



Heol Crwys
Cwmavon
Port Talbot
SA12 9PA

Energy Strategy Statement

Project Ref: 2575

17 February 2023

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Architecture
Low Energy Consultancy
Civil Engineering
Structural Engineering
Urban Design

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Section 1: Introduction

1.1 Introduction

This **Energy Strategy Statement** has been prepared by Spring Design to support Tai Tarian's proposed delivery of 43 dwelling units for social housing at the following development site:

Rofton Bungalows
Cwmavon
Port Talbot
SA12 9PA

This document establishes the legislative context as it pertains to energy, discusses the refurbishment potential and viability of the existing buildings and assesses the success of proposals through the lenses of [4.1 Site Layout & Orientation](#); [4.2 Heat Loss Form Factor](#); [4.3 Glazing Quantity, Distribution & Shading](#), [4.4 Building Fabric](#), [4.5 Mechanical Services](#) and [4.6 Overheating](#).

Section 2: Context

2.1 Planning Policy Wales - Edition 11

Welsh Government have enshrined the route to decarbonisation of housing within planning policy, dedicating sections of [Planning Policy Wales - Edition 11](#) (2021) to the discussion of strategic approaches for sustainable development in Wales.

Key policies established include the Energy Hierarchy for Planning (Figure 1) which clearly prioritises the reduction in energy demand above energy efficiency and renewable energy generation. This is considered critical in supporting a divestment of fossil fuels and uptake of electric power, particularly with the growing use of electric vehicles and heat pumps.

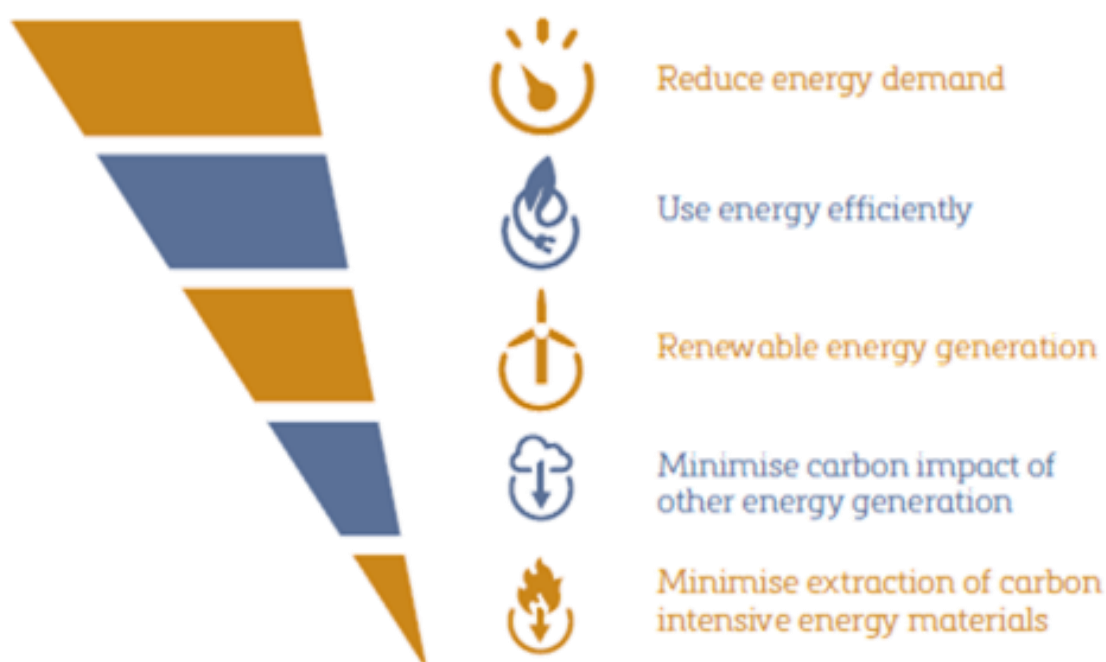


Figure 1: Planning Policy Wales - Edition 11 (2021) - Energy Hierarchy for Planning

In response to this requirement for a reduction in energy demand the planning system is required to support development that can demonstrate low embodied carbon and low operational energy demand. It follows that proposals should evidence procedures for the minimisation of whole life emissions associated with their location, design, construction, use and eventual demolition. Strategies to deliver decarbonisation, mitigation for climate change and built-in climate resilience should also be considered positively.

Proposals developed for planning must consider the implications of revisions and changes to Building Regulations requiring enhanced standards of carbon reduction in new buildings.

Excerpts from the relevant sections of the policy document are supplied for reference within [6.1 Planning Policy Wales – Edition 11](#).

2.2 Welsh Development Quality Requirements 2021

Building upon [Planning Policy Wales - Edition 11 \(2021\)](#) the [Welsh Development Quality Requirements 2021](#) (WDQR 2021) sets clear aspirations for the decarbonisation of new build social housing.

WDQR 2021 requires consideration of whole-life carbon and strategies for a reduction of both embodied and operational carbon. This is supported by recommending assessment of the reuse potential of existing buildings, specification of reused and recycled materials and ensuring buildings are designed so at the end of their operational life they can be adapted, reused or - embracing circular economy principles - deconstructed with recovered materials re-used or recycled. The reduction of operational energy demand is again prioritised: on-site renewables are recommended as a complementary strategy where they would be appropriate for the development.

A minimum EPC A (SAP 92+) must be achieved for dwellings without the use of fossil fuel appliances to deliver heating and hot water. In attaining EPC A, dwelling fabric standards must align with those defined within Table E1 Elemental Specification of [Approved Document L Volume 1: Dwellings \(2022\)](#) (Figure 2). Alternative proposals are considered acceptable where they can demonstrate energy demand has been reduced.

Assessment of climate resilience, in the form of protection against overheating, is also mandated for all apartments and those dwelling houses without windows in two parallel aspects. Dwellings falling into this definition must undertake dynamic thermal modelling through CIBSE TM59 assessment as a 'Category 1 building.' Where a dwelling house is provided operable windows in two parallel aspects, it is assumed to have adequate provision of cross-ventilation to mitigate the potential for overheating.

Excerpts from the relevant sections of the policy document are supplied for reference within [6.2 Welsh Development Quality Requirements 2021](#).

2.3 Approved Documents F, L & O

The Approved Documents provide guidance on how to comply with each aspect of the Building Regulations, periodically revised to respond to perceived issues and to reflect the evolving knowledgebase. Both [Approved Document F Volume 1: Dwellings \(2022\)](#) and [Approved Document L Volume 1: Dwellings \(2022\)](#) have been revised to reflect improved energy efficiency targets, augmented by [Approved Document O: Overheating \(2022\)](#) to build in climate resilience.

[Approved Document F Volume 1: Dwellings \(2022\)](#) has been refined to simplify guidance in relation to ventilation provisions. The document exists to ensure dwellings are provided an adequate supply of fresh air, sufficient extraction from rooms where water vapour or pollutants are likely to be generated and purge ventilation to remove high concentrations of pollutants and water vapour. This provision can be achieved through natural ventilation, mechanical ventilation or a combination of the two systems.

An as-built air permeability below $3\text{m}^3/(\text{h}\cdot\text{m}^2)$ at 50Pa disqualifies a dwelling from using natural ventilation.

The requirements and rates are not significantly different from those established within the superseded 2010 document but does clarify purge ventilation is likely to be exceeded by the requirements of AD O (2022): the greater figure should always be the design target.

[Approved Document L Volume 1: Dwellings \(2022\)](#) aims to deliver c. 30% reduction in CO₂ emissions versus the 2014 regulations by motivating more energy efficient dwellings. An additional metric for assessment is introduced, the target primary energy rate (TPER), which combines: energy demand of the dwelling; efficiency of the heat delivery system; carbon intensity of the generation and distribution of the chosen fuel source.

The document mandates all new build dwellings must achieve a minimum EPC B (SAP 81+) and demonstrate a dwelling emission rate (DER) at or below the target emission rate (TER) plus dwelling primary energy rate (DPER) at or below the target primary energy rate (TPER). Revised fabric u-values are defined within Table 10 Elemental Specification (Figure 2) and present an improvement on the superseded document.

Table E1 Elemental Specification

Element or system	Specification
Opening areas (windows and doors)	Same as actual dwelling up to a maximum proportion of 25% of total floor area ¹
External Wall U-value (W/m ² K)	0.13
Corridor Wall U-value (W/m ² K)	0.18
Party Wall U-value (W/m ² K)	0
Roof U-value (W/m ² K)	0.11
Floor U-value (W/m ² K)	0.11
Windows, Roof Windows and Glazed Door U-value (W/m ² K)	1.3 (whole window u-value)
Rooflight U-value (W/m ² K)	1.6 (whole window u-value)
Windows, Roof Windows, Glazed Rooflights and Glazed Door g-value	0.63 ³
Opaque and Semi-glazed Door U-value (W/m ² K)	1.0

Figure 2: Excerpt from AD L Volume 1: Dwellings (2022) - Table E1 Elemental Specification

Thermal bridges are dealt with more punitively than previously with the default values for SAP significantly increased. This should incentivise more attention to the detailing of junctions to mitigate the effect of thermal bridging with bespoke psi value calculations.

[Approved Document O: Overheating \(2022\)](#) has been introduced as a means of climate resilience, building in strategies to deal with anthropogenic climate change elevating the incidence rate of heatwaves. While relatively basic in this first edition, it starts to develop criteria to mitigate the overheating potential of dwellings.

Where a dwelling house demonstrates compliance with AD F (2022) and has operable windows in two parallel aspects it is assumed to have adequate cross-ventilation provision. All apartments and those dwelling houses without operable windows in two parallel aspects must either demonstrate compliance with the simplified method (Figure 3) or undertake dynamic thermal modelling through CIBSE TM59 assessment as a 'Category 1 building.'

Mitigation approach	Minimising summer solar gains	Heat removal (Openable windows ¹ and ventilation louvers)
Single aspect residential buildings		
Approach S1	Maximum glazed area of 15% of floor area	Minimum free area of 12% of floor area
Approach S2	Maximum glazed area of 20% of floor area Glazing with a maximum g-value of 0.4.	Minimum free area of 10% of floor area
Dual aspect residential buildings		
Approach D1	Maximum glazed area of 15% of floor area	Minimum free area of 12% of floor area
Approach D2	Maximum glazed area of 35% of floor area Glazing with a maximum g-value of 0.4.	Minimum free area of 12% of floor area
Approach D3	Maximum glazed area of 35% of floor area External shutters with means of ventilation on all facades. Overhangs with 50° altitude cut-off can be used instead of external shutters on south façades*. * i.e. walls with a south east to south west facing orientation	Minimum free area of 12% of floor area
Note: ¹ When calculating the free area for heat removal on hinged or pivot windows, for calculation purposes, the maximum opening angle that is practical and safe to achieve can be used, however, with a limit of 60°.		

Figure 3: Excerpt demonstrating the simplified method from AD O: Overheating (2022) - Controlling overheating by minimising summer solar gains and heat removal

2.4 Tai Tarian Design Principles & Specification

The [Tai Tarian Design Principles & Specification](#) (September 2022) document outlines the aspirations of the housing association to become carbon neutral by 2030.

As well as identifying a fundamental requirement for compliance with WDQR 2021 and Building Regulations, this document stipulates achieving EPC A by pursuing a fabric first approach with measurement of embodied carbon and operational energy.

Air permeability is identified as a particular consideration for delivering energy efficiency within Tai Tarian's housing portfolio and a performance target of 3m³/(h·m²) or less at 50Pa is set, requiring a mechanical ventilation strategy. The document clarifies air permeability can be increased to 5m³/(h·m²) at 50Pa - permitting the use of natural ventilation - provided EPC A is still achieved.

Section 3: Existing - Rofton Bungalows

Rofton Bungalows at Heol Crwys currently comprises 30 prefabricated social rent bungalows. Originally erected in the late 1960s, these are recognised as having significantly exceeded their design life.

Building Research Establishment Report: Rofton steel framed houses (1988) records the construction and condition of 10 such prefabricated units across England and Wales. While the structural steel frames were typically intact, various building elements in contact with the frame had suffered corrosion and degradation with interstitial condensation the suspected cause. Typical details of the construction (Figure 4) demonstrate the steel frame elements as easily identifiable thermal bridges.

Further, multiple internal and external linings are reported as comprised of asbestos board. Whilst thermal bridging may have been feasible to address, the presence of asbestos throughout the built fabric renders retrofitting these buildings financially unviable.

As a result of the identified limitations of the existing bungalows it was resolved to redevelop the site with dwellings that aligned with Tai Tarian's aspirations and could meet modern accessibility, acoustic, energy efficiency and spatial standards.

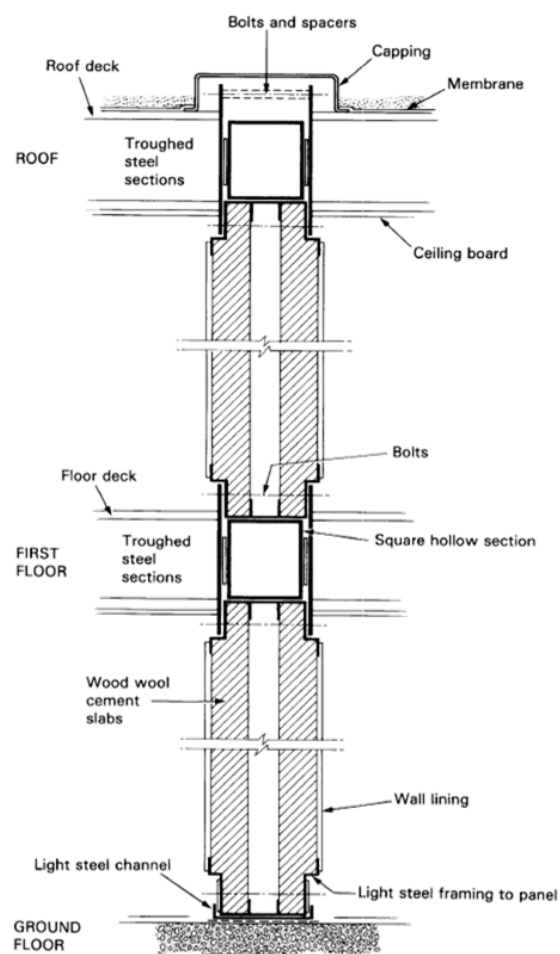


Figure 4: Schematic vertical section through crosswall from Building Research Establishment Report: Rofton steel framed houses (1988)

Section 4: Proposals

4.1 Site Layout & Orientation

Rofton Bungalows occupy a bluff between Heol Crwys and Heol Jwbilli with the topography falling in a southerly direction toward Heol Jwbilli. To ensure the viability of development, proposals maximise coverage and capitalise on the potential of the development plateau.

The site layout (Figure 5) prioritises the provision of southerly aspects for the dwellings, typically achieving at least one primary elevation facing WSW. Blocks and terraces are well spaced to reduce incidental shading of the low winter sun; individual dwellings step down with the topography to reduce their impact as shading objects to more northerly properties.



Figure 5: Excerpt from 2575-00(03)100B - Site Layout

4.2 Heat Loss Form Factor

Heat loss form factor is a relative measure establishing the ratio of internal heated volume to external surface area, i.e. surfaces through which heat will be lost. This be used as an indicator for the efficiency of the dwelling: a lower form factor means there will be less opportunity for heat loss through the fabric.

A majority of the proposed dwellings are bungalows, notorious for achieving relatively poor form factor. To counter this, HT 213 and HT 321 are uniformly terraced and HT 321 semi-

detached which reduces the effective heat loss surface and therefore increases the energy efficiency of the dwellings. This represents a cost and material effective method of reducing heat demand that aligns with policy directives.

Walk-up flats achieve a much lower form factor by virtue of their two storey configuration and the inherent efficiencies this incurs. Where conjoined with a second or third unit, this reduces the form factor further to increase the latent energy efficiency of the dwelling units. As previously, this represents a cost and material efficient way of reducing heat demand.

4.3 Glazing Quantity, Distribution & Shading

Every habitable room is provided at least one operable window and every dwelling unit (except two in each HT 212 block) achieve operable windows in parallel elevations. The fenestration hierarchy proposes the largest windows to living rooms and bedrooms with opening sizes reducing in kitchens and bathrooms to account for necessarily higher sills.

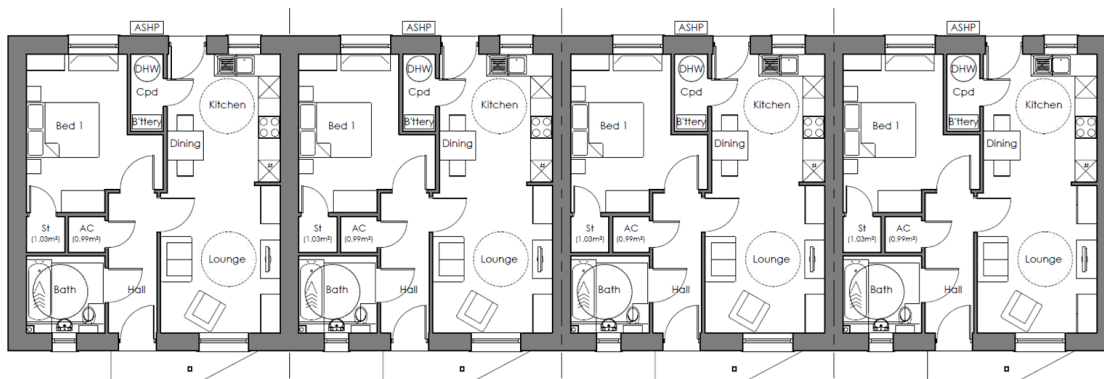


Figure 6: Excerpt from 2575-213D(02)200 - HT 213 Terrace of 4 Floor Plans

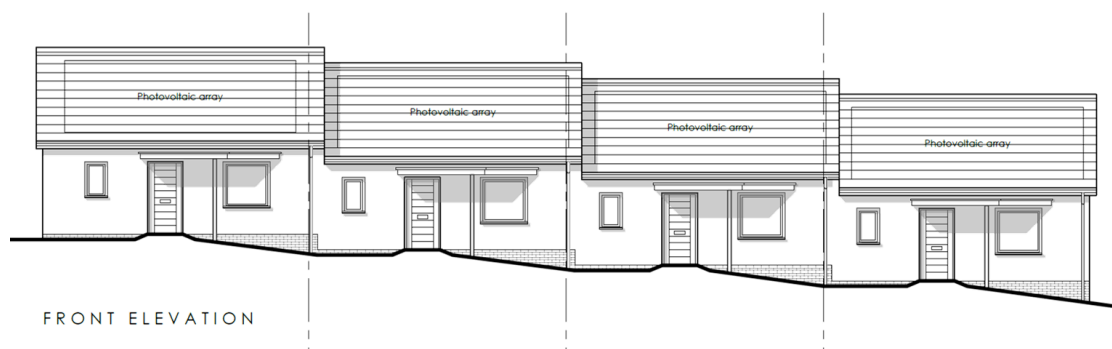


Figure 7: Excerpt from 2575-213D(02)300 - HT 213 Terrace of 4 Elevations 1

Living room windows within the front elevations of bungalow typologies are afforded shade by generous entrance canopies. These are sized and positioned to occlude the high summer sun, mitigating overheating potential, while admitting the low winter sun to derive heating benefit from solar gain.

4.4 Building Fabric

Spring Design have collaborated with GreenBuild Consult to develop a site-wide fabric specification for the dwellings to ensure all achieve EPC A (SAP 92+). The fabric aligns [Approved Document L Volume 1: Dwellings \(2022\)](#)'s Table E1 Elemental Specification.

Building Fabric	U Value W/m ² k
<u>Ground Floor</u> Spec TBC	0.11
<u>External Walls</u> Spec TBC	0.13
<u>Corridor & Party Walls</u> Spec TBC	0.00
<u>Roofs</u> Spec TBC	0.11
<u>Windows, Roof Lights and Glazed Doors</u> Triple-glazed windows in uPVC frames	u-value 1.30 g-value 0.52
<u>Doors</u> Solid external doors	1.30
<u>Air Permeability</u> 3.5 m ³ /hm ² , all dwellings to be tested upon completion	
<u>Thermal Bridging</u> Enhanced thermal bridge details used throughout.	

Figure 8: Excerpt of tabulated fabric specification from GreenBuild Consult

4.5 Mechanical Services

Proposals for mechanical services are indicative to inform the design stage SAP and require specialist subconsultant input to fix the mechanical plant specification for each house type.

M&E Specification	
Primary Heating	Air Source Heat Pump: Vaillant aroTHERM 5kW or equivalent
Heating Controls	Programmer, room thermostat, and TRVs
Heating Emitters	Radiators
Secondary Heating	None specified
Hot Water	From primary heating system: 150/210-litre cylinder with heat loss of 1.91 kWh/day (or equivalent).
Ventilation	Intermittent extract fans throughout, no MVHR
Lighting	100% low energy lighting throughout. 95 lm/W LED bulbs
Renewable Technology	Solar PV, directly connected to each dwelling. Oriented southeast/southwest. See Table 2.0
Export Capable Meter?	Yes
Diverter Present?	No
Battery Storage?	5 kWh battery storage

Figure 9: Excerpt of tabulated mechanical services specification from GreenBuild Consult

The fabric specification of the dwellings reduces heating demand to lower the necessary input from building services. Aligning with Welsh Government's Energy Hierarchy, these have been designed to first prioritise a reduction in heating demand - where mechanical systems can contribute to the fact - then the efficient use of energy, then aim for on-site renewable energy generation.

Heating and hot water needs are met by electrically-powered heat pump technologies. The design stage SAP and EPC specify Vaillant aroTHERM which are air source technologies with coefficients of performance (COP) c. 3.66 at 40°C flow temperature. The COP relates to the efficiency of the unit averaged across the year: this translates into every 1 kWh of electrical energy input producing 3.66 kWh of heat energy.

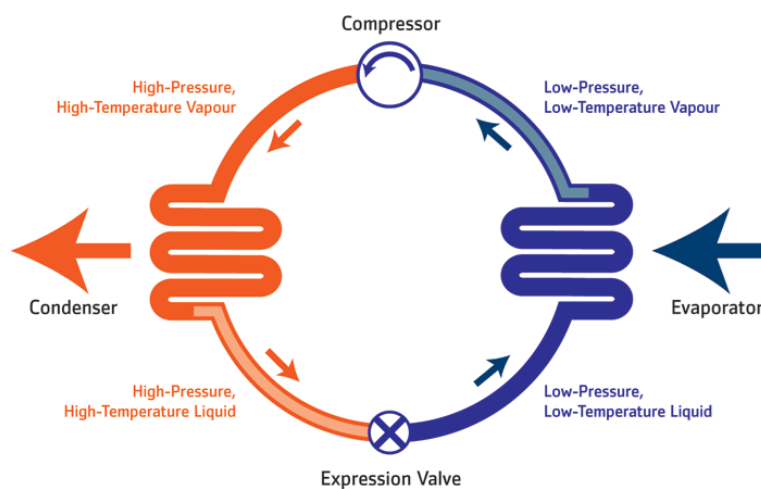


Figure 10: Diagram illustrating principle of heat exchange, property of Carmichael Browns

These high-efficiency, electrically powered heating systems are appropriate fossil fuel alternatives that contribute to the decarbonisation of dwellings and a significant reduction in primary energy demand.

Photovoltaic panels are proposed on appropriately oriented roof slopes and complemented by 5 kWh battery storage within each dwelling. On-site renewable provisions will reduce occupant energy demand from the grid, augmented with battery technology to enable peak production (midday) to directly benefit peak demand (evenings). These interlinked systems ensure occupants benefit from photovoltaic production even if absent from the household.

4.6 Overheating

Spring Design have collaborated with GreenBuild Consult to assess the relevant dwelling units to anticipate overheating issues. This has been informed by the policy requirement to prioritise passive means of cooling rather than introducing active mechanical systems.

Approved Document O: Overheating (2022) and Welsh Development Quality Requirements 2021 require all flats and those dwellings without windows in parallel elevations to undergo CIBSE TM59: Design methodology for the assessment of overheating risk in homes (2017). GreenBuild Consult completed this analysis by modelling the walk-up flats at Plots 22-27 and 40-43 as an indicative sample using IES Virtual Environment Version 2022.2.0.0.

All assessed dwellings were found to suitably mitigate summer heat gains and maintain a comfortable internal environment.

TM59 Overheating Assessment Results for Residential Spaces				
Apt. Number	Room Name	TM59 Criterion (a) - <3 (%)	TM59 Criterion (b) - <33 (hours)	Pass or Fail
Plot 22	Bedroom	0.7	4	Pass
	LKD	1.5	-	Pass
Plot 23	Bedroom	0.6	4	Pass
	LKD	1.2	-	Pass
Plot 24	Bedroom	0.4	5	Pass
	LKD	1.2	-	Pass
Plot 25	Bedroom	0.7	6	Pass
	LKD	1.5	-	Pass
Plot 26	Bedroom	0.8	8	Pass
	LKD	1.6	-	Pass
Plot 27	Bedroom	0.7	5	Pass
	LKD	1.3	-	Pass
Plot 40	Bedroom	0.9	4	Pass
	LKD	1.4	-	Pass
Plot 41	Bedroom	0.8	4	Pass
	LKD	1.2	-	Pass
Plot 42	Bedroom	1.2	2	Pass
	LKD	0.7	-	Pass
Plot 43	Bedroom	0.8	2	Pass
	LKD	1.4	-	Pass

Figure 11: Tabulated results of the TM59 assessment

Section 5: Summary

This **Energy Strategy Statement** has established the legislative context of the proposals and described the fabric first methodology that has informed their development.

Through alignment with the Table E1 Elemental Specification complemented by appropriate low carbon technologies the proposed dwellings achieve EPC A (SAP 92+) and a meaningful reduction in heating demand as the priority defined by Welsh Government's Energy Hierarchy for Planning.

Further, it has been demonstrated that the proposed building design - in combination with an appropriate fabric specification and mechanical services - suitably mitigates summer heat gains to maintain a comfortable internal environment without recourse to active cooling. This aligns with policy to passively protect occupants from overheating.

Section 6: Appendix

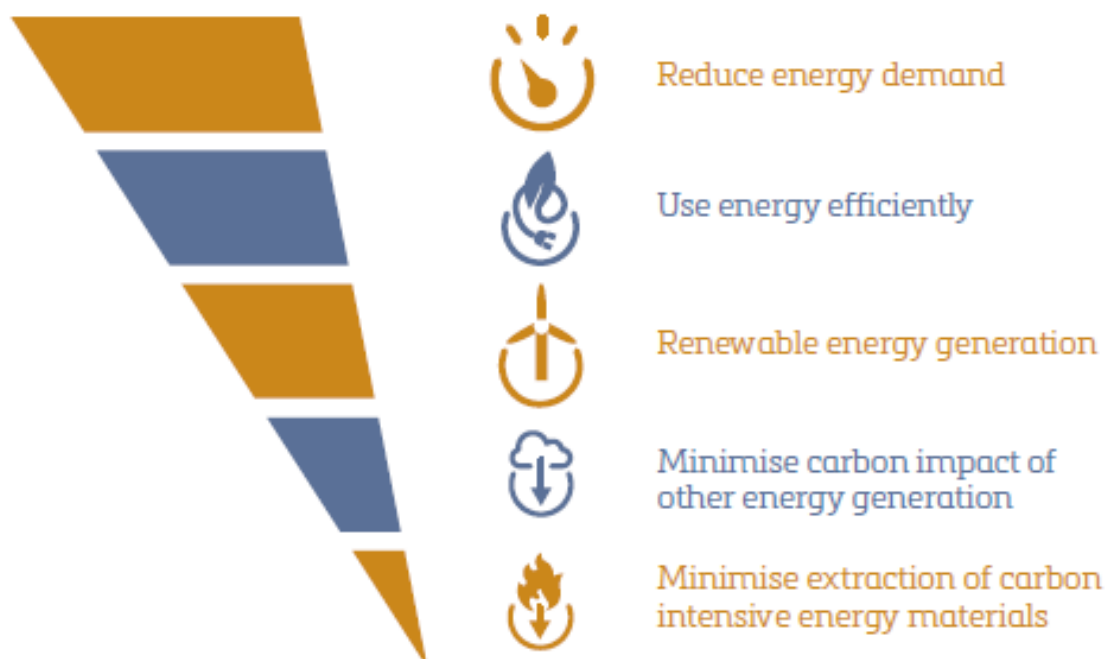
6.1 Planning Policy Wales - Edition 11

Excerpts from pages 89-92.

Energy Hierarchy for Planning

5.7.13 Welsh Government planning policy recognises an energy hierarchy. The Welsh Government expects all new development to mitigate the causes of climate change in accordance with the energy hierarchy for planning, as set out in the following energy policies. Reducing energy demand and increasing energy efficiency, through the location and design of new development, will assist in meeting energy demand with renewable and low carbon sources. This is particularly important in supporting the electrification of energy use, such as the growing use of electric vehicles and heat pumps. All aspects of the energy hierarchy have their part to play, simultaneously, in helping meet decarbonisation and renewable energy targets.

Figure 10: The Energy Hierarchy for Planning



[...]

Reduce Energy Demand and Use of Energy Efficiency

5.8 Sustainable Buildings

5.8.1 The planning system should support new development that has very high energy performance, supports decarbonisation, tackles the causes of the climate emergency, and adapts to the current and future effects of climate change through the incorporation of effective mitigation and adaptation measures.

5.8.2 The Welsh Government's policy is to secure zero carbon buildings while continuing to promote a range of low and zero carbon technologies as a means to achieve this.

5.8.3 Sustainable building design principles should be integral to the design of new development. Development proposals should:

- mitigate the causes of climate change, by minimising carbon and other greenhouse gas emissions associated with the development's location, design, construction, use and eventual demolition; and
- include features that provide effective adaptation to, and resilience against, the current and predicted future effects of climate change.

5.8.4 In order to further promote energy efficiency and energy conservation, planning authorities should consider including development plan policies requiring applications for major development to be accompanied by an Energy Report. This independent report should include recommendations to the developer relating to energy efficiency and appropriate renewable energy technologies that could be incorporated into the development. A response to that report from the developer should also accompany the application. If planning authorities feel that insufficient consideration has been given to energy issues in project design, they may refuse planning permission.

5.8.5 Planning authorities should assess strategic sites to identify opportunities to require higher sustainable building standards, including zero carbon, in their development plan. In bringing forward standards higher than the national minimum, which is set out in Building Regulations, planning authorities should ensure the proposed approach is based on robust evidence and has taken into account the economic viability of the scheme.

5.8.6 TAN 12: Design and Practice Guidance: Planning for Sustainable Buildings provides guidance on sustainable building design. Design and Access Statements should show how sustainable building design principles have been considered in the design process.

5.8.7 Developers should take into account future requirements for carbon reduction in new buildings when designing their schemes, as a result of changes to Building Regulations in Wales; being mindful of any future changes will ensure design aspects of requirements are considered as early as possible.

6.2 Welsh Development Quality Requirements 2021

Excerpts from pages 2-3.

1. Homes should be of high quality, innovative and sustainable

[...]

c) Adopt best practice in moving to a decarbonised and circular built environment by considering:

- Assessing and reducing upfront and embodied carbon during the design and construction phases, and when undertaking refurbishment.
- Evaluating the potential for reuse of existing buildings, specifying reused and recycled materials and ensuring that buildings can be adapted, reused or deconstructed and recovered materials re-used or recycled at end of life.
- Maximising the efficient use of timber in construction to increase carbon storage in harvested wood products in Wales.
- Minimising operational carbon by reducing operational energy demand and where appropriate, using on site renewables.
- Ensuring there is sufficient provision for the collection of key recyclables and storage of food waste in homes.
- Undertaking as-built assessment of whole life carbon and post occupancy evaluation of the building's performance in relation to the design intent.
- Once upfront, embodied and operational carbon are minimised, using robust offsetting schemes to move to net-zero whole life carbon.

[...]

d) New homes must meet energy and decarbonisation requirements which consists of:

- Achieving EPC A (SAP92 or greater) through the minimum fabric standard set out in "Appendix E" – Elemental specification for the DER/TER, within the Building Regulations Approved Document Part L Wales 2020 and by not using fossil fuel fired boilers to provide domestic hot water and space heating. Alternative proposals will be acceptable where it can be demonstrated by independent certification that the building's energy demand is reduced in accordance with the Energy Hierarchy for Planning in Welsh Government's Planning Policy Wales.
- An assessment of overheating risk based on the CIBSE TM59 methodology (for 'Category 1 buildings'), which demonstrates compliance with the CIBSE TM59 compliance criteria, for the following dwelling types:
 - o Apartments/Flats.
 - o Houses which do not have two or more parallel aspects to facilitate cross-ventilation.

6.3 Approved Documents F, L & O

Excerpt from AD F: Dwellings (2022) pages 17-19.

Table 1.2 Minimum extract ventilation rates for continuous extract systems⁽¹⁾

Systems

Room	High rate	Continuous rate
Kitchen	13 litres per second	The sum of all extract ventilation in the dwelling on its continuous rate should be at least the whole dwelling ventilation rate given in Table 1.3
Utility room	8 litres per second	
Bathroom	8 litres per second	
Sanitary accommodation	6 litres per second	

Note:

1. If the continuous rate of ventilation provided in a room is equal to or higher than the minimum high rate specified in the table, no extra ventilation is needed.

Whole dwelling ventilation

1.23 Supply air for the dwelling should be delivered through either:

- Continuous supply fans
- Background ventilators

1.24 The minimum whole dwelling ventilation rate for the supply of air to the habitable rooms in a dwelling should meet both of the following conditions:

- A minimum rate of 0.3 litres per second per m² of internal floor area (this includes all floors, e.g. for a two-storey building, add the ground-floor and first-floor areas).
- A minimum rate determined by the number of bedrooms, as specified in Table 1.3.

Table 1.3 Minimum whole dwelling ventilation rates^{1,2}

Number of bedrooms	1	2	3	4	5
Minimum ventilation rate by number of bedrooms (l/s)	19	25	31	37	43
Notes: 1. Where the dwelling has only one habitable room, a minimum ventilation rate of 13 l/s should be used. 2. For each additional bedroom, add 6 litres per second to the values in Table 1.3.					

[...]

Table 1.4 Purge ventilation openings

Opening type	Minimum total area of openings
Hinged or pivot windows with an opening angle of 15 to 30 degrees	1/10 of floor area of room
External doors Opening sash windows Hinged or pivot windows with an opening angle of greater than or equal to 30 degrees	1/20 of floor area of room

1.31 Hinged or pivot windows with an opening angle of less than 15 degrees are not suitable for **purge ventilation**.

Excerpt from AD F: Dwellings (2022) page 22.

Table 1.6 Types of ventilation system

System type	Dwellings covered by the guidance
Natural ventilation (paragraphs 1.47 to 1.59)	Less airtight dwellings
Continuous mechanical extract ventilation (paragraphs 1.60 to 1.66)	All dwellings
Mechanical ventilation with heat recovery (paragraphs 1.67 to 1.73)	All dwellings

Note: For situations outside the scope of Table 1.6, **expert advice** should be sought for the design, sizing and position of ventilators to provide effective ventilation.

Note: As defined in **Appendix A**, **less airtight dwellings** are dwellings which have one of the following.

- a. A design **air permeability** higher than $5\text{m}^3/(\text{h}\cdot\text{m}^2)$ at 50Pa.
- b. An as-built **air permeability** higher than $3\text{m}^3/(\text{h}\cdot\text{m}^2)$ at 50Pa.

1.46 Where a **dwelling** has **natural ventilation** and a measured **air permeability** that differs from the design **air permeability**, so that it is defined as a **highly airtight dwelling**, one of the following applies.

- a. **Expert advice** should be sought.
- b. A **continuous mechanical extract ventilation** system should be installed by following the guidance in paragraphs 1.60 to 1.66.

Note: **Continuous mechanical extract ventilation** systems are available as decentralised options. An intermittent extract fan may be replaced with a decentralised **continuous mechanical extract ventilation** system fan.

Table E1 Elemental Specification

Element or system	Specification
Opening areas (windows and doors)	Same as actual dwelling up to a maximum proportion of 25% of total floor area ¹
External Wall U-value (W/m ² K)	0.13
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Roof U-value (W/m ² K)	0.11
Floor U-value (W/m ² K)	0.11
Windows, Roof Windows and Glazed Door U-value (W/m ² K)	1.3 (whole window u-value)
Rooflight U-value (W/m ² K)	1.6 (whole window u-value)
Windows, Roof Windows, Glazed Rooflights and Glazed Door g-value	0.63 ³
Opaque and Semi-glazed Door U-value (W/m ² K)	1.0
y-value (W/m ² K)	Based on the 'Option 2' psi values in Table R2 of SAP 10.1 except use of $y=0.05 \text{ W/m}^2$ K if the default value of $y=0.20 \text{ W/m}^2$ K is used in the actual building
Ventilation System Type	Intermittent extract fans with trickle vents
Air Permeability (m ³ /h·m ² at 50 Pa)	5
Air Conditioning	None
Heating system	Mains Gas
	If gas or oil combi boiler performing space heating in actual dwelling, instantaneous combi boiler; otherwise regular boiler Low temperature radiators (design flow temperature = 55°C)

Element or system	Specification
	Room sealed Fan flue SEDBUK 2009 89.5% efficient
Space Heating Controls	1. For a single storey dwelling in which the living area is greater than 70% of total floor area, programmer and room thermostat; 2. For any other dwelling, time and temperature zone control, TRVs; And in all cases: Modulating burner control Boiler interlock ErP Class V Heated by boiler (regular or combi as above)
Hot Water System	Separate time control for space and water heating If cylinder specified in actual dwelling: volume of cylinder in actual dwelling If combi boiler: no cylinder Otherwise: 150 litres If cylinder, declared loss factor = $0.85 \times (0.2 + 0.051 V^{2/3})$ kWh/day, where V is the volume of the cylinder in litres Cylinder in heated space Thermostat controlled Fully insulated primary pipework
Shower Flow Rate	8 l/min
Waste Water Heat Recovery (WWHR) Secondary Space Heating Fixed Lighting Capacity (lm) Lighting Efficacy (lm/W) Thermal Mass Parameter	Efficiency of 55% Utilisation of 0.98 None 185 x Total Floor Area 80 Same as actual dwelling For houses kWp = 40% of ground floor area, including unheated spaces / 6.5 For flats kWp = 40% of dwelling floor area / (6.5 x number of storeys in block) SE/SW facing, 45° pitch No/very little overshadowing
PV System	

Element or system	Specification
	¹ The Building Regulations do not specify minimum daylight requirements. However, reducing window area produces conflicting impacts on the predicted CO₂ emissions: reduced solar gain but increased use of electric lighting. As a general guide, if the area of glazing is much less than 20 per cent of the total floor area, some parts of the dwelling may experience poor levels of daylight, resulting in increased use of electric lighting. ² The orientation of the elemental building is the same as the actual building. See SAP 10 Appendix R for treatment of curtain walling (an allowance of +0.1W/m²K is made on the window U-value for thermal bridging within the curtain wall). The treatment of roof windows is also detailed in SAP 10 Appendix R (an adjustment factor of +0.3W/m²K is applied). ³ Higher g-values would also comply with the recipe as increasing solar gains reduced the space heat load. However, designers should be aware of the impact of g-value on the risk of overheating and optimise their choice accordingly.

Table 1.1

Residential building/unit type	Compliance approach
<i>Flats (including communal areas and communal corridors)</i>	Paragraph 1.2 to 1.3 should be followed.
Dwelling-houses with two or more parallel aspects to facilitate cross-ventilation.	These dwelling types are considered to adequately mitigate the risk of summer overheating when the minimum requirements of Approved Document F and Section 2 of this approved document are achieved. However, if ventilation is restricted due to noise, pollution, safety or security concerns (see Section 2), then paragraphs 1.2 to 1.3 should be followed.
Dwelling-houses without two or more parallel aspects to facilitate cross-ventilation.	Paragraph 1.2 to 1.3 should be followed.
Residential (institutional) <i>(including communal areas and communal corridors)</i>	Paragraph 1.2 to 1.3 should be followed.
Residential (other) <i>(including communal areas and communal corridors)</i>	These residential unit types are considered to adequately mitigate the risk of summer overheating when the minimum requirements of Approved Document F and Section 2 of this approved document are achieved. However, if ventilation is restricted due to noise, pollution, safety or security concerns (see Section 2), then paragraphs 1.2 to 1.3 should be followed.

[...]

Table 1.2 – Controlling overheating by minimising summer solar gains and heat removal

Mitigation approach	Minimising summer solar gains	Heat removal (Openable windows ¹ and ventilation louvers)
Single aspect residential buildings		
Approach S1	Maximum glazed area of 15% of floor area	Minimum free area of 12% of floor area
Approach S2	Maximum glazed area of 20% of floor area Glazing with a maximum g-value of 0.4.	Minimum free area of 10% of floor area
Dual aspect residential buildings		
Approach D1	Maximum glazed area of 15% of floor area	Minimum free area of 12% of floor area
Approach D2	Maximum glazed area of 35% of floor area Glazing with a maximum g-value of 0.4.	Minimum free area of 12% of floor area
Approach D3	Maximum glazed area of 35% of floor area External shutters with means of ventilation on all facades. Overhangs with 50° altitude cut-off can be used instead of external shutters on south façades*. * i.e. walls with a south east to south west facing orientation	Minimum free area of 12% of floor area
Note: ¹ When calculating the free area for heat removal on hinged or pivot windows, for calculation purposes, the maximum opening angle that is practical and safe to achieve can be used, however, with a limit of 60°.		

6.4 Tai Tarian Design Principles & Specification

Excerpts from pages 3-4.

ENERGY STATEMENT

As one of the largest housing associations in Wales, with over 9,000 homes, we recognise our responsibility to minimise the impact on our environment. That is why, in 2019, we announced our commitment to become carbon neutral by 2030.

[...]

The homes we provide are one of the largest contributors to our carbon footprint. We want to provide homes that are sustainable in their construction, maintenance and use. We also want them to be affordable for their occupants.

Our approach is still being developed but at the heart of all development and regeneration projects will be:

- Achieving an A rated EPC for all new build and regeneration projects following the “fabric first” approach
- Heating/cooling solutions that work for occupants, both in terms of cost and thermal comfort
- Measurement of embodied carbon and operational energy
- Improving links with the cyclical and foundational economies
- Collaboration and partnership working
- Implementation of smart technology to support the energy strategy identified
- A mixture of carbon reduction and green energy generation

We ask that all of above be incorporated into the design and specification and considered when proposing/procuring products and materials.

SECTION 1 - DESIGN FEATURES

[...]

The external components and finishes of all dwellings are to consist of **low maintenance** materials, wherever possible, with consideration given to whole life-cycle costs.

Tai Tarian is continually looking at ways to improve the accommodation provided to its tenants and, as such, a great emphasis is placed on the energy efficiency of the building fabric. Key performance requirements contained within this document shall be achieved by the contractor.

Particular attention shall be paid to air permeability with a performance target of 3 or less to be achieved via pressure testing; this can be 5 provided that “EPC A” rating is achieved through design/specification combination.

The contractor shall use the relevant manufacturers ‘Thermal Bridging Details’ to ensure the maximum Thermal bridging efficiency is achieved.



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