CC020-B

Supporting Document

Essex Net Zero Specifications

September 2025

Introba Levitt Bernstein People.Design Etude Currie & Brown

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1.0 Executive Summary

The Essex Climate Action Commission have commissioned Introba, Levitt Bernstein, Etude and Currie & Brown to develop the Essex Net Zero Specifications Guide for six different residential typologies, in addition to a supporting document with high level advice to show that achieving "*Policy GE1: Operational Energy and Carbon (Net Zero) in Homes and Buildings*" (as set out in the '*Operational Energy & Carbon (Net Zero) – Planning Policy Statement (2025)*') is deliverable in practice.

This document is a supporting document to the "Essex Net Zero Specifications Guide" which brings background information on topics that are not covered in the "Essex Net Zero Specifications Guide". It provides high level advice on the requirements regardless of meeting Net Zero, aesthetics of Net Zero and achieving Net Zero at low cost. The document also identifies whether there are material and supply chain gaps in Essex, in addition to providing an elemental cost breakdown of the proposed operational policy's net zero specifications and the Part L 2021 baseline that were used in the "Essex Net Zero Policy – Technical Evidence Base" report issued in 2025.

The "Essex Net Zero Specifications Guide" outline packaged solutions that meet the "*Policy GE1: Operational Energy and Carbon (Net Zero) in Homes and Buildings*" requirements. For each typology, a 2-pager guide has been developed which covers fabric and system options in addition to MVHR best practice design guidance. The document also includes high level guidance on design considerations and thermal bridging. The typologies covered include a semi-detached house, terrace block, bungalow, low-rise block of flats, mid-rise block of flats and a high-rise block of flats.

This report and the "Essex Net Zero Specifications Guide" focus on the operational energy of residential buildings, however it is important that the life cycle embodied carbon emissions are also considered, to make sure that each area is optimised and clearly demonstrated in design and construction. For embodied carbon policy requirements and guidance, please refer to the "Essex Embodied Carbon Policy Study" and the "Embodied Carbon and Circular Economy Planning Policy Statement (2025)".

Figure 1: Net Zero Carbon New Building in Operation policy requirements

2.0 Requirements regardless of meeting Net Zero

Low carbon heating

The Future Homes Standard, which is Part L of the Building Regulations due to be implemented in 2025, has had various different options at the different consultations. One consistent feature has been that fossil fuel heating is not permitted. There are several low carbon heating systems but the only one available at scale in all locations and for any home type is heat pumps. These will therefore be the normal installation with local alternatives only by exception.

Overheating

Mitigation of overheating risk is a key climate change adaptation challenge. Overheating is becoming a more significant and serious health risk in the UK as heatwaves become more frequent and more severe. Part O of the building regulations has formalized the requirement and approach to tackling the issue based on the TM59 methodology. Adequate ventilation is the central element needed, along with better glazing design and performance.

Airtightness

Good airtightness is a signifier of good quality construction and fundamental to ensuring comfortable, draught free homes, so aiming for low air permeability should be a target for all new homes, regardless of the overall energy performance target.

Indoor Air Quality

Poor indoor air quality is a health issue which particularly affects children. Good ventilation and particularly centralized ventilation incorporating filtration can substantially alleviate the build up of indoor air pollutants and reduce the impact of external pollution.

Smart grids

Smart meters are an essential part of delivering the UK's carbon targets at a national level, and a very effective tool for householders in reducing their energy bills. They allow householders to access Time of Use tariffs which encourage residents to use electricity when there is a high renewable contribution to the national generation mix by making the unit cost cheaper and discourage use during peak, more expensive times. This behaviour 'nudge' can help to match demand to supply and reduce reliance on standby fossil fuel generation.

Figure 2: Severe heat waves such as occurred in 2022 are forecast to happen with increasing frequency, due to climate change. Building Regulations ([Part O]) requires mitigation to be incorporated into the design of new homes, based on the methodology described in [CIBSE TM59].

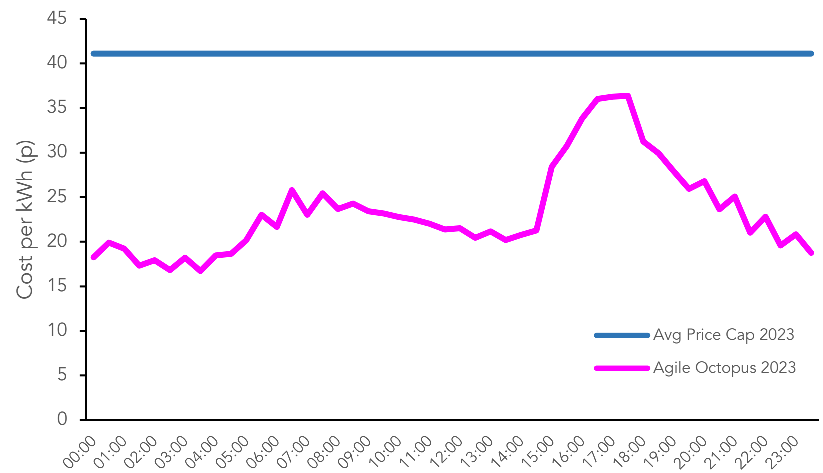


Figure 3: Annual average half hourly prices for electricity from Octopus Energy's Agile tariff were significantly lower than the average price cap rate for standard fixed and variable tariffs in 2023. A similar pattern existed during 2018, 2019 and 2020 (ie years excluding the energy price crisis, which disrupted normal pricing). Access to this type of tariff is only possible through smart meters. Source: [Energy Stats]

3.0 Achieving net zero at low cost

Associating cost with net zero

It is inevitable that a transition from the minimum requirements of Part L 2021 to net zero operational energy will result in an increase in construction cost. However, the cost uplift from Part L 2021 was demonstrated to be marginal in Essex at 4-7% for flats and houses (Essex Net Zero Policy Study).

As Part L regulations evolve to meet net zero, greater emphasis will be placed on enhancing building fabric efficiency and integrating low carbon and renewable energy systems. Consequently, the gap in costs between minimum regulatory requirements and net zero design is expected to narrow further over time.

When reviewing the cost of net zero design it is important to factor in the cost savings alongside the additional costs (see opposite). For instance, higher levels of insulation reduce the building's heating demand, resulting in the specification of a smaller central heating system and associated services.

Good design reduces cost but is often never quantified

Net zero design seeks to simplify the building form and balance window areas to maximise energy efficiency. However, the cost benefits of these design strategies are often overlooked. For instance, the cost savings derived from simplifying the building's form are never compared to that of a building with a more complex form. Simplification of building form is also good for buildability. Therefore, it is important to acknowledge the design team's role in making cost savings through good environmental design. It is in the design team's gift to:

- Improve building orientation, even if just by a little on difficult sites. Selecting rooms which naturally have larger windows and facing them south, east or west can increase free heat from the sun.
- Improve the form factor, while also reducing the number of thermal bridges.
- Group warm and cold spaces to reduce external wall length.
- Moderate window areas to balance heat gain and heat loss

While simplicity and efficiency in design may sometimes appear to conflict with architectural aspirations, these two approaches can complement each other, leading to more focused and thoughtful designs. Examples of how aesthetically pleasing architecture can be twinned with net zero specifications are detailed on page 7.

Cost associated with upgrading from Part L minimum requirements to net zero buildings

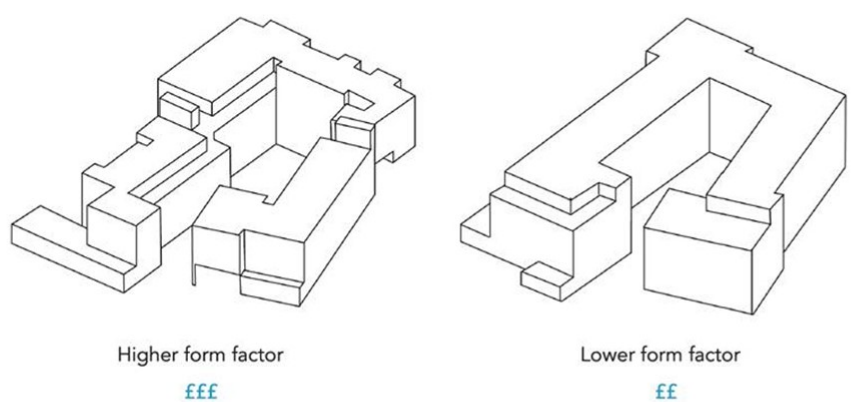
Additional costs

- Window upgrade – double to triple glazing
- Additional contractor supervision to ensure quality build and outcomes
- MVHR upgrade to more efficient model
- Higher levels of insulation
- ASHP
- Predictive energy modelling consultant
- PVS to meet net zero balance
- Airtightness products and contactors risk
- Thermal bridge products

Cost savings

- Site infrastructure
- Reduced size of central heating plant and associated building services for heating
- Reduction of external wall area
- Window area optimized (reduced when compared to baseline schemes)
- Reduction of build complexity – thermal bridges
- Reduced energy offset payments due to reductions on-site

The cost of good design is often never quantified – building form



Improving the form factor costs nothing when implemented from early design stage, but a complex form can be more costly regardless of net zero design.

Figure 4: Cost saving as a result of better form factor

For more net zero design guidance refer to the Net Zero Toolkit https://www.essexdesignguide.co.uk/climate-change/net-zero-carbon-toolkit/

4.0 Aesthetic of Net Zero

Examples of existing buildings in east and southeast England and London. These all have a space heating demand ≤15kWh/m²/yr and meet some of the other net zero metrics. Further additional details on the construction methods and materials of the projects, visit Passivhaus database website.

Carrowbreck Meadow development, Norwich

Building typology: detached house
Architect: Hamson Barron Smith
Image source: Passive House+
Total number of dwellings on site: 14

Net zero design strategies:

- South-facing orientation
- Simplified design form
- Optimised glazing areas

Performance against Net Zero policy requirements:

14 kWh/m2/year

Exterior wall U-value: 0.10 W/m²K
Ground floor U-value: 0.11 W/m²K
Roof U-value: 0.09 W/m²K
Window U-value: 0.77 W/m²K
Window g-value: 0.59-62
Airtightness: 0.54 ac/h

Gas boiler | 35 kWh/m2/year EUI | Net Zero Balance | Certified Passivhaus

Essex Village Wimbish II, Wimbish, Essex

Building typology: semi-detached houses
Architect: Parsons + Whittley
Image source: Passive House+
Total number of dwellings on site: 11

Net zero design strategies:

- Simplified design form
- Optimised glazing areas

Performance against Net Zero policy requirements:

15 kWh/m2/year

Exterior wall U-value: 0.12 W/m²K
Ground floor U-value: 0.10 W/m²K
Roof U-value: 0.09 W/m²K
Window U-value: 0.74 W/m²K
Window g-value: 0.50
Airtightness: 0.60 ac/h

Gas boiler | 35 kWh/m2/year EUI | Net Zero Balance | Certified Passivhaus

Burnham Overy Stainthein, Norfolk

Building typology: terrace houses
Architect: Parsons + Whittley
Image source: Passive House +
Total number of dwellings on site: 3

Net zero design strategies:

- Simplified design form
- Optimised glazing areas

Performance against Net Zero policy requirements:

13 kWh/m2/year

Exterior wall U-value: 0.10 W/m²K
Ground floor U-value: 0.08 W/m²K
Roof U-value: 0.08 W/m²K
Window U-value: 0.78 W/m²K
Window g-value: 0.61
Airtightness: 0.64 ac/h

ASHP | 35 kWh/m2/year EUI | Net Zero Balance | Certified Passivhaus

Goldsmith St, Norwich

Building typology: terrace houses
Architect: Mikhail Riches
Image source: Levitt Bernstein
Total number of dwellings on site: 93

Net zero design strategies:

- South-facing orientation
- Simplified design form – long terrace
- Optimised glazing areas
- Design for reduced overshadowing

Performance against Net Zero policy requirements:

13 kWh/m2/year

Exterior wall U-value: 0.11 W/m²K
Ground floor U-value: 0.08 W/m²K
Roof U-value: 0.10 W/m²K
Window U-value: 0.74 W/m²K
Window g-value: 0.51
Airtightness: 0.60 ac/h

Gas boiler | 35 kWh/m2/year EUI | Net Zero Balance | Certified Passivhaus

KEY: Requirement has been met | Requirement has not been met | Information not available

4.0 Aesthetic of Net Zero

Standings Court development, Horsham, West Sussex

Building typology: terrace houses
Architect: MH Architects
Image source: MH Architects
Total number of dwellings on site: 12

Net zero design strategies:

- Simplified design form
- Optimised glazing areas

Performance against Net Zero policy requirements:

14 kWh/m2/year

Exterior wall U-value: 0.11 W/m²K
Ground floor U-value: 0.11 W/m²K
Roof U-value: 0.08 W/m²K
Window U-value: 0-9-1.0 W/m²K
Window g-value: 0.45
Airtightness: 0.60 ac/h

Gas boiler & solar thermal | 35 kWh/m2/year EUI | Net Zero Balance: PVs installed on-site | Certified Passivhaus

Cannock Mill Co-housing, Colchester, Essex

Building typology: low-rise block of flats (2 storeys)
Architect: Anne Thorne Architects LLP
Image source: Passive Trust
Total number of dwellings on site: 23

Net zero design strategies:

- Simplified design form
- Optimised glazing areas

Performance against Net Zero policy requirements:

15 kWh/m2/year

Exterior wall U-value: 0.11 W/m²K
Ground floor U-value: 0.14 W/m²K
Roof U-value: 0.11 W/m²K
Window U-value: 0.94 W/m²K
Window g-value: 0.54
Airtightness: 0.56 ac/h

Gas boiler | 35 kWh/m2/year EUI | Net Zero Balance | Passivhaus

Plashet Road, Newham, London

Building typology: low and mid-rise block of flats (4-5 storeys)
Architect: Levitt Bernstein
Image source: Levitt Bernstein
Total number of dwellings on site: 65

Net zero design strategies:

- Simplified design form
- Optimised glazing areas

Performance against Net Zero policy requirements:

15 kWh/m2/year

Exterior wall U-value: 0.15 W/m²K
Ground floor U-value: 0.11 W/m²K
Roof U-value: 0.10 W/m²K
Window U-value: <1.00 W/m²K
Window g-value: 0.53
Airtightness: 0.60 ac/h

Communal ASHP | 44 kWh/m2/year EUI | Net Zero Balance | Awaiting Passivhaus certification

Agar Grove, Camden, London

Building typology: mid-rise block of apartments (6-storeys)
Architect: Hawkins/Brown, Architype
Image source: Architype
Total number of dwellings on site: 38

Net zero design strategies:

- South-facing orientation
- Simplified design form
- Optimised glazing areas

Performance against Net Zero policy requirements:

13 kWh/m2/year

Exterior wall U-value: 0.17 W/m²K
Ground floor U-value: 0.25 W/m²K
Roof U-value: 0.09 W/m²K
Window U-value: 0.78 W/m²K
Window g-value: 0.46
Airtightness: 0.59 ac/h

ASHP | 35 kWh/m2/year EUI | Net Zero Balance | Certified Passivhaus

KEY: ✓ Requirement has been met · ✗ Requirement has not been met · ? Information not available

5.0 Supply chain and skills mapping

To identify any supply chain and skills shortages in Essex, a survey was carried out and sent to 50 different organizations in Essex. Seven organizations have responded, and it has been assumed that those who did not respond do not have an issue with what was circulated.

Material availability

Survey results showed that construction materials are generally bought through the use of local builder's merchants or national suppliers. The survey also asked about the ease of finding materials for net zero carbon homes, and the results are demonstrated in the Chart 1 on the right, showing there are no significant issues with finding materials for zero carbon homes.

Furthermore, a review of Essex supplier outlets identified high levels of availability of all MEP items such as WWHR, heat pumps and accessories, MVHR units and solar PV panels, and fabric items such as low conductivity wall ties, low thermal bridging lintels, insulation products and triple glazed windows. In addition, materials and MEP components are available with free and rapid (1-2 days) delivery from a wide range of online merchants.

Construction supply chain barriers

Chart 2 shows results for skills availability to build zero carbon homes. Results indicate that skills are available from the market, with some potential impact on cost/programme. There is generally less experience of ASHP and MVHR installation and achieving high airtightness standards, however these are not considered as impractical constraints. ASHP installation will be part of Building Regulation standards from 2025 onwards, and the capacity of ASHP installers has already increased significantly from 3,000 trainers in 2022 to 8,000 in 2023 across the UK. Furthermore, MVHR installation capacity is unknown but its a widespread solution in apartments. In regard to airtightness, capacity of skilled individuals is unknown but testing established infrastructure and evidence from elsewhere suggests previously inexperienced contractors are able to achieve necessary standards with good details and support.

Design supply chain barriers

The Essex net zero operational policy requires that all new residential developments demonstrate compliance using predictive energy modelling tools, such as the Passive House Planning Package (PHPP). The proposed policy is based on predictive energy modelling tools such as PHPP, and although PHPP modelling is not as common as Building Regulations compliance modelling, the Passivhaus Trust Organization shows that there are over 200 members in London and East of England, and that is due to increase as predictive energy modelling becomes a policy requirements for different local councils.

Chart 1: Getting the materials for building zero carbon homes

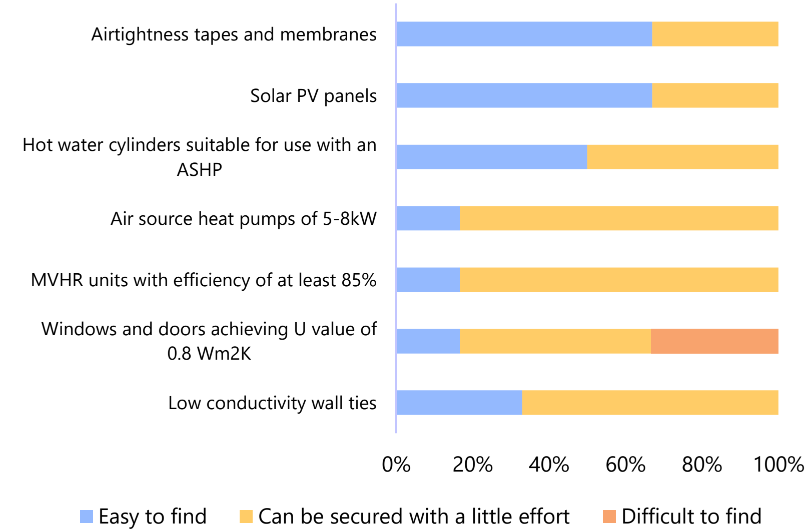


Chart 2: Skills needed for building zero carbon homes

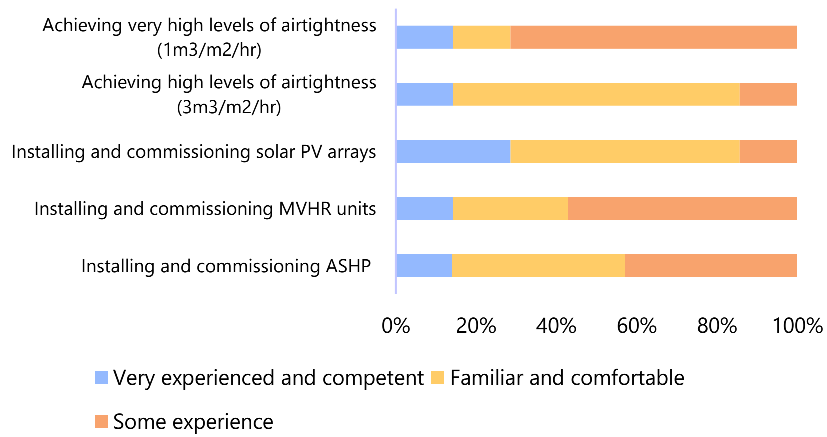


Figure 5: Bar charts showing survey results