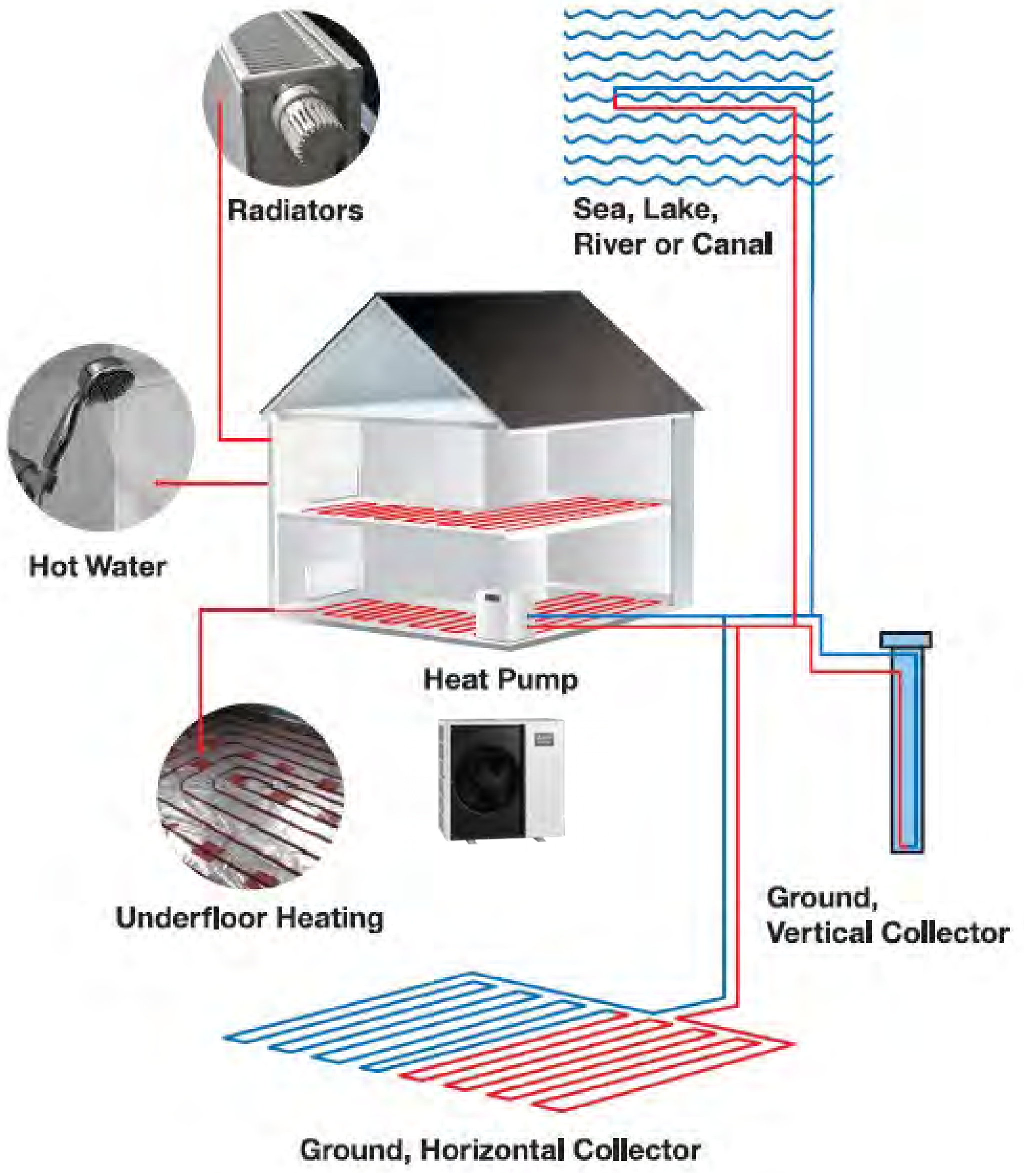
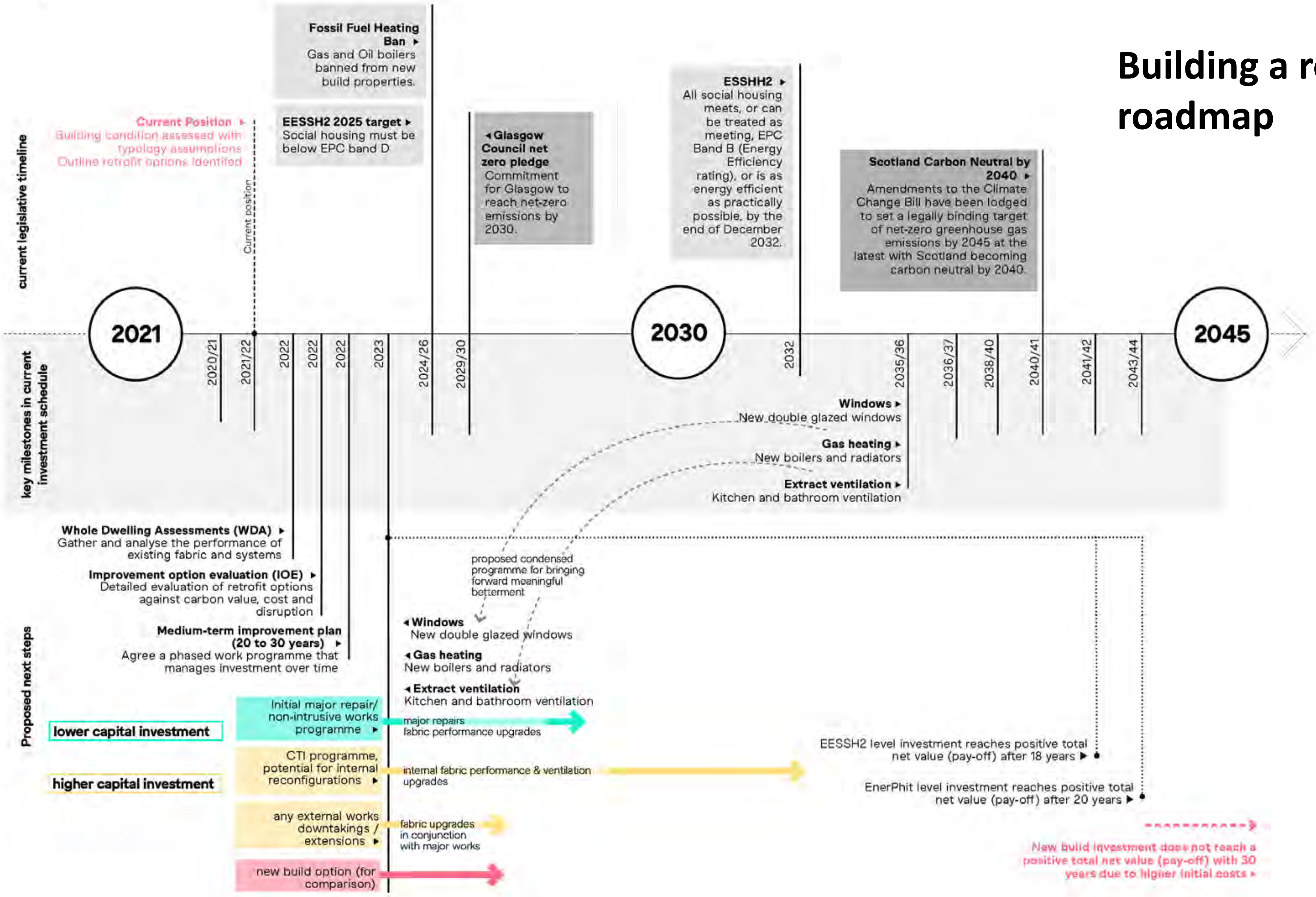


Building a retrofit roadmap



thanks