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NLA Retrofit Conference

Upskilling the Sector

LETI Guide

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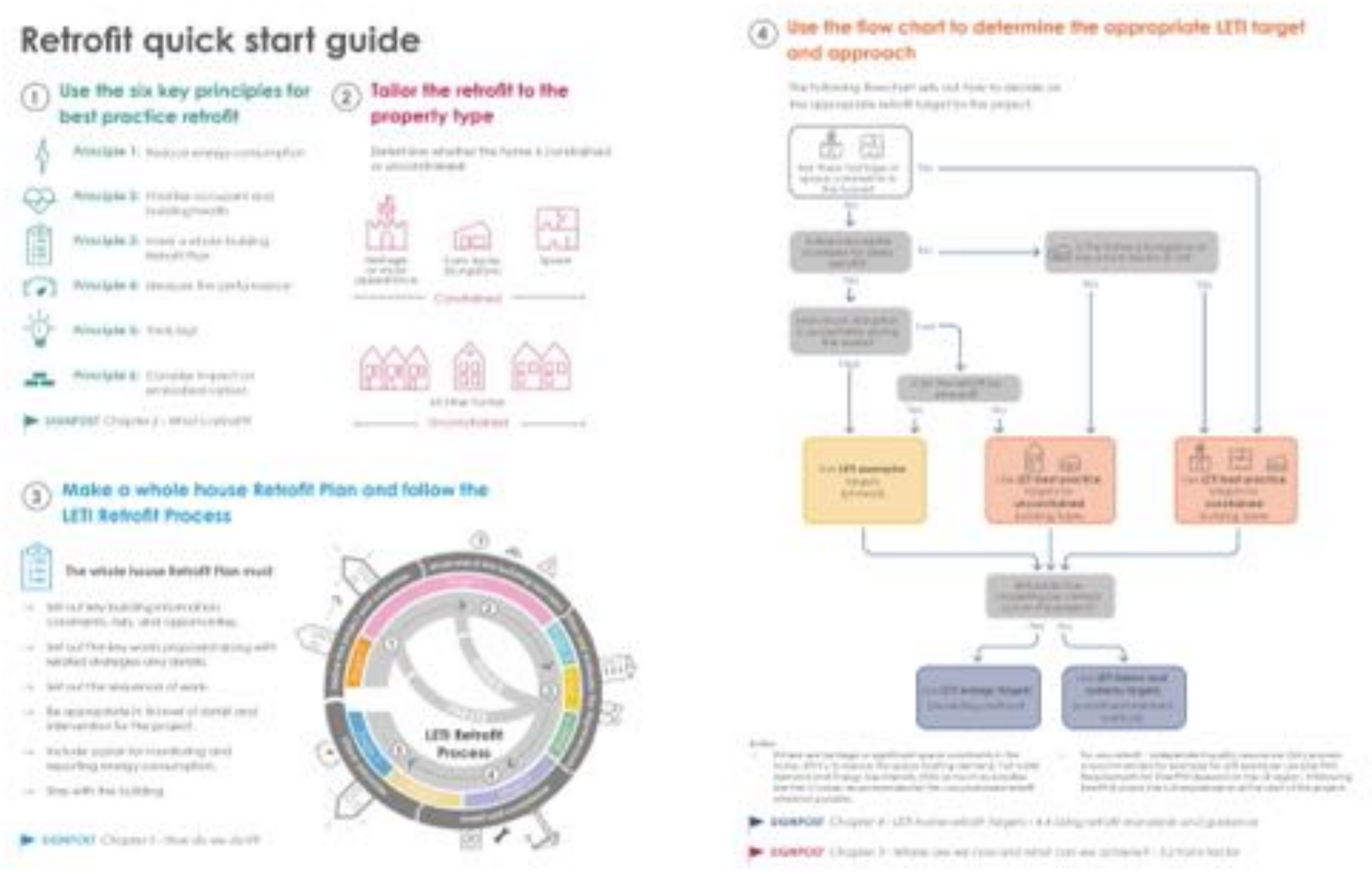
Theory

- SIGNPOST *Chapter 1 - Why retrofit?*
- SIGNPOST *Chapter 2 - What is retrofit?*
- SIGNPOST *Chapter 3 - Where are we now and what can we achieve?*

Practice

- SIGNPOST *Chapter 4 - LETI home retrofit targets*
- SIGNPOST *Chapter 5 - How do we do it?*
- SIGNPOST *Chapter 6 - Case studies*



Retrofit quick start guide

1. Use the six key principles for best practice retrofit

2. Tailor the retrofit to the property type

3. Make a whole house Retrofit Plan and follow the LETI Retrofit Process

The whole house Retrofit Plan must

LETI Retrofit Process

4. Use the flow chart to determine the appropriate LETI target and approach

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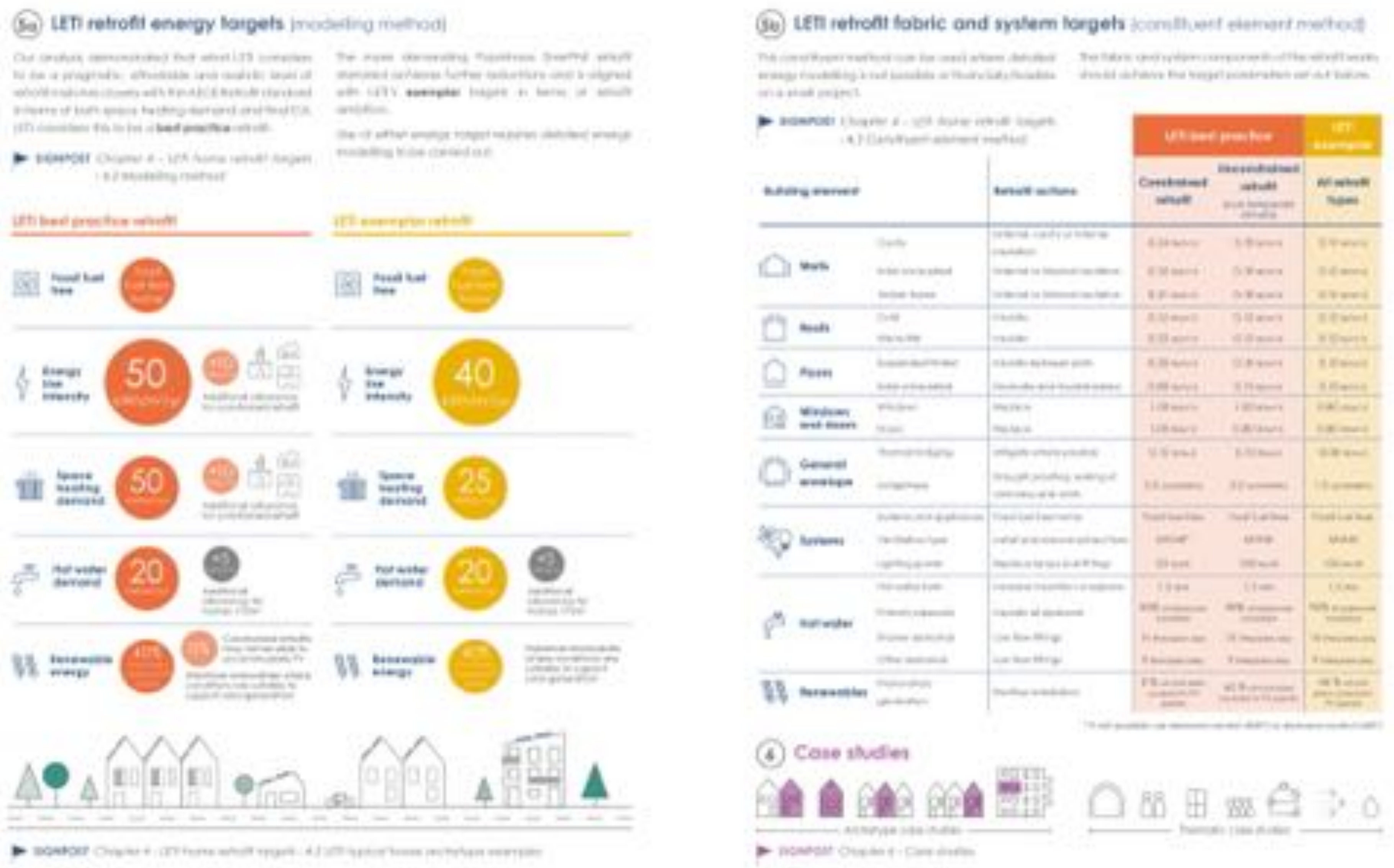

LETI retrofit energy targets (modelling method)
LETI retrofit fabric and system targets (constituent element method)
50
40
50
25
20
20
Case studies

Two
depths of retrofit

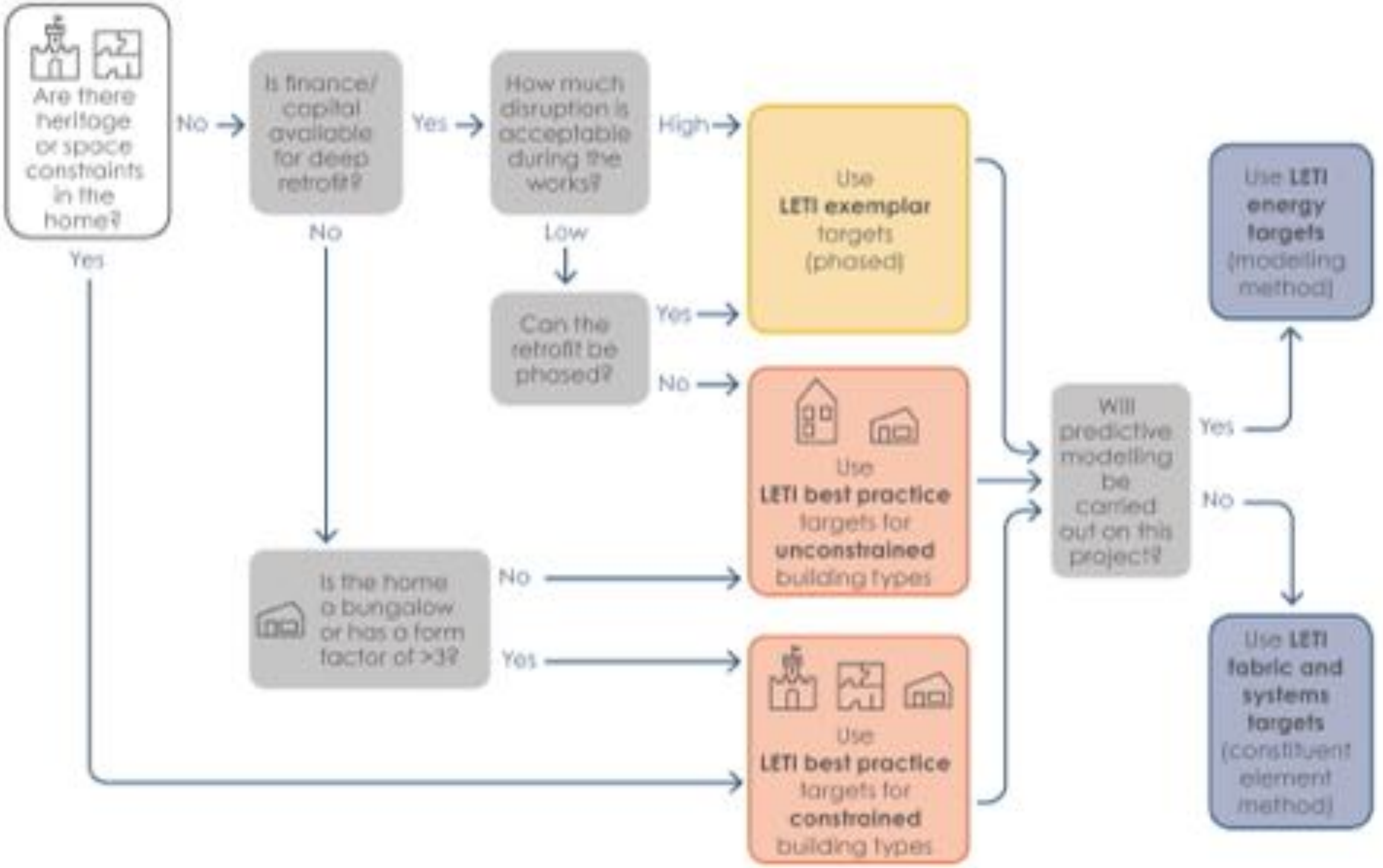
LETI Best Practice
- Constrained
- Unconstrained

LETI Exemplar

Two
Approaches

Energy Targets (Modelling method)

Fabric and systems targets
(Constituent element method)


Are there heritage or space constraints in the home?
No
Yes
Is finance/ capital available for deep retrofit?
Yes
No
How much disruption is acceptable during the works?
High
Low
Can the retrofit be phased?
Yes
No
Use LETI exemplar targets (phased)
Use LETI best practice targets for unconstrained building types
Is the home a bungalow or has a form factor of >3?
No
Yes
Use LETI best practice targets for constrained building types
Will predictive modelling be carried out on this project?
Yes
No
Use LETI energy targets (modelling method)
Use LETI fabric and systems targets (constituent element method)

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How can you help?

Donate time:

Join our new retrofit workstreams

Retrofit Part 2: **HOW DEEP, FOR HOW MANY, AT WHAT COST? – NOV 21**
Retrofit Part 3: **NON- DOMESTIC – JAN 22**

www.leti/london/retrofit

Donate money:

Keep LETI moving
Raise £25k

£50 - individual donations £500 - organisational donations
www.leti/london/donate

Why retrofit

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Definition of Retrofit

WHAT?

“Retrofit is the upgrading of a building to enable it to respond to the imperative of climate change.”

Marion Baeli, Residential Retrofit 20 Retrofit Case Studies, London: RIBA Publishing 2013

- Reduce carbon emissions
- Adapt for climate change

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The Climate Emergency

WHY?

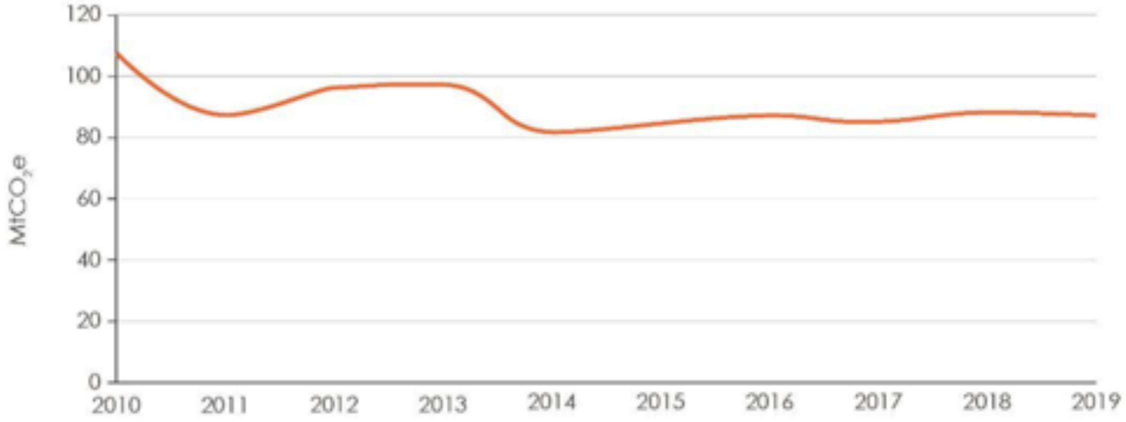

Figure 1.3 - Total annual emissions from UK buildings, 2010 to 2019, in $MtCO_2e$. Source: UKCCC, Progress Report to Parliament, June 2020

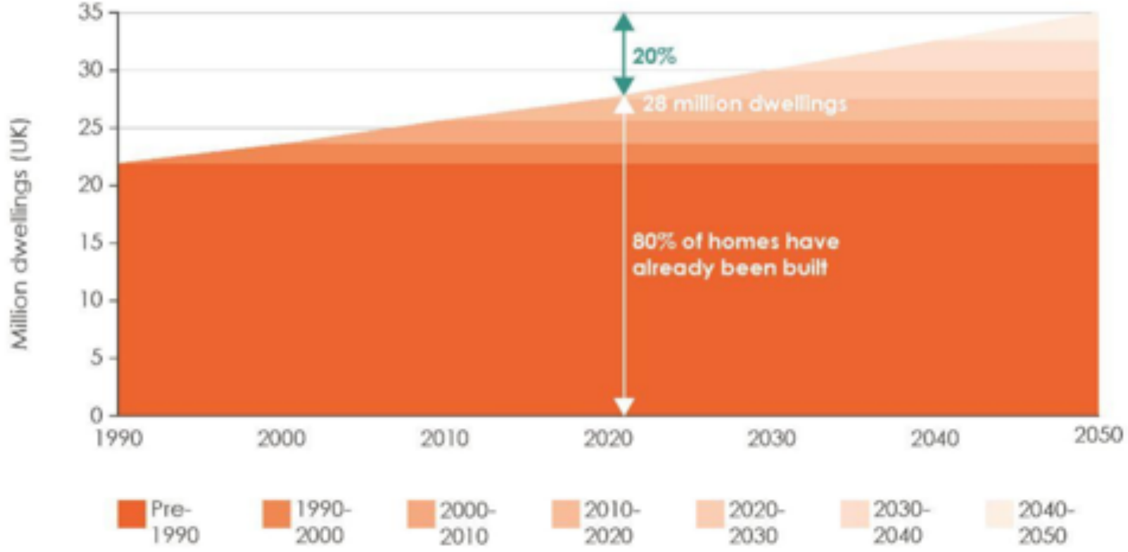

Figure 1.4 - Millions of dwellings built in the UK from pre-1990 to 2050. Note: demolition has been ignored in this table as the relatively small amount of domestic demolition is usually followed with replacement.

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Broader Benefits of Retrofit

WHY?

Energy bills & Fuel Poverty

1kWh of electricity = 4 x 1kWh of gas

3.3m UK homes in fuel poverty

Energy infrastructure costs

1kWh saved = 1kWh we don't need to produce

Energy capacity

Winter peak heat demand = 3x peak electricity supply

Energy security

Global energy supply & shocks

Health & IAQ

1m homes have serious damp

1 in 5 UK children carry inhalers

Health & Cold Homes

1m homes are unhealthily cold and contribute to 10,000 winter excess deaths

Fire

1m homes have significantly higher than average risk of fire

Resilience

2020 - 1 in 6 homes at risk of flooding

2050 - 1 in 3 homes at risk of flooding

Economy

CLC: 500,000 new jobs in retrofit by 2030

How far should retrofit go?

Deep retrofit

- → Reduced carbon emissions
- → Reduced renewable energy demand
- → Reduced peak load
- → Less grid storage required
- → Significantly lower energy bills
- → Improved health and comfort
- → Effective heat pumps

Shallow retrofit

- → Reduced carbon emissions
- → Large renewable demand
- → Large peak demand
- → More grid storage required
- → Little change in energy bills
- → Limited health benefits
- → Sub-optimal heat pump performance

Figure 1.12 - Comparison of percentage of energy demand reductions and associated co-benefits from shallow and deep retrofits.

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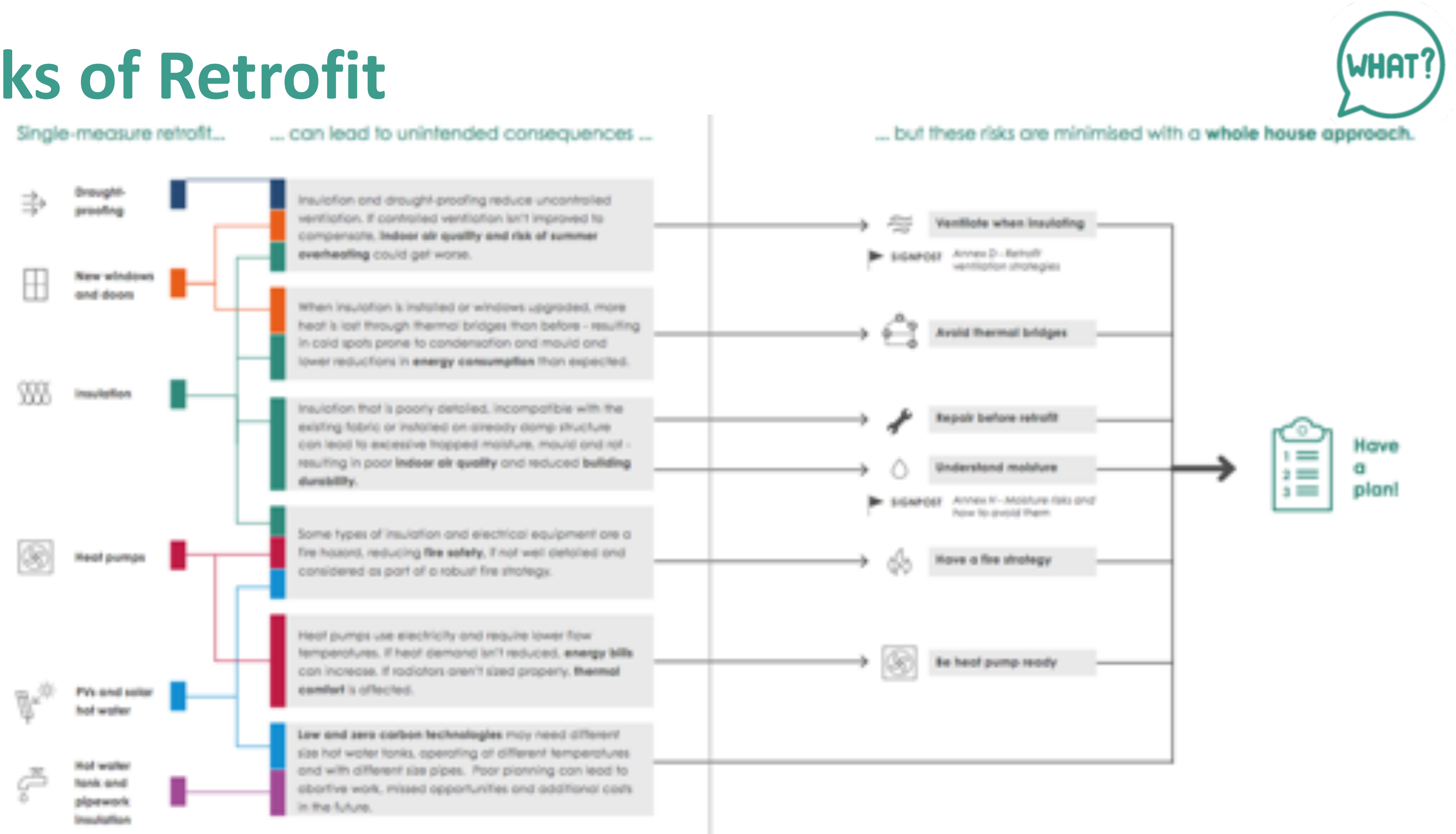
Risks of Retrofit



Principles of Good Retrofit

WHAT?

1 Use the six key principles to good retrofit

Principle 1: Reduce energy consumption

Principle 2: Prioritise occupant and building health

Principle 3: Have a whole building Retrofit Plan

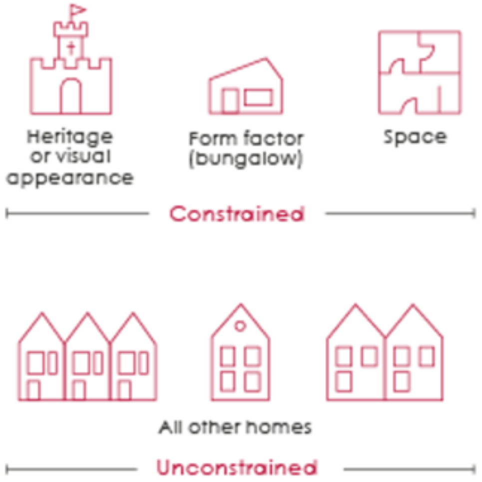
Principle 4: Measure the performance

Principle 5: Think big!

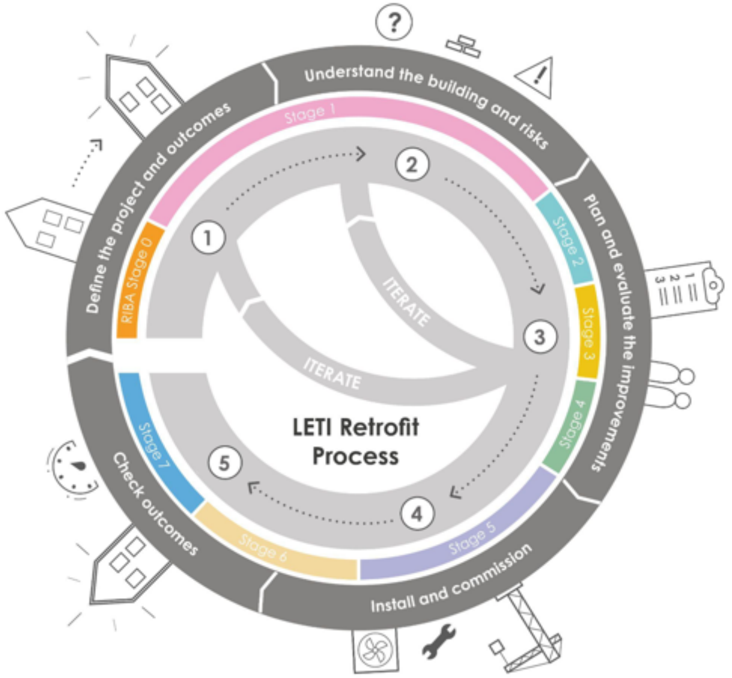
Principle 6: Consider embodied carbon

2 Tailor the retrofit to the property type

Determine whether the home is constrained or unconstrained:



3 Make a whole house Retrofit Plan and follow the LETI Retrofit Process



Case Studies

Princedale Road

Victorian terraced house

Conservation area

Social housing

Retrofit for the Future

PassivHaus certified

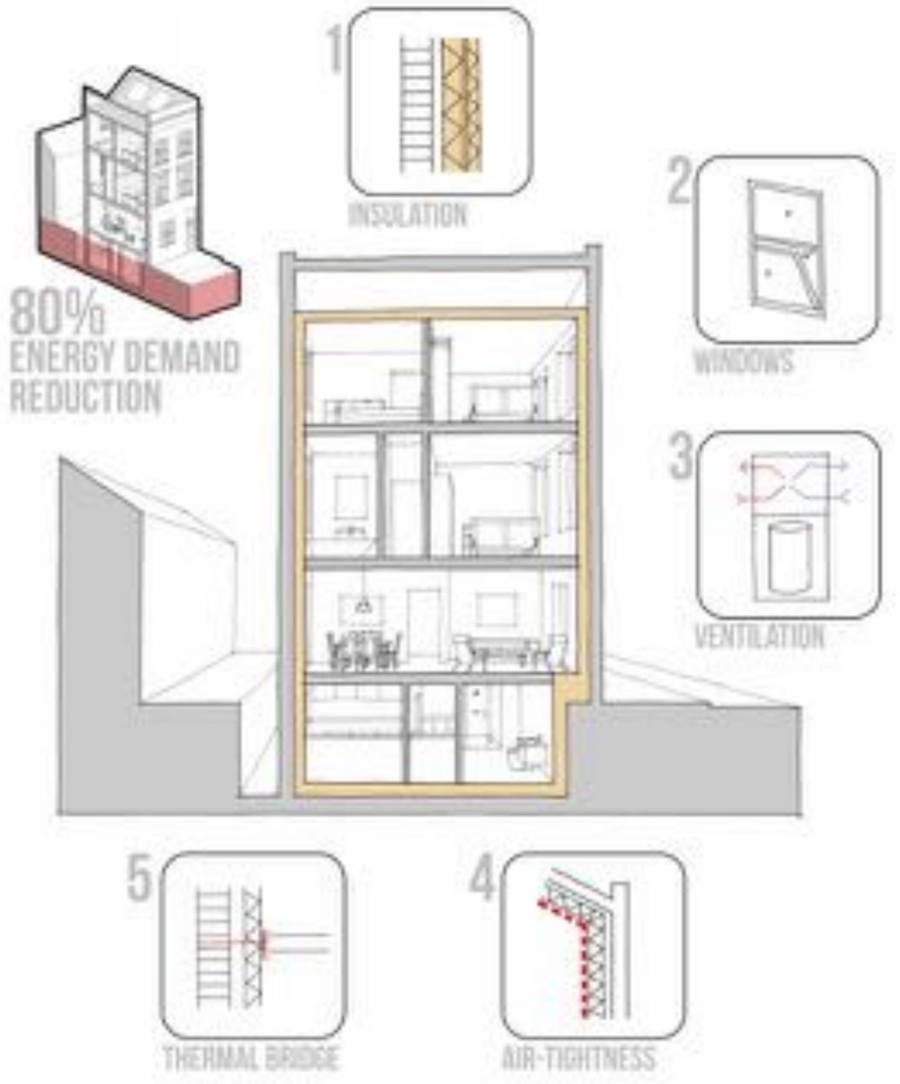
Princedale Road

Key principles

1. Insulate
2. Upgrade the windows
3. Ventilate
4. Make it all draft-proof airtight
5. Address cold bridges

Princedale Road

Key principles



Princedale Road

Prototyping

Princedale Road

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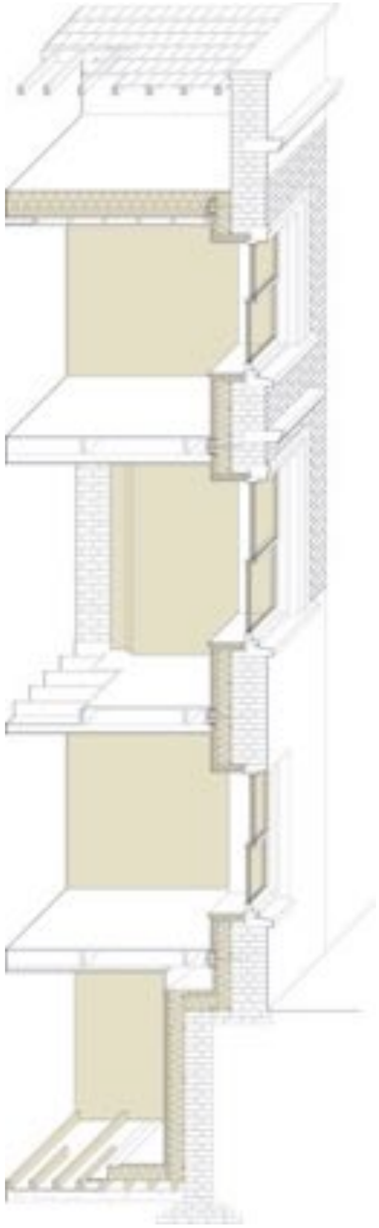
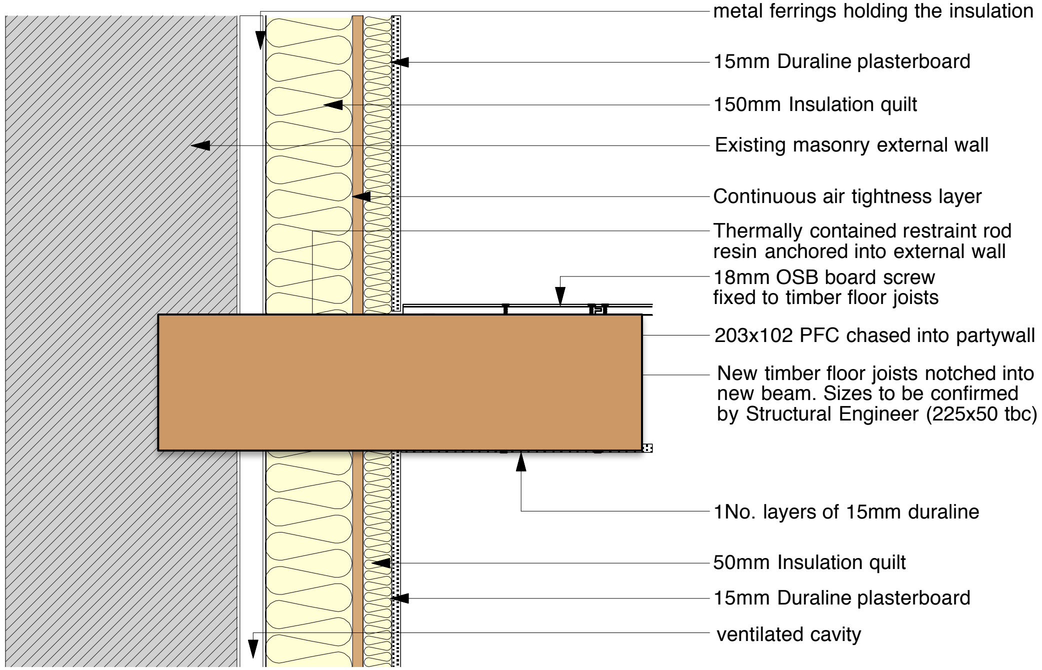
Princedale Road



Fabric:
• Continuous internal insulation
• Triple glazing
• No cold bridges (joist ends detached)

Services:
• MVHR (Genvex Combi)
• Solar thermal
• Below ground heat exchanger

Airtightness
0.34 m3/m2h@50Pa



Princedale Road

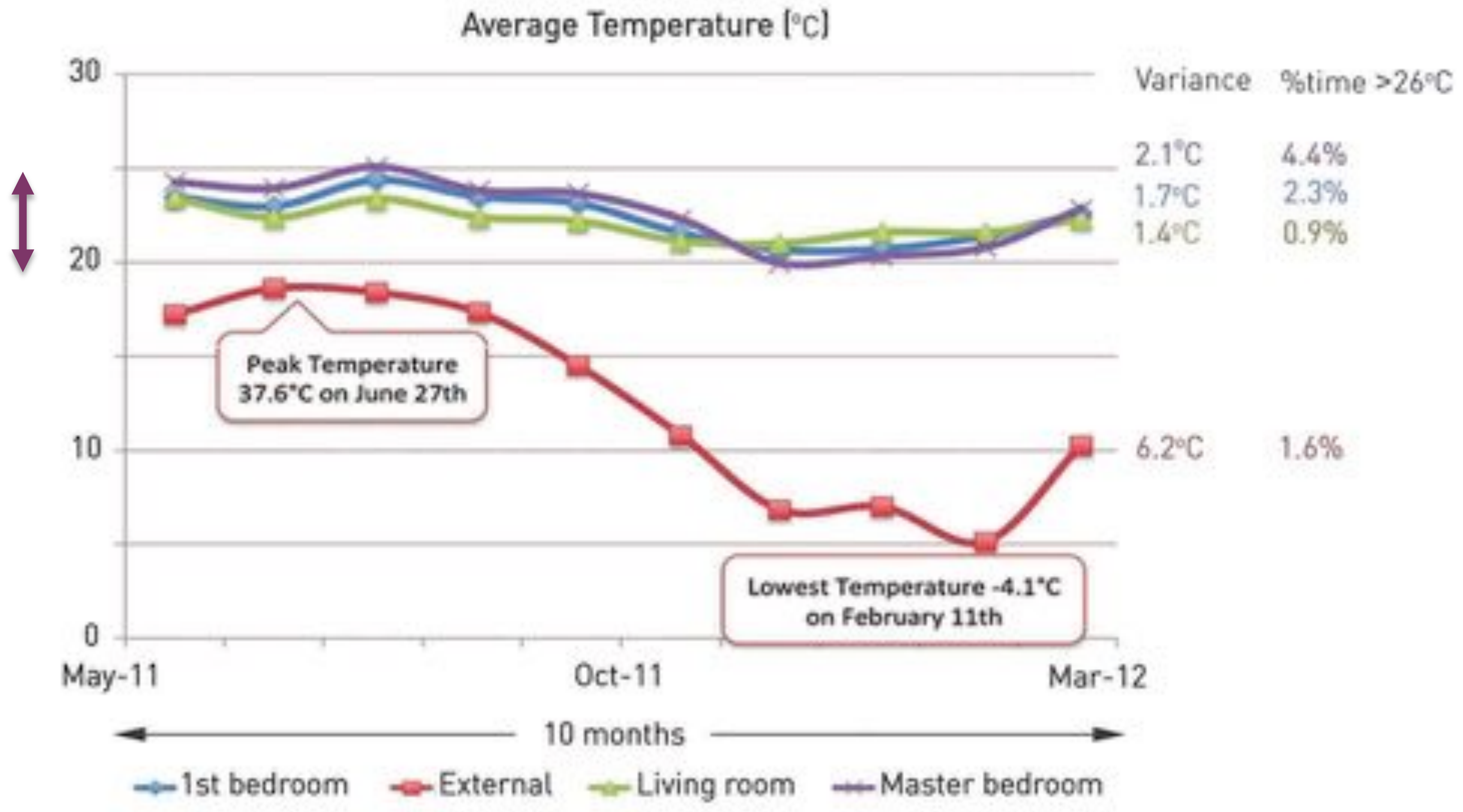
Monitoring

Vital statistics table

Characteristics	Before	Target	Measured
Primary energy (kWh/m²/yr)	250	120	128
Space heating (kWh/m²/yr)	120	15	10
Airtightness (m³/m²h @ 50 Pa)	–	0.6	0.34
Type of glazing	single	triple	triple
CO_2 emissions (kg CO_2/m²/yr)	70	17	20

Princedale Road

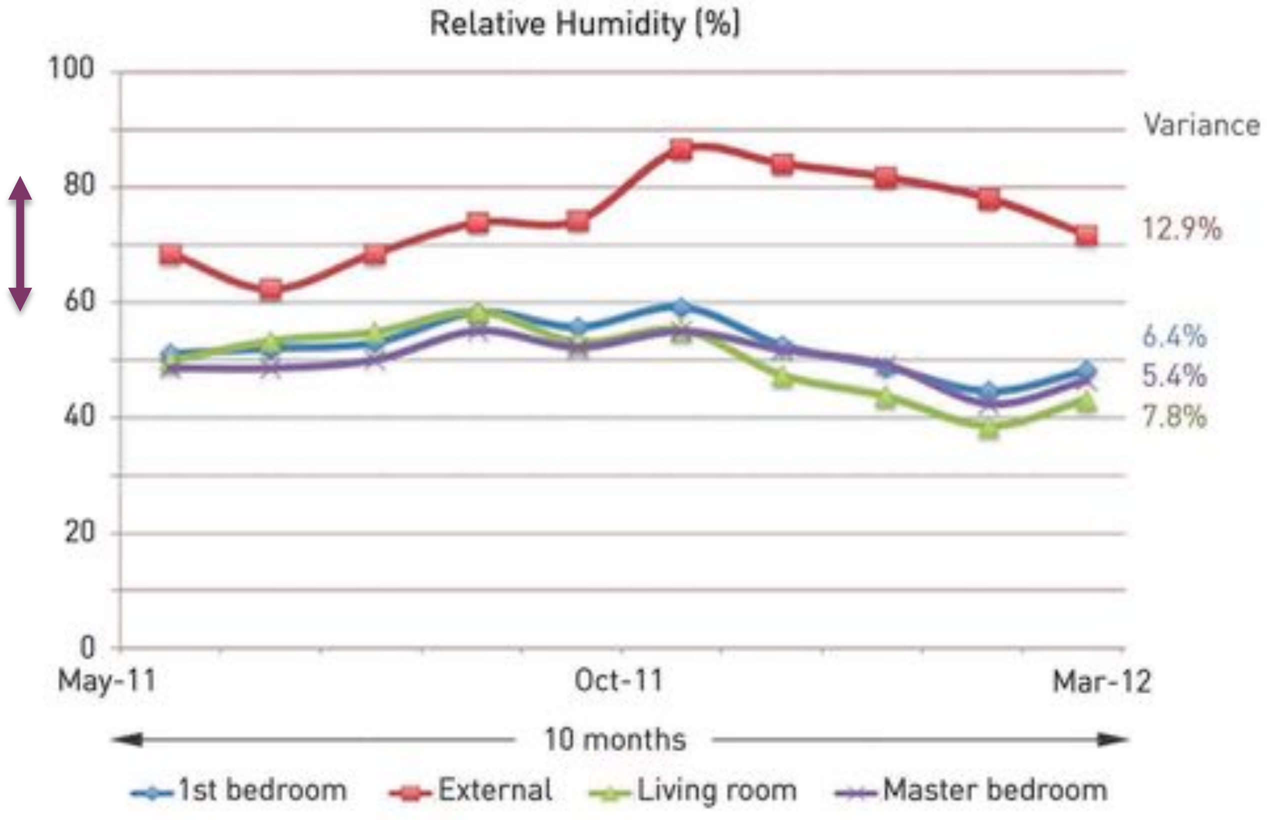
Monitoring



Princedale Road

Princedale Road

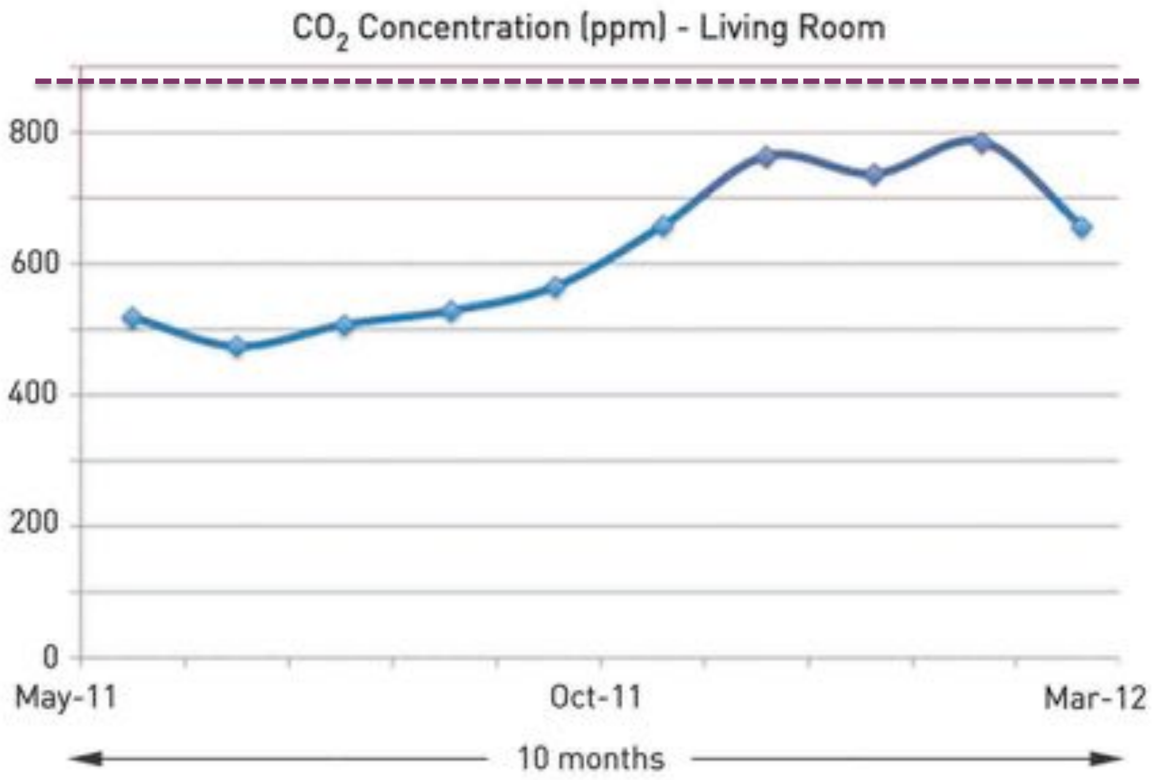
Monitoring



Princedale Road

Princedale Road

Monitoring



Regent’s Crescent

Grade I listed
Designed by John Nash

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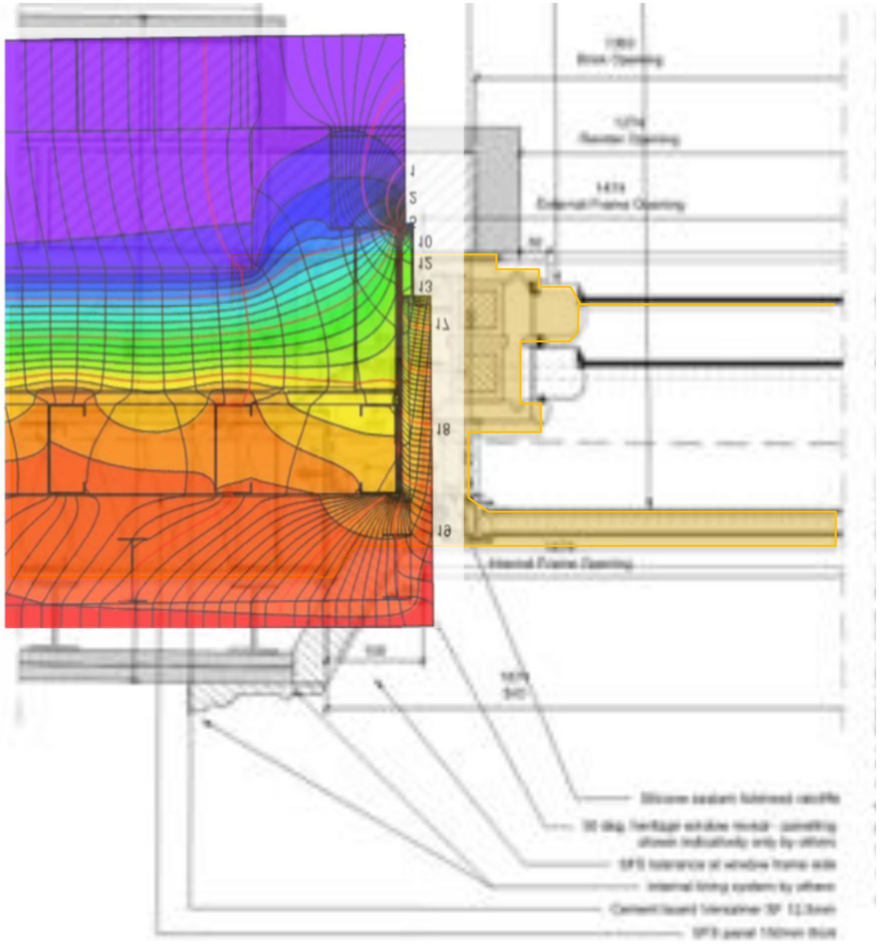
Regent's Crescent

Building Physics – Thermal bridges - **THERM**



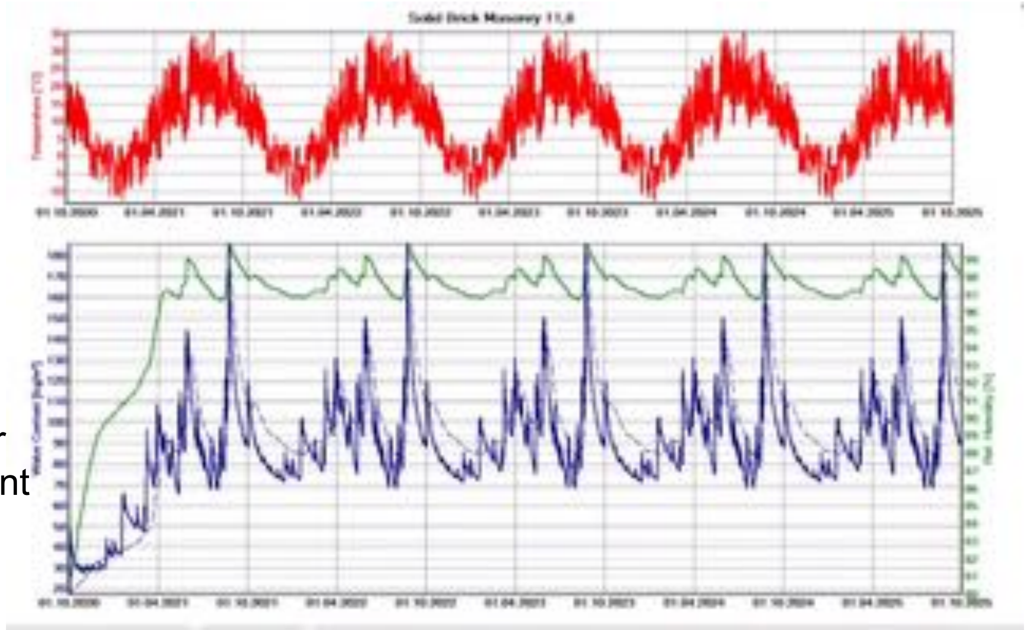
Regent’s Crescent

Building Physics – Moisture content - **WUFI**

Temp

RH

Water content



Cambridge House Hotel

Grade I listed
Grade II listed

Cambridge House Hotel

Grade I listed
Grade II listed

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Cambridge House Hotel

Cambridge House

Heritage

Cambridge House Hotel

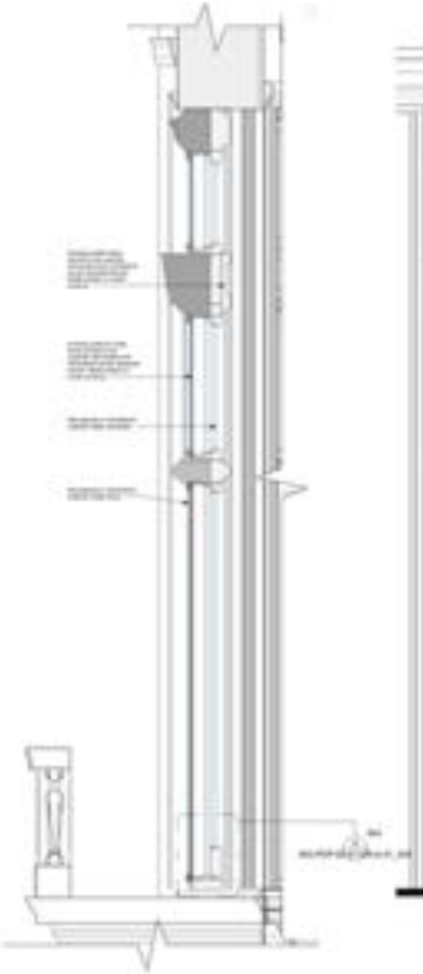
Cambridge House

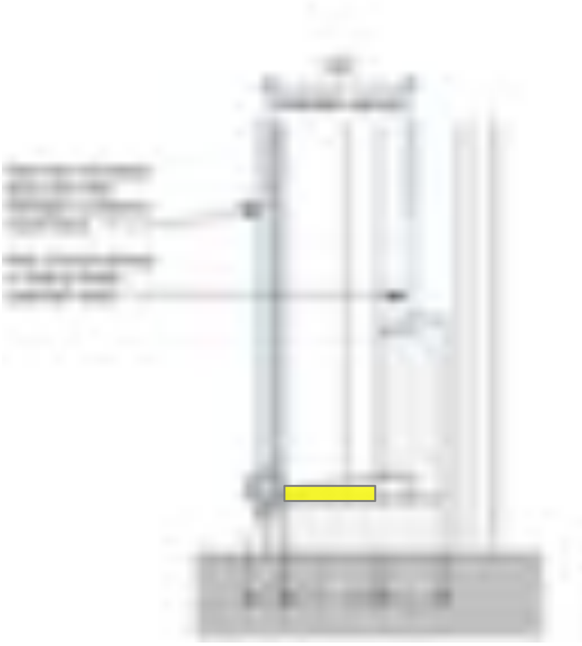
Glazing

Cambridge House Hotel

Cambridge House

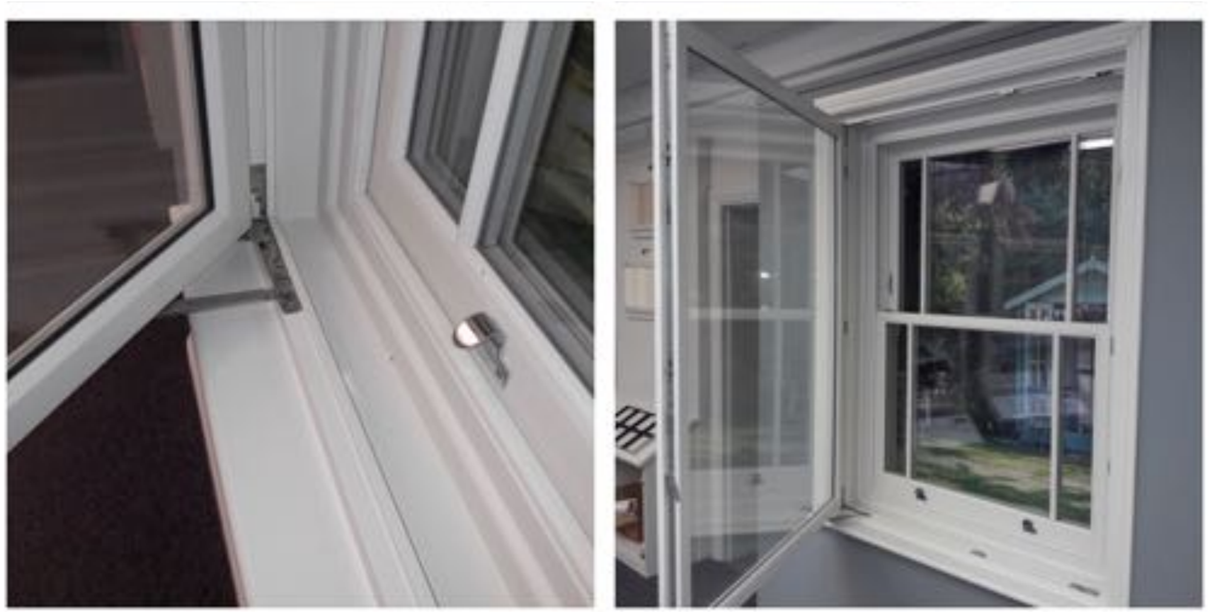
Secondary glazing





Secondary Glazing

Vacuum glass panes



LANDVAC – **0.5**w/m2k

FINEO – **0.7**w/m2k

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Internal wall insulation

Non-flammable - obligations

- Thermablock
- Rockwool
- Diathonite
- Dritherm
- Calsitherm
- Spacetherm
- Icynene
- Calostat

Details											
Insulation type	**Glass Mineral Wool**		**Mineral Wool**		**Lime, cork and clay**	**Lime, cork and clay/ Calcium silicate**	**Calcium silicate board**	**Aerogel**		**Polyurethane**	**Amorphous synthetic silicone dioxide**
Insulation manufacturer	**Knauf**		**Rockwool**		**Diasen**	**Diasen/ Calsitherm**	**Calsitherm**	**Thermablok**	**ProctorGroup**	**Icynene**	**Evonik**
Insulation product	Dritherm 32	Dritherm 37	Rockwool RW5	Rockwool Duoslab	Diathonite	Diathonite w/ Calsitherm	Calsitherm	Thermaslim	Spacetherm Slentex	Icynene	Calostat Pad
											
Third Party Certification	BBA 95/3212	BBA 95/3212		BBA				BBA 16/5290		NFPA285	BCEMT
Installation	Between metal studs (70 I 70)	Between metal studs (70 I 70)	Between timber studs	Direct to wall - mechanical fixing (mushroom plates)	Direct to wall - spray or hand applied	Direct to wall - spray or hand applied/ adhesive mortar	Direct to wall - adhesive mortar	Direct to wall - mechanical fixing (mushroom plates)	Between metal studs (70 I 70)	Direct to wall - spray applied	Between metal studs (70 I 70)
Drying time	N/A	N/A	N/A	N/A	c.2mm/ day		N/A	N/A	N/A	Negligible	N/A
Cavity venting requirements (2ACH) 25mm cavity; weepholes top and bottom at 1m centres	Weepholes	Weepholes	TBA with WUFI	Not required	Not required	Not required	TBA by WUFI	TBA by WUFI	TBA by WUFI	Not required	Weepholes
Performance											
Reaction to Fire (BS EN 13501-1)	A1	A1	A1	A1	A2	A2-s1, d0/ A1	A1	A2-s1, d0	A2-s1, d0	E	A2-s1, d0
Thermal Conductivity (λ)	0.032 W/mK	0.037 W/mK	0.034 W/mK	0.035 W/mK	0.045 W/mK		0.059 W/mK	0.018 W/mK	0.015 W/mK	0.038 W/mK	0.019 W/mK
Thickness to achieve 0.3 W/m²K (assumes solid masonry wall, 345mm London Stock brick)	85mm	85mm	100mm	75mm	90mm	110mm (60mm/ 50mm)	50mm	50mm	50mm	100mm	50mm
Vapour resistance (μ)	1	1	1	1.18	4		3	60	5	3.3	5
Case studies											
Project	1890	1890	2082		2065	1890				1674	1890
Vapour Control Layer	Intello	Intello	Tyvek Reflective	None	None	None	None	TBA	TBA	Tyvek Reflective	Tyvek Reflective
Psi Value calculation complete	No	Yes	No	No	No	No	No	No	Yes	No	Yes
BuildDesk calculation complete	Yes	Yes	Yes	Yes (Condensation dries in summer)	Yes	No	No	Yes	Yes	Yes	Yes
WUFI calculation complete	Yes	Yes	No	No	Yes	Yes	No	No	No	Yes	Yes
Teperature factor (typical Frsi)	0.924			0.9	0.928	0.925	N/A	0.927	0.94	0.924	0.924
Embodied energy	TBA	TBA	TBA	TBA	TBA	TBA	TBA	TBA	TBA	TBA	TBA
Cost (supply and install)	£26 sm	£26 sm	TBA	TBA	£78 sm	TBA	TBA	TBA	TBA	TBA	£252 sm TBC
Availability	Good	Good	Good	Good	Medium	Medium	Medium	Medium	Low	Medium	Medium

Claridge House

How to ‘**ZERO**’

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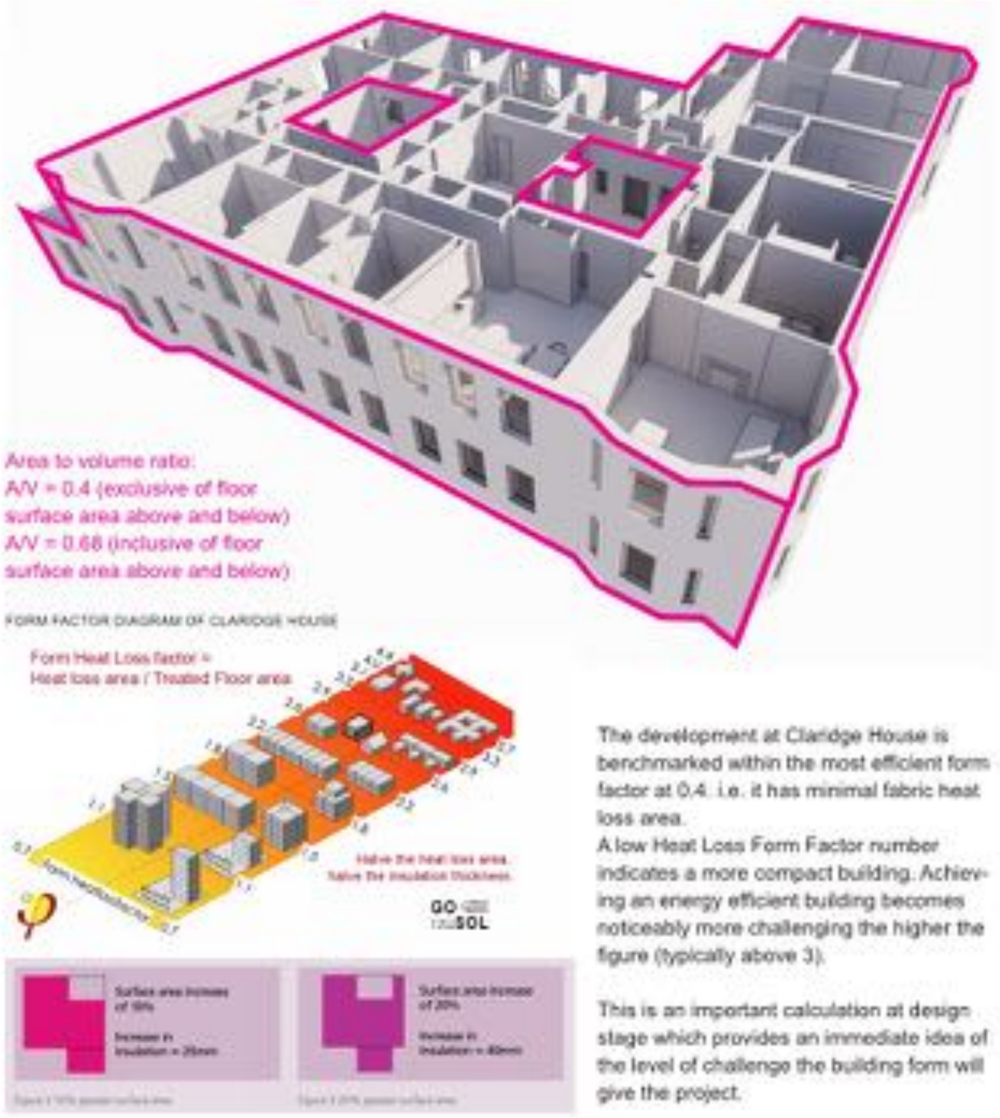
GROSVENOR

Claridge House

Form factor



Claridge House

Client brief

Electrification of space heating

Page 9: Our carbon emissions forecast

Energy use in buildings (Scope 1, Scope 2 and Scope 3: Energy use by tenants)

Our net zero carbon pathway shows the impacts of reducing energy use intensity in each of our assets to comply with the more stretching of a) the CRREM 2030 EUI benchmarks for the relevant country and asset type or b) the net zero carbon definition set by the local Green Building Council or local regulation in the relevant country (if applicable). Further to this, our pathway assumes that all emissions from natural gas and oil (i.e. Scope 1 emissions) will be eliminated by 2030 through the electrification of heating systems or use of geothermal/district heat networks.

Claridge House

Client brief

Energy Use Intensity table

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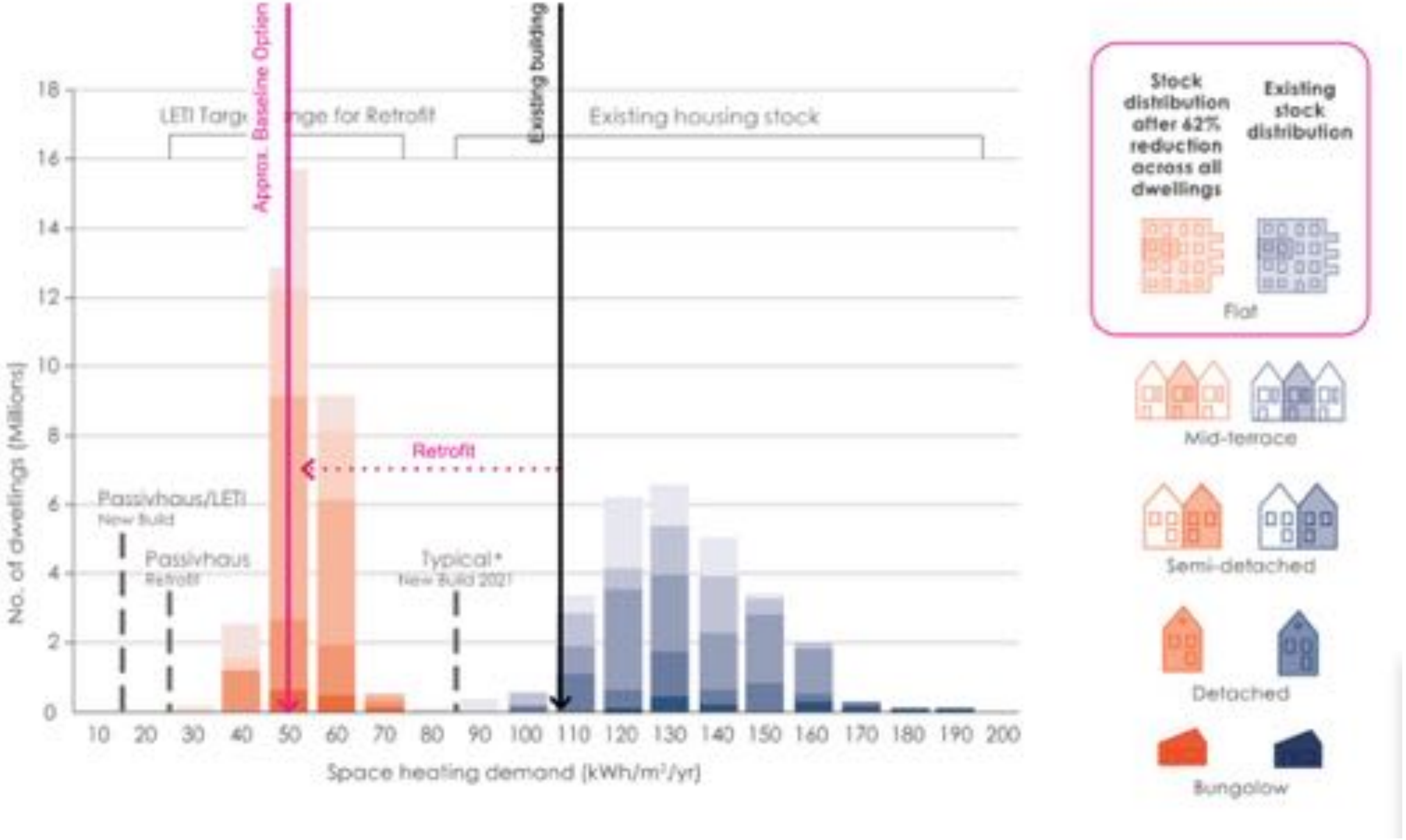
Sector	Scope	Metric	Our Existing Buildings 2020-2025	2025-2030
Offices >1,000m²	Base building energy	NABERS UK star rating	4.5	5
Retail >250m² and other non-residential >1000m²	Whole building energy	DEC	D90	C65
Retail<250m² and other non-residential <1000m²				
– Cafes	Whole building energy	kWhe/m² (GIA)	389	280
– Clubs	Whole building energy	kWhe/m² (GIA)	140	100
– Fitness club/Gym	Whole building energy	kWhe/m² (GIA)	165	119
– Hairdressers & beauty salons	Whole building energy	kWhe/m² (GIA)	289	208
– Hotels	Whole building energy	kWhe/m² (GIA)	213	153
– Large non-food shops	Whole building energy	kWhe/m² (GIA)	132	95
– Offices	Whole building energy	kWhe/m² (GIA)	130	90
– Pubs	Whole building energy	kWhe/m² (GIA)	242	174
– Restaurants & takeaways	Whole building energy	kWhe/m² (GIA)	771	554
– Showrooms	Whole building energy	kWhe/m² (GIA)	105	75
– Small non-food shops	Whole building energy	kWhe/m² (GIA)	82	59
Residential **Resi**	Whole building energy	kWhe/m² (GIA)	101	**91**

pre-retrofit
EUI 233
post retrofit
EUI 68

Claridge House

Context



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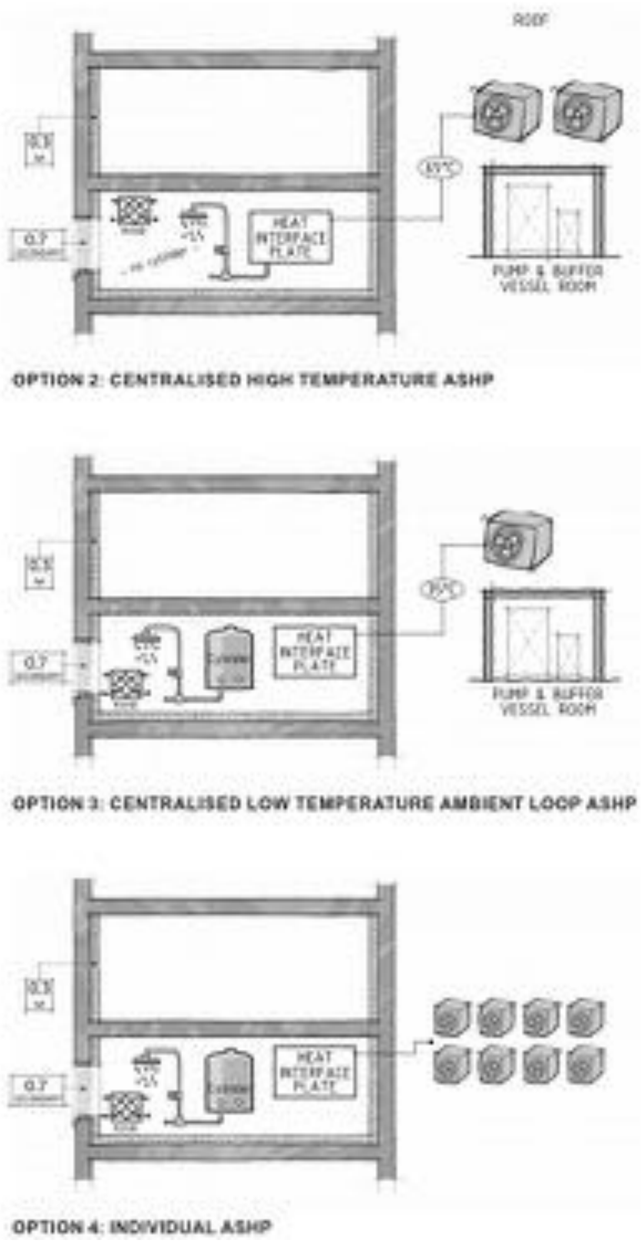
Opionering



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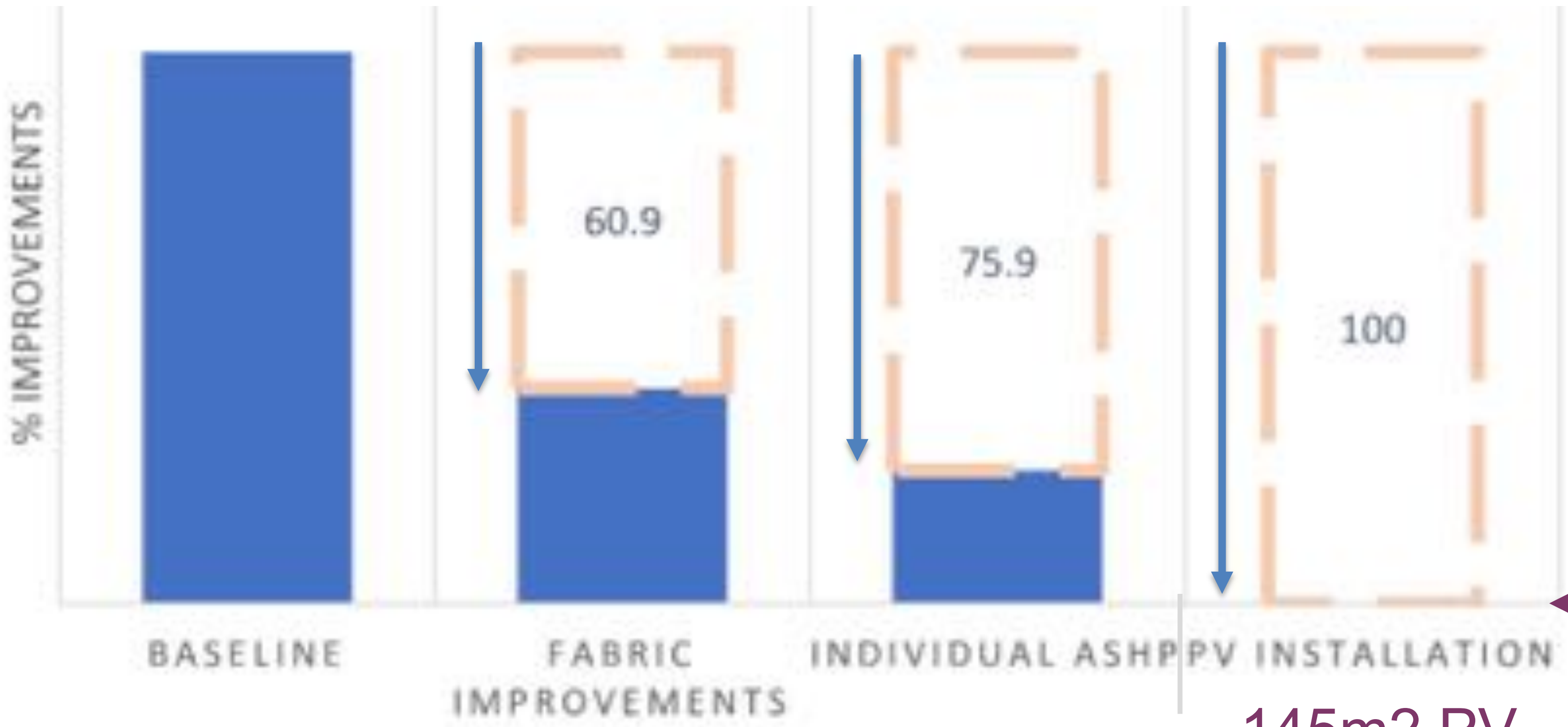
CO2e savings

GROSVENOR



ZERO!!

145m2 PV
38,000 kWh / yr

ZERO emissions - **ZERO** offset

Training
&
Key publications

PAS 2035
whole building approach

RETROFIT COORDINATOR

Passivhaus Trust
The UK Passive House Organisation

bre

THE Green REGISTER OF CONSTRUCTION PROFESSIONALS

STROMA CERTIFICATION

AECB CarbonLite

Training required

Make Retrofit real to people

Showing what a good retrofit looks like.

Addresses:

- Awareness gap - carbon literacy
- Knowledge gap - where do you start?
- Skills gap - who can do?

LONDON
ENERGY
TRANSFORMATION
INITIATIVE

- **GLA Guidance to come in Sept**

Guidance: LETI Retrofit Guide

RIBA 2030 Climate Challenge target metrics for domestic / residential

RIBA Sustainable Outcome Metrics	Business as usual (new build, compliance approach)	2025 Targets	2030 Targets	Notes
Operational Energy $kWh/m^2/y$	120 $kWh/m^2/y$	< 60 $kWh/m^2/y$	< 35 $kWh/m^2/y$	Targets based on GIA. Figures include regulated & unregulated energy consumption irrespective of source (grid/renewables). BAU based on median all electric across housing typologies in CIBSE benchmarking tool. 1. Use a 'Fabric First' approach 2. Minimise energy demand. Use efficient services and low carbon heat 3. Maximise onsite renewables
Embodied Carbon $kgCO_2e/m^2$	1200 $kgCO_2e/m^2$	< 800 $kgCO_2e/m^2$	< 625 $kgCO_2e/m^2$	Use RICS Whole Life Carbon (modules A1-A5, B1-B5, C1-C4 incl sequestration). Analysis should include minimum of 95% of cost, include substructure, superstructure, finishes, fixed FF&E, building services and associated refrigerant leakage. 1. Whole Life Carbon Analysis 2. Use circular economy strategies 3. Minimise offsetting & use as last resort. Use accredited, verifiable schemes (see checklist). BAU aligned with LETI band E; 2025 target aligned with LETI band C and 2030 target aligned with LETI band B.
Potable Water Use Litres/person/day	125 l/p/day (Building Regulations England and Wales)	< 95 l/p/day	< 75 l/p/day	CIBSE Guide G.

Guidance: RIBA 2030 Climate Challenge

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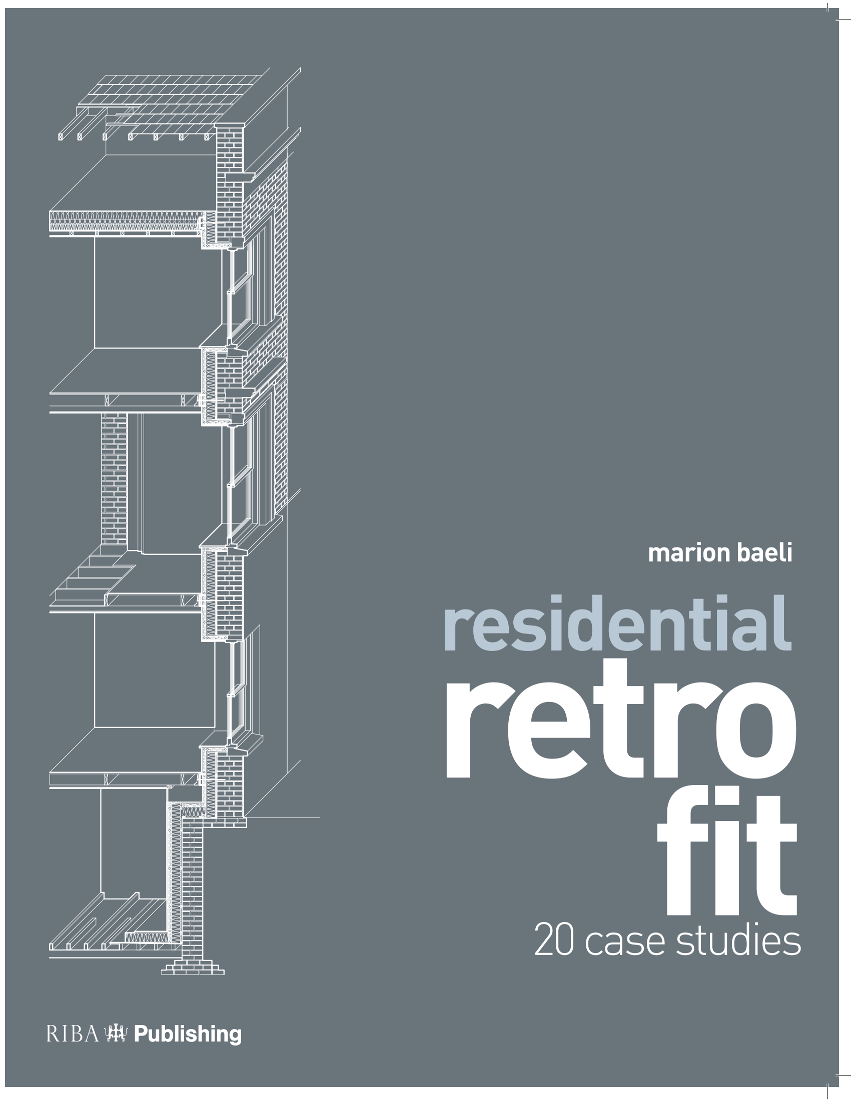
marion baeli
residential
retro
fit
20 case studies
RIBA Publishing

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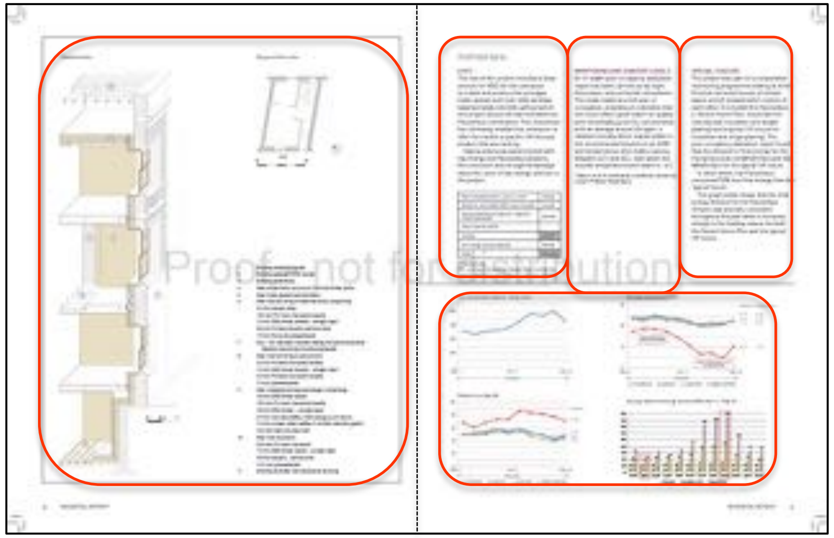
Content:

- ID card + summary of measures
- Description of each strategy
- Vital statistics
- Detailed isometric section
- Costs (material & labour)
- Monitoring data:
  Energy & Internal comfort
- Special feature



Retrofit Coordinator – **PAS 2035**

PAS 2035 requires that all domestic retrofit projects incorporate a Retrofit Coordinator whose job is to oversee the management and design of all retrofit measures. To carry out this vital role, it is necessary for Retrofit Coordinators to attain the Level 5 Diploma in Retrofit Coordination and Risk Management.

Guidance: Retrofit Academy

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Train ‘en masse’: PDP London Low Carbon Retrofitters

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Thank You