build energy

consulting
compliance
testing

The New Building Regulations

SAP 10 - Part L - Part O

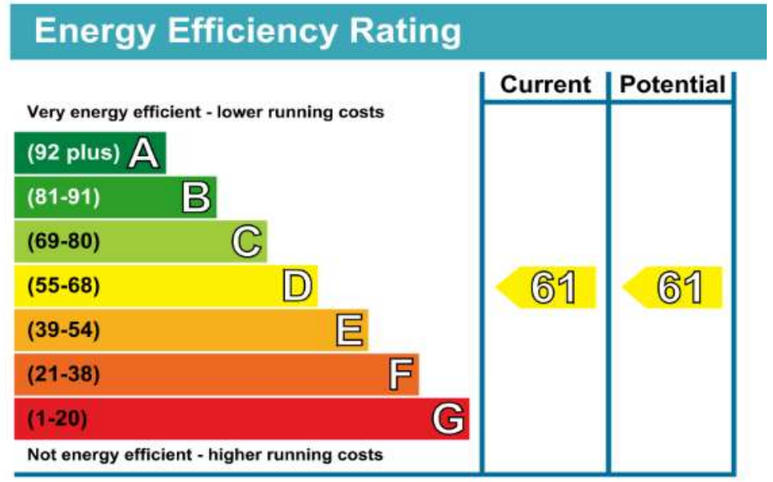
What to know ahead of June 2022

What we'll cover...

1. Energy Assessments - Basics
2. The Building Regulations Part L – New Buildings
3. The Building Regulations Part O – Overheating in New Homes
4. Changes in SAP 10
5. The Building Regulations Part L – Existing Buildings
6. The Future Homes Standard - 2025
7. Other Regulations
8. Planning
9. Key Points
10. Q&A

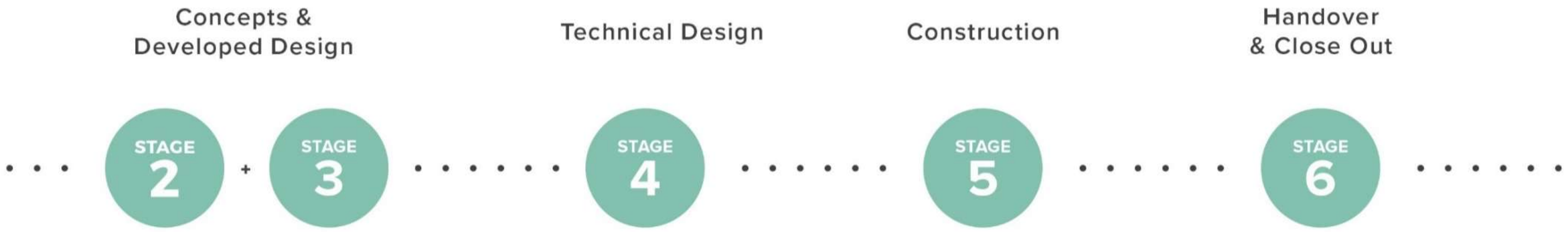
What do energy assessments provide?

- To determine the energy rating and produce an EPC for the consumer
- To demonstrate compliance with Part L of the Building Regulations and any relevant planning requirements



1a TER and DER		
Fuel for main heating system: Mains gas		
Fuel factor: 1.00 (mains gas)		
Target Carbon Dioxide Emission Rate (TER)	16.81 kg/m²	
Dwelling Carbon Dioxide Emission Rate (DER)	16.56 kg/m²	OK

When is an assessment carried out?



Energy statement

Demonstrate carbon reduction for local policy

Some assumptions for fabric & building services

Building control reports

Detailed specification

Some minor assumptions

Air test certificates

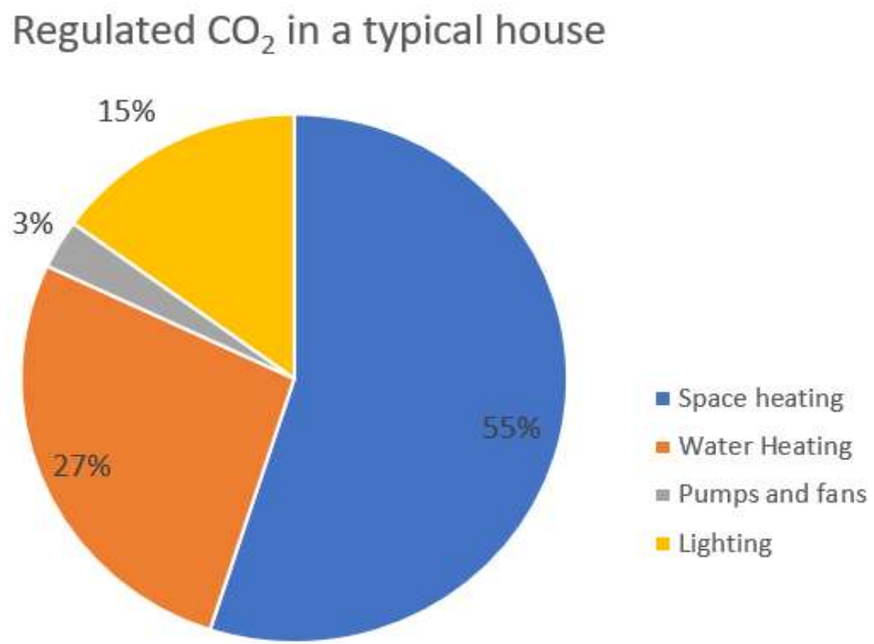
Evidence & declarations

As-built plans

What do energy assessments measure?

What do energy assessments measure?

- Regulated energy and carbon emissions = 60% of total emissions
  - Space heating
  - Water heating
  - Electricity for pumps and fans
  - Electricity for lighting
- Assumptions made for occupancy, heating patterns and hot water use etc.



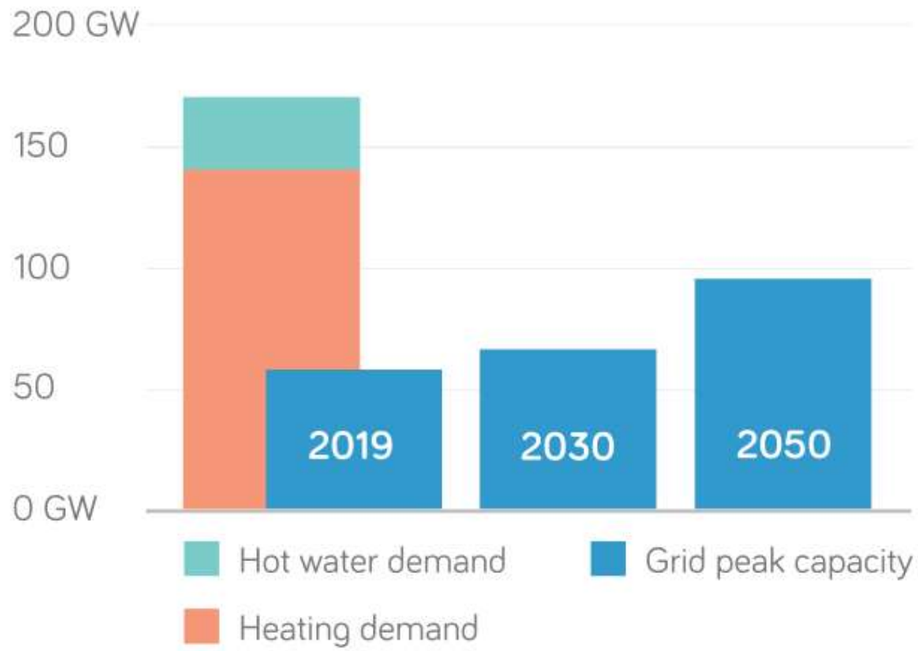
Why have Building Regulations for energy use?

- "The scientific evidence is unequivocal: climate change is a threat to human well-being and the health of the planet. Any further delay in concerted global action will miss a brief and rapidly closing window to secure a liveable future.“ – IPCC Report 2022
- Zero carbon society by 2050 – Government Policy.
- Over the average buildings lifetime:
  - Half are operational (HVAC, lighting, daily use)
  - Half are embodied (materials, site)
- 35-40% of UK total emissions are from operation of buildings, not including embodied - UK’s Green Construction Board / Architects Journal

Can’t we just switch to electric?

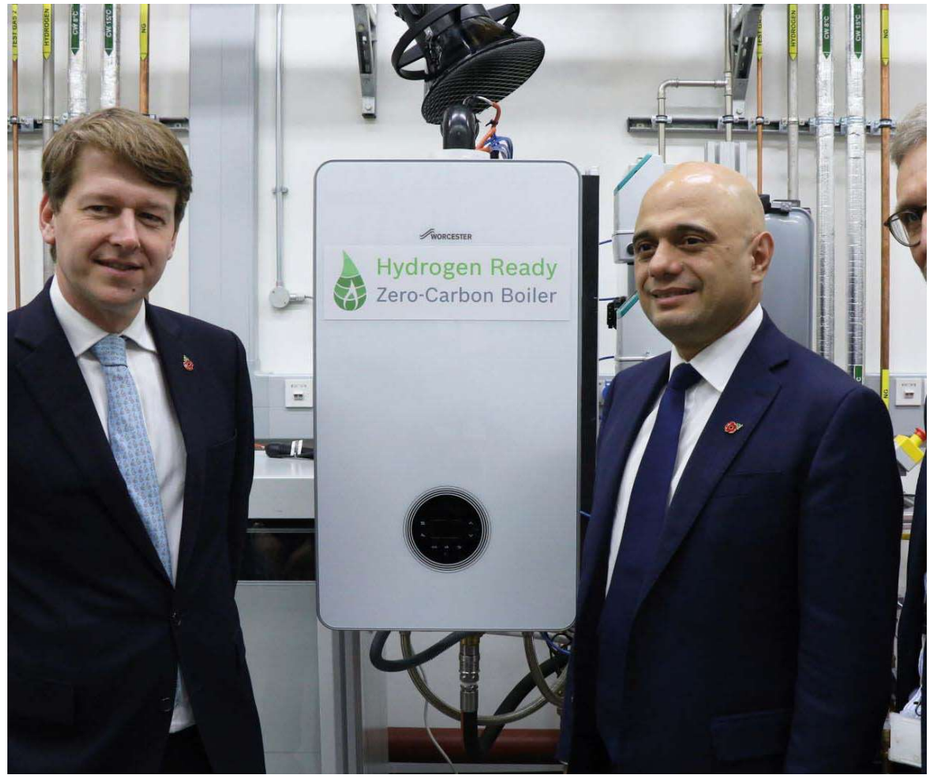
- We must also reduce energy demand dramatically.
- The peak thermal load currently demanded by homes and delivered by gas is c.a. 170GW.
- The current electric grid capacity is 60GW.
- Projected to be 100GW by 2050

Source: Passivhaus Trust



Can’t we just swap gas for hydrogen?

- Many boiler manufactures now claim to be “zero carbon” or “zero carbon ready”.
- Less efficient than electric heat pumps.
- Not zero carbon at scale.



Can’t we just swap gas for hydrogen?

- Grey hydrogen – burns gas.
- Blue hydrogen (most talked about)- burns gas. Relies on carbon capture which isn’t there yet.
- Green hydrogen – zero carbon but:
  - Relies on renewables capacity that isn’t there.
  - Only 46% efficient. Using the green electricity for heat pumps instead is 270% efficient.
- **Conclusion: we cant reach zero carbon by swapping gas for hydrogen in homes**

Source: LETI

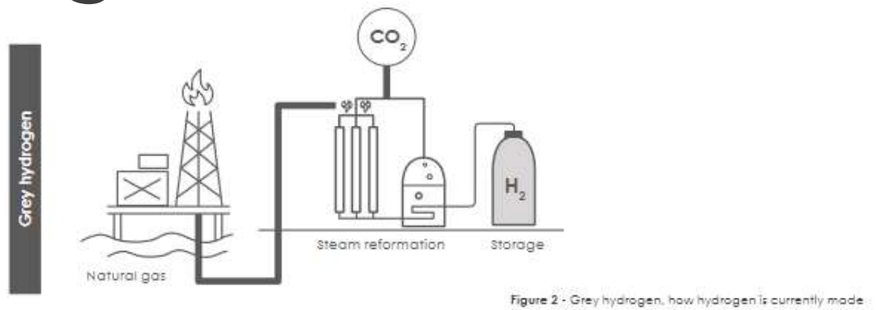


Figure 2 - Grey hydrogen, how hydrogen is currently made

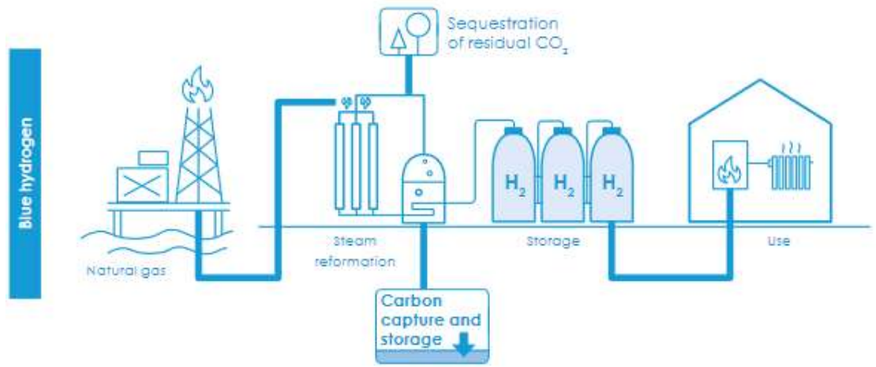


Figure 3 - Blue hydrogen, as advocated by the gas supply industry

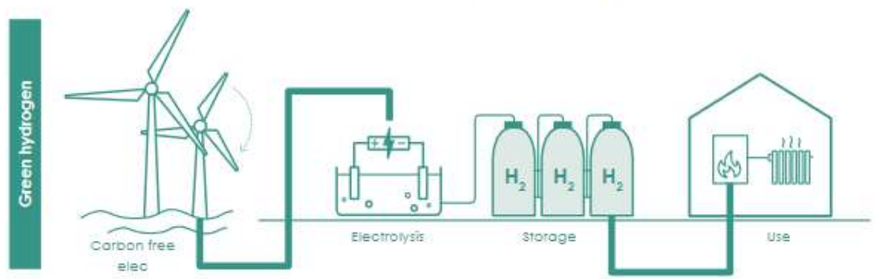


Figure 4 - Green hydrogen, made from renewable energy

The retrofit problem

- Every building needs to be retrofitted – 80% of 2050's buildings are in use today.
- That's 29 million homes
- UK's housing stock is one of the oldest and worst insulated in Europe, with only 15% of housing being built since 1990.
- Every new building that isn't zero carbon adds to that problem.
- It can cost tens of thousands of pounds to retrofit systems and fabric per home.
- We have no national plan to address this.

Part L does not address this directly

- New buildings which need to be retrofitted will keep adding to the problem.
- Much cheaper to get it right first time.

Source: House of Commons BEIS

The targets for new buildings

1. Target Emission Rate (BER or DER ≤ TER)
Total CO_2 emissions from regulated energy use.

2. Target Fabric Energy Efficiency (DFEE ≤ TFEE)
Ensures a fabric-first approach. Homes only.

3. NEW: Target Primary Energy Rate (BDER or DPER ≤ TPER)

- New in 2022 – addresses energy demand
- Influenced by fabric and fuel
- Significantly benefits heat pumps


ONLINE VERSION

HM Government

The Building Regulations 2010

Conservation of fuel and power

L

APPROVED DOCUMENT

Volume 1: Dwellings

Requirement L1: Conservation of fuel and power

Requirement L2: On-site generation of electricity

Regulations: 6, 22, 23, 24, 25, 25A, 25B, 26, 26A, 26C, 27, 27A, 27C, 28, 40, 40A, 43, 44 and 44ZA

2021 edition – for use in England

The targets for new buildings

How are these calculated?

- Targets are determined for each plot
- Based on a notional dwelling of the same size, shape and orientation as the proposed
- BUT with a set of reference values for the building specification
- Block compliance may be used

Three main targets for operational emissions/demand.

- None yet for embodied.
- None are yet zero carbon.

The targets for new buildings

4. Meet limits on design flexibility

- U-values
- Air permeability
- HVAC efficiency
- Hot water cylinder storage loss
- Heating controls
- Low energy lighting (minimum of 75% of fittings)

The targets for new buildings

Example – U-values for new homes

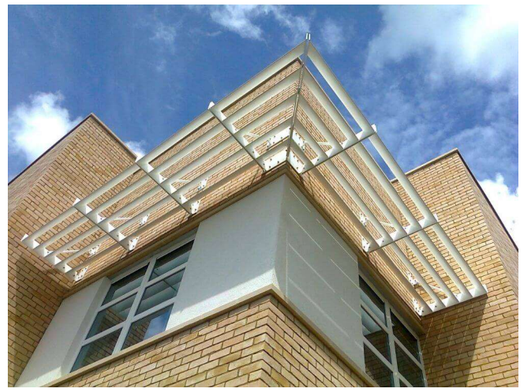
- Aim for the reference values used to calculate the three targets.
- Anything higher is technically allowed but needs to be made up for with lower values elsewhere.
- **NEW: These are the new, reduced values from June.**

	Reference Values	Limiting Values (average)
Floors	0.13	0.18
Walls	0.18	0.26
Roof	0.11	0.16
Doors	1	1.6
Windows	1.2	1.6
Air Permeability	5	8

The targets for new buildings

5. Overheating Risk

- Old assessment based on solar gain, ventilation, thermal mass and the summer temperature for the dwelling's location
- Calculates a risk of overheating during the summer months
- In SAP, overheating risk must be 'moderate' or less to comply
- Simplistic and unreliable vs. DSM tools
- **NEW: Now being replaced with the new Part O for homes.**



Part O – Simple Method

Focuses on two key checks:

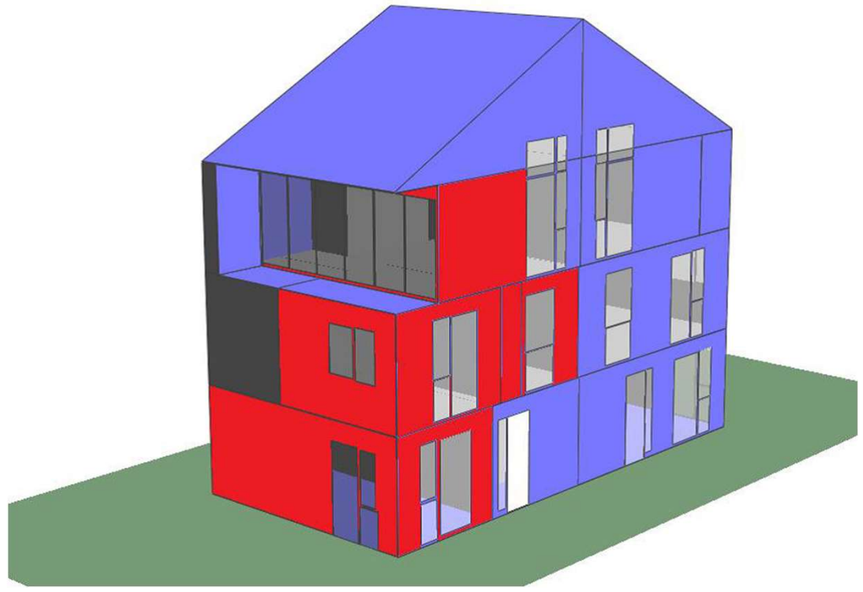
- Limiting solar gains
- Removing excess heat

Considers:

- Cross ventilation
- Location by moderate or high risk, i.e. parts of London and Manchester
- Glazing and ventilation size
- Shading by one of:
  - External shutters with means of ventilation.
  - Glazing with a maximum g-value of 0.4 and a minimum light transmittance of 0.7.
  - Overhangs on south-facing façades.

Part O – Simulation Method

- Requires a modelling expert with suitable software
- Uses CIBSE's TM59 methodology for predicting overheating risk….with some tweaks
- More accurate



Part O – Early indicators

Some early studies being carried out (**Inkling** and **CIBSE)** which identify some potential issues and inconsistencies:

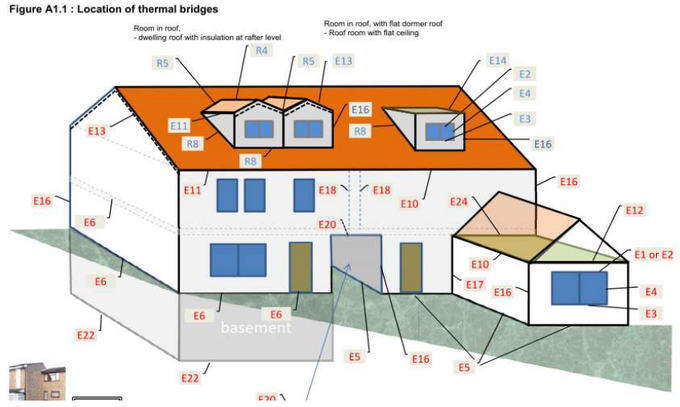
- When is mechanical cooling allowed?
- Noise & air quality implications
- Security and protection from falling
- Simple method is likely to be difficult to pass
- Blinds/trees/foliage ignored in TM59 model

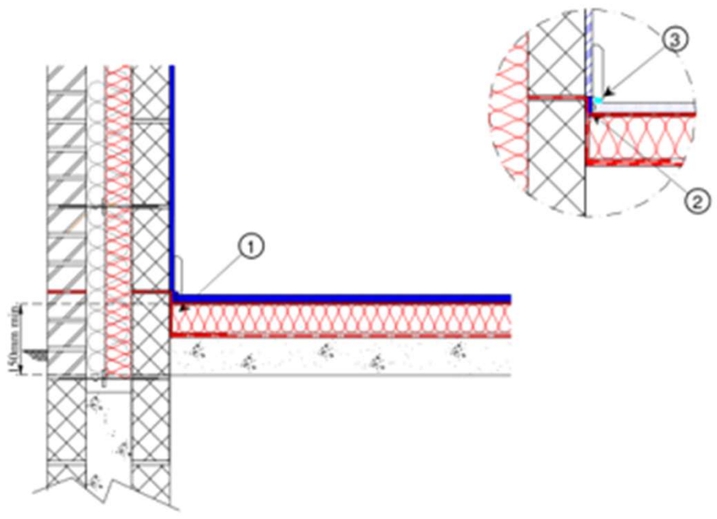
Thermal bridging

Heat loss through gaps where two constructions meet i.e. corners between walls, eaves, around windows etc.

Each junction needs inputting into SAP. There are four options:

1. **Default values**
   Not viable – fails Part L targets.
2. **Bespoke calculations**
   One-off PSI values for more specialist constructions.
3. **Accredited Construction details**
   Long seen as the default / tick box exercise and not checked.
   Outdated (introduced in 2002).
   NEW: Phased out in June
4. **Insulation & block manufacturers or industry bodies**



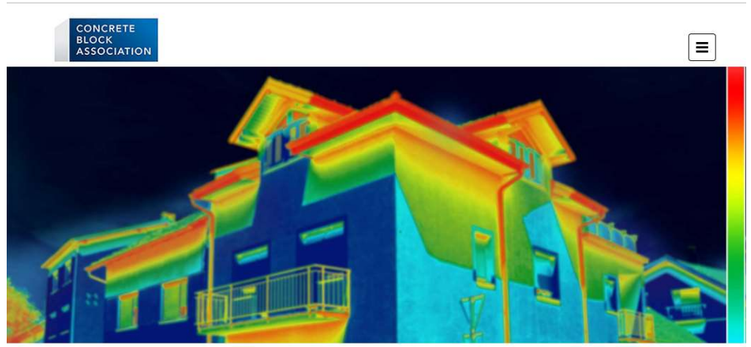


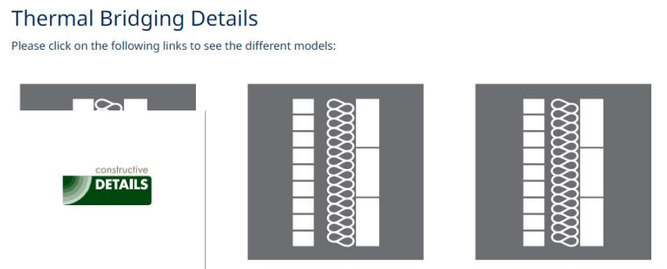
Thermal bridging

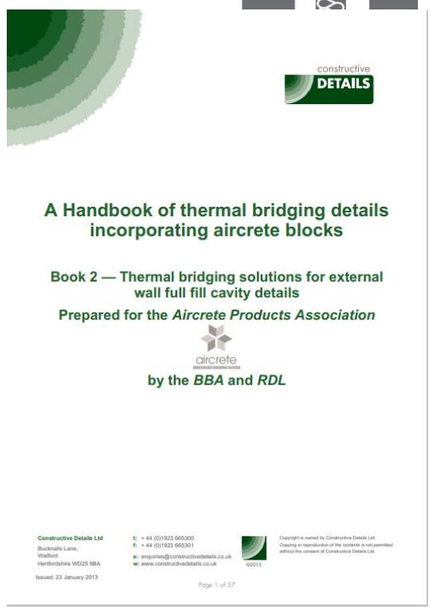
This means from June there are two options:

1. **Follow scheme(s) from industry bodies based on the construction and insulation, e.g:**
   - The Concrete Block Association
   - Constructive Details
   - Insulation and block manufacturers

2. **Calculate individual PSI values**
   - Bespoke one-off calculations for a junction design based on construction or insulation where no existing schemes are suitable
   - More accurate and repeatable
   - 2d or 3d modelling by a competent person







Electric systems

NEW: Electric systems perform better

- Significant reduction in electricity emissions – from 0.519 to 0.233 kgCO_2/kWh (55% reduction).
- Electric based heating improves, but solar PV has less benefit.
- Another win for heat pumps.

Evidence requirements

Design stage

- Desk based with drawings and specification
- Measure areas, volumes and heat loss junctions
- Enter full fabric and building services:
  - U-values
  - Psi values for thermal bridging
  - Target air permeability for testing later
  - HVAC
  - Renewables
  - Lighting - **NEW: fitting details**
  - Thermal mass parameter - includes internal wall build ups - **NEW: compulsory**

As built assessment

QA process to audit:

- As-built drawings
- Finalised U-value calculations
- Signed developer declarations of:
  - Final specification for HVAC, fabric, lighting.
  - Thermal bridging
- Air test certificate
  - **NEW: test every home, no more sampling**
- MCS certificate or datasheet for any renewables
- Photographs
  - **NEW: Photographic evidence from developers of key parts of the build**

Developers photographs during work

- End of “tick box culture”?
- Robust photographic evidence of the construction and continuity of insulation around:
  - Foundations
  - Walls
  - Roofs
  - Openings
  - HVAC (makes, models, installation quality)
- Geo-location to confirm the location, date and time of each image.

Part L – Existing Buildings

- New and replacement walls, floors, roofs and glazing subject to maximum U-values.

- Extensions: Glazing size limited to 25% of extensions floor area, OR:
  - **NEW: Primary Energy Rate** (TPER/DPER)
  - **NEW: Fabric Energy Efficiency** (TFEE/DFEE)
  - CO_2 Emissions (TER/DER)

This means more detailed assessments for entire building

The Future Homes Standard - 2025

Proposed changes for new homes:

- Gas and oil heating systems no longer be permitted
- Reduced Primary Energy target
- Reduced carbon emission target
- Reduced Fabric Energy Efficiency target
- More robust minimum standards and backstop values for fabric and services

Rolled out as "SAP 11" – BRE & BEIS developing now

See also – Future Buildings Standard for non-domestic

Other Relevant Building Regulations

Part S – Electric Vehicle Charging

- Introduced in June 2022.
- New homes and other buildings will now be expected to provide electric vehicle charge points and/or cable routes for future connection.

Part F – Ventilation

- Changes to background ventilation requirements
- Accounts for more airtight, better insulated dwellings
- Improve air quality

Planning conditions and BREEAM

- Planners can ask for Part L targets to be exceeded.
- Most local authorities can request up to 19% improvement via “optional” Building Regulations.
- Some authorities with devolved powers are able to exceed this limit.
- Conditions for BREEAM or HQM can rely on SAP performance

Key points

1. **Electric heat pumps are the new normal**

- Carbon factors more realistic
- New mains gas connections difficult now, banned altogether from 2025

2. **The new Primary Energy Rate target**

- Only with lower energy demand can we reach zero carbon
- Buildings will need better insulation and thermal bridging
- Heat pumps are the best option – local generation reduces demand further

3. **New robust evidence requirements:**

- Get ready for site photographs now - no sign off without them
- Thermal bridging
- Air test for every new home – no sampling

Key points

4. Part O – New rules for mitigating overheating risk

- More careful consideration of orientation, cross ventilation and shading
- Full dynamic simulation modelling may be required

5. Improved performance for existing buildings undergoing work

- New primary energy and fabric targets.

Welcomed changes – better buildings, raising standards. But much more needed to get to net zero…

Further Reading

- **Build Energy** Tips and Insight - www.buildenergy.co.uk/tips-and-insight/
- **LETI** - www.leti.london/publications

  LETI Design Guide - www.leti.london/cedg

  LETI Hydrogen Guide - www.leti.london/hydrogen
- **BEIS Report on Retrofit** - https://committees.parliament.uk/work/645/decarbonising-heat-in-homes/publications/
- **Part L Documents** - www.gov.uk/government/publications/conservation-of-fuel-and-power-approved-document-l
- **BRE SAP 10** - www.bregroup.com/sap/sap10/
- **BRE SAP 11** – www.bregroup.com/sap/sap-industry-forum/
- **Future Homes Standard** - www.gov.uk/government/consultations/the-future-homes-standard-changes-to-part-l-and-part-f-of-the-building-regulations-for-new-dwellings
- **Inkling** - www.inklingllp.com/2022/02/15/part-o-the-inkling-appraisal/
- **CIBSE** - www.cibse.org/Knowledge/Guides

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Any Questions?

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