The AECB Building & Retrofit Standards

The AECB Building Standards

Three standards:
• Building Standard (self-certification)
• Retrofit Standards (self-certification)
  • Heat pump retrofit (Level 1)
  • Full fabric retrofit (Level 2)
• Water Efficiency (Standards & guidance)
• Lifetime Carbon (software, guidance & training)
• Daylighting (software, guidance & training)
All models are wrong but some are useful

George E.P. Box

- PHPP
- DesignPH (SketchUp)
- PHribbon / EPDs
- AECB Stock Model
Modelling the deployment of Standards at scale

Decarbonising assumptions!
Scenarios
CO2e emitted each year

Without decarbonising manufacturing!
Consumption-based not territorial emissions
UK Housing Stock – by heating demand and dwelling type

AECB Level 1 Retrofit: ‘typical’ semi with cavity walls (delivered heating energy)

Note:
Space heat demand is not the same as ‘delivered heating energy’ (which factors in the efficiency of the system e.g. 350% for a good HP install)

AECB Level 1 Retrofit Standard does not have a space heat demand limit!

AECB Level 2 Retrofit Standard is set at 50kWh/m².a but allows exemptions up to 100kWh/m².a
The AECB Level 1 Retrofit Standard – ‘heatpumpification’

The AECB LEVEL ONE retrofit standard is designed to support a rapid transition to low carbon heating.

✓ It recognises that switching from fossil fuel heating to heating by heat pumps is the single easiest and cheapest measure to reduce both operational and embodied carbon whilst keeping homes warm

✓ As such it for many buildings it may not require the deeper fabric retrofit measures needed to achieve the LEVEL 2 AECB retrofit standard – but it does require good ventilation measures

✓ It is designed to ensure appropriately designed heat pump installations without worsening heating bills

✓ However, it is assumed that many properties will later be taken to Level 2 to further reduce operational carbon and energy bills and to again improve on building occupants’ health and comfort

✓ For Level 1 the Standard includes for avoiding ‘lock-in’ which could compromise or prevent the successful implementation of a LEVEL 2 AECB retrofit

✓ For Level 1 & 2 retrofits there should be a clear focus on minimising upfront carbon emissions from materials used in the retrofit.
Rate of retrofit – two waves?

1st Wave
- Level 1 % of stock: 50%
- Level 2 % Direct: 25%
- Decarbonised manufacturing
- Show Embodied CO2

2nd Wave
- Level 2 from 1 % Converted: 25%

1st Wave
- Level 1 % of stock: 80%
- Level 2 % Direct: 25%
- Decarbonised manufacturing
- Show Embodied CO2

2nd Wave
- Level 2 from 1 % Converted: 75%
<table>
<thead>
<tr>
<th>Criteria</th>
<th>Building Standard</th>
<th>Level 1 Retrofit Standard</th>
<th>Level 2 Retrofit Standard</th>
<th>Level 2 Retrofit Standard with exemption</th>
</tr>
</thead>
<tbody>
<tr>
<td>Delivered space heating and cooling (kWh/m²/a)</td>
<td>≤ 40 kWh/m².a</td>
<td>≤ 50 kWh/m².a</td>
<td>≤ 100 kWh/m².a</td>
<td></td>
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<tr>
<td>Primary Energy (PE, varies)</td>
<td>(varies) kWh/m².a</td>
<td></td>
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<tr>
<td>Renewable (PER) (kWh/m²/anum)</td>
<td>≤ 75 kWh/m².a</td>
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Ensure ventilation
Continuous MEV or MM-FR must be installed: follow PAS 2035 Annex C or as required by Part F of the Building Regulations. Note: the AECB Standards do not allow a 'natural ventilation' option.

Air tightness (q50)
≤ 1.5 m³/m².h
<5.0 m³/m².h
<2.0 m³/m².h

Thermal Bridges
Assumed less than 0.01W/mK, else accounted for in PHPP or for L1 & L2 retrofit standards a default heat loss factor may be used.
NA, unless fabric measures below eaves junction are installed.
Assumed less than 0.01W/mK, else accounted for in PHPP or for L1 & L2 retrofit standards a default heat loss factor may be used.

Surface Condensation (firsi) assessed
firsi not to exceed criteria in PHPP, or 0.75 (as Building Regulations/ PAS2035), or local standards - whichever is more onerous.
NA, unless fabric measures below eaves junction are installed.

Heating system
Install a non fossil fuel system or if appropriate a connection to low carbon or future-proofed District Heating Network.
Change existing fossil fuel or direct electric heating system to a heat pump.
Existing heating systems may be retained, but future-proofing for low carbon heating must be evidenced.

Energy Model using PHPP showing
Building Standard achieved
- Pre-retrofit Baseline
- Level 1 achieved
- a retrofit scenario showing how Level 2 could be achieved

PHPP modelled overheating risk, <10% Acceptable (Guidance: <5% Good practice or <3% Best practice)

Where a heat pump is installed
For certification the following applies: Acceptable - Heating system is designed and installed for flow temp <50°C; Best Practice - Heating system is designed and installed for flow temp <48°C
Space heating and lifetime carbon of fabric and services measures:
excluding end of life and no decarbonisation of manufacturing
Space Heating & embodied CO2e of retrofit measures*

*excluding end of life and no decarbonisation of manufacturing

Current average CO2 emissions per capita = 5.5t x 2.4 ppl/yr (exc. import-related consumption)

House heated by gas before phase 1 retrofit @17C

Total annual personal CO2 budget of 11/yr

GHG budget available for everything else

L1 Capital c. £25k?   L2 Capital c. £80k?
Typical semi-detached house

Typical measures

Existing house to Level 1 retrofit

- 50mm CWI
- 400 mm attic insulation
- 5kW or larger ASHP
- 2g uPVC windows
- <5 m3/m2.h (and dedicated ventilation!)

Floor

U = 0.64
U = 1.96
U = 3.8
U = 0.45 to 0.1
Typical semi-detached house

Typical measures

Existing house to Level 2 retrofit

50mm CWI + EWI

5kW or larger ASHP

2g uPVC windows

<2 m3/m2.h (and dedicated ventilation!)

400 mm attic insulation

Insulate floor

U = 0.45 to 0.1

U = 0.64 to 0.19

U = 3.8 to 0.95

U = 1.96 to 0.26

AECB building knowledge
Q&A

For training enquiries contact: training@aecb.net