SK/AD® Energy

Technical Bulletin

Section 6 - 2022 – Energy Standards

October 2022

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Introduction

The Scottish Government have recently released an update to the energy standards of the building regulations, which aims to improve the energy efficiency of both new and existing domestic and non-domestic developments. The update to the regulations comes 6 months after the government released its consultation *'Energy Standards and associated topics'* numerous stakeholders added their thoughts and recommendations.

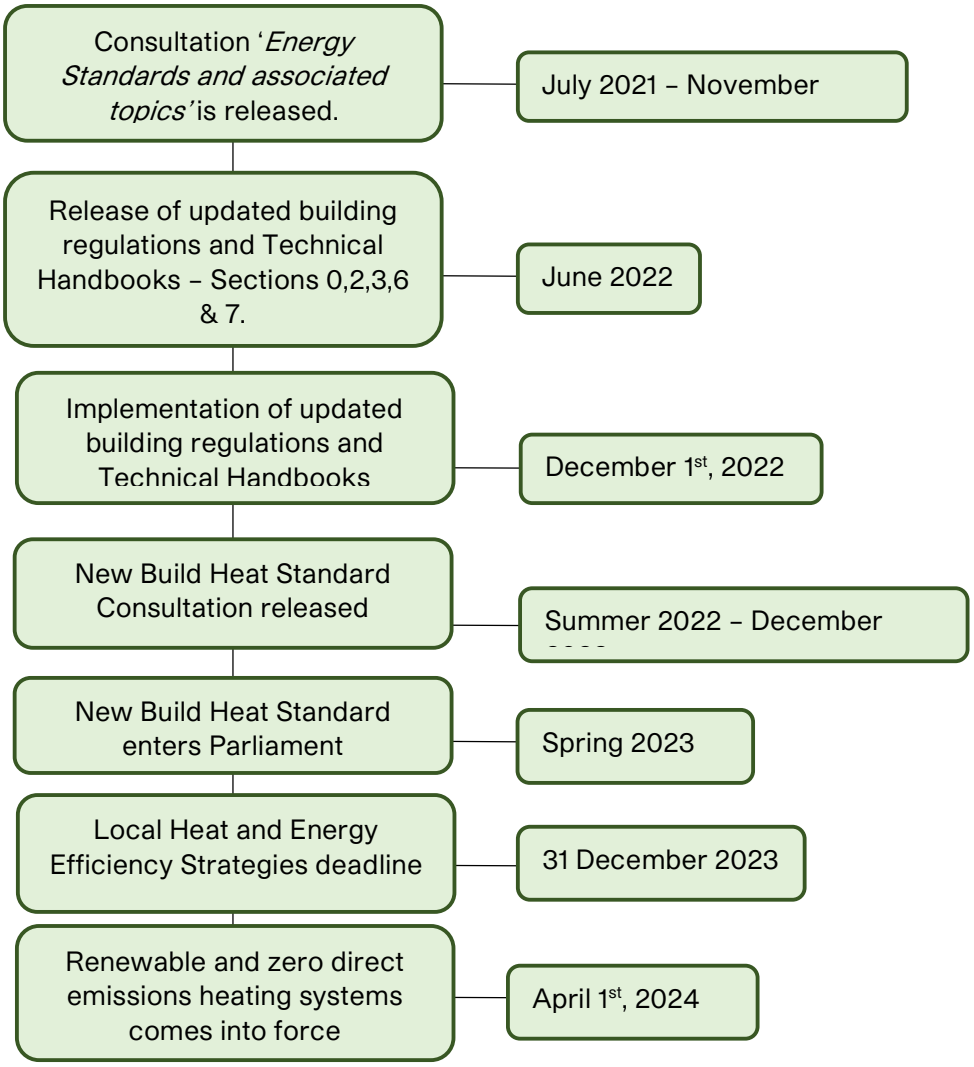
The consultation, released in July 2021 proposed two options to further improve the energy performance of new buildings. Option 1, which included a 32% reduction in carbon emissions over the 2015 Standards, and Option 2, which proposed a 53% reduction. The Scottish Government have now confirmed that Option 1 is to be the preferred option. For non-domestic buildings, an aggregate emission reduction of 16% over the current 2015 standards.

In addition to these emission reductions, the government have also provided an uplift to the backstop U-Values alongside additional guidance on airtightness, ventilation, overheating and electric charging points.

In this report, we break down the key updates, what it means for you, and how SK/AD can assist with ensuring your projects are compliant with the new standards.

When are the key dates?

Below is a timeline of the updated building regulations and key dates clients will want to consider for their future developments.



What are the mandatory metrics for compliance under the new standard?

As is the case with current building regulatory requirements, there is still a requirement for new build properties to reduce their annual emissions (Dwelling Emission Rate/ Target Emission Rate).

In addition to the emissions reduction requirement, the updated regulations will require compliance with a new metric which looks at the annual energy consumed by a dwelling. This metric will be an assessment of the 'Delivered Energy' which is a slightly different take to the 'Primary Energy Target used in other UK regions. Definitions of the relevant metrics can be found below.

Target Emissions Rate and Dwelling Emission Rates (DER/TER)

As required by the building regulations, when a building is erected, it must not exceed the target CO_2 emissions rate for the building.

The target CO_2 emissions rate (TER) sets a minimum allowable standard for the energy performance of a new building and is defined by the annual CO_2 emissions of a notional building of the same size and shape as the proposed dwelling. TER is expressed as $CO_2/yr/m^2$.

The DER or BER for non-domestic buildings must not exceed the TER. Factors that impact the DER includes fabric specifications alongside space heating, domestic hot water, lighting, and ventilation energy use.

Primary Energy

Primary energy is defined as "*energy from renewable and non-renewable sources which has not undergone any conversion or transformation process*"

Primary energy takes into consideration the impact of the upstream activities involved with the production and processing such as:

- Planting of biofuel sources
- Cultivation of biofuel sources
- Extraction of fuels
- Processing of fuels (e.g., cleaning, grading)
- Transformation of fuels
- Transportation of raw and refined products
- Transmission and distribution losses

Rather than assessing the energy used within the building itself, primary energy rates consider the amount of energy required to produce the fuel source in the first place. For example, 1.13 kilowatts of energy are required to extract 1.00 kilowatt of gas from the earth, refine it, and then

transport or pump it through the UK's pipe network to reach a dwelling. This additional 13% of consumption used in the production and delivery of gas is then added to every kilowatt of gas used by the dwelling in the SAP or SBEM calculation.

The primary energy demand for a building is already reported on Energy Performance Certificates and is derived by the application of primary energy factors to the calculated total delivered energy (that supplied from external sources) for each fuel used at a building. This primary energy standard is the required energy standard for homes built in England and Wales. The Primary Energy Rate is expressed as kWh_{PE}/m^2/year. Examples of emissions associated with common fuels can be found below.

Emission Factors and Primary Energy Factors		
Fuel Type	**Emissions kg CO_{2e} Per kWh**	**Primary Energy Factor**
Mains Gas	0.210	1.130
Bulk LPG	0.241	1.140
Electricity	0.136	1.501
Biogas (Including anaerobic digestion)	0.024	1.286
Wood Logs	0.028	1.046

Delivered energy

In Scotland, the proposal is to adapt the 'Delivered Energy Rate' as it is felt this provides a more direct representation of energy demand.

Within the consultation, delivered energy is defined as *the amount of energy that needs to be supplied to the building from external sources. This is the calculated energy demand for the building less any offsetting of that demand from the generation of energy or heat from onsite renewable sources.* It is the delivered energy total for each fuel supplied to a building to which primary energy and emission factors are applied.

The calculated delivered energy demand for the proposed dwelling is measured in kWh/m^2/yr.

On-site generation of power – export limitation

As with the notional building calculation, the calculation of the performance of the actual building will assess the contribution of on-site generation of power. This power will be capped to the amount of generated energy that is assessed as not exported from the dwelling.

Where the calculated generating capacity exceeds that which is assessed as utilised on site, this excess will be reported to the designer/developer and not be used for the benefit of the SAP or SBEM Calculation. This capping is to provide assurance on the extent that such generation at a building is effective in reducing the **delivered energy** total for the dwelling.

This will likely increase the use of domestic battery storage in new dwellings as a means to ensure dwellings receive the full benefit of the energy generated from onsite renewables. **Blocks of flats with PV connected to landlord's supply will no longer benefit from the use of onsite energy generation. For flats to receive a benefit from PV installations, the PV panels must be connected to the dwellings via individual inverters** .

The 'Notional Dwelling' – Domestic

As previously mentioned, when a SAP calculation is calculated, the Target Emissions Rate (TER) and the Target Delivered Energy Rate (TDER) for the 'notional dwelling' needs to be established.

The 'notional dwelling' is a dwelling of the same size, shape and 'living area fraction' as the proposed dwelling being assessed. To ensure compliance with the required regulations, the proposed dwelling must have a Dwelling Emission Rate (DER) and Dwelling Delivered Energy Rate (DDER) rate as good as or better than the Notional dwelling (TER/TDER)

Under the new Section 6 requirements, the Notional Dwelling has the below specification. In layman's terms, the specification your proposed development is up against.

'Notional' Dwelling- fabric and fixed building services values for TER/TDER	
Openings (windows, doors, etc)	Same as actual dwelling up to a maximum total area of openings of 25% of total floor area. If the total area of openings exceeds 25% of the total floor area, reduce to 25%
Walls	0.15 W/m²K
Party walls	0.00 W/m²K
Floors	0.12 W/m²K
Roofs	0.09 W/m²K
Doors	1.20 W/m²K
Windows	U = 1.20 W/m²K Frame factor 0.70, Solar energy transmittance 0.63, Light transmittance 0.80
Roof windows	U = 1.20 W/m²K) Overshading factor 1.0, Other parameters as for windows
Rooflights	U = 1.70 W/m²K Overshading factor 1.00, Other parameters as for windows
Thermal mass	Same as actual dwelling
Number of sheltered sides	Same as actual dwelling
Allowance for thermal bridging	Assigned y-value of 0.050
Ventilation system	Continuous mechanical extract ventilation
Air permeability	5.00 m³/(h.m²)@50Pa
Extract fans/points	Number of extract fans/points the same as the actual building

Main heating fuel (space and water)	Heat pump (Electric)	All other solutions	Heat Network
Heating system	Air Source Heat Pump, 250% (SPF as modelled in SAP) Boiler and radiators (large); Design flow temperature of 55 °C	Combi or system boiler (as actual building) SEDBUK2009 = 89.5% Room-sealed, fan-assisted flue. Modulating burner control Boiler and radiators (large); central heating pump 2013 or later, in heated space Design flow temperature of 55 °C	As actual dwelling (from existing heat network) Heating output - design flow temperature of 55 °C HIU data if for PCDB entry 400001 - direct 400002 - indirect
Heating system controls	Time and temperature zone control	Time and temperature zone control, interlock, ErP Class V controls, delayed start	Charging system linked to use of heating, programmer and TRVs
Hot water system	As space heating source		
Showers and baths	Number of showers and baths same as actual dwelling. If shower(s) specified, shower flow rate(s) to be 8 l/min. Shower(s) supplied by main water heating system (not instantaneous electric shower).		
Main heating fuel (space and water)	**Heat pump (Electric)**	**All other solutions**	**Heat Network**
Wastewater heat recovery	None	All showers connected to WWHR Recovery efficiency: House = 55% Flat = 36% Utilisation of 0.98, waste water fraction 0.9	None

Main heating fuel (space and water)	Heat pump (Electric)	All other solutions	Heat Network
Hot water cylinder	If present in actual building. Volume as actual building; subject to minimum volume of 150 litre.		None
Hot water cylinder	If cylinder present. Declared loss factor = 0.85 x (0.2 + 0.051 V2/3) kWh/day where V is the volume of the cylinder in litres. Cylinder thermostat; cylinder in heated space.		None
Primary water heating losses	Fully insulated primary pipework; Separate time control for space and water heating.		None
Secondary heating	None		
Electrical Supply	Standard Tariff		
Lighting	Fixed lighting capacity (lm) = 185 x total floor area; Efficacy of all fixed lighting = 80 lm/W		
Main heating fuel (space and water)	**Heat pump (Electric)**	**All other solutions**	**Heat Network**
PV system	**None**	Houses - kWp = 0.4 x ground floor area (m²) / 6.5 Flats - kWp = 0.4 x dwelling floor area (m²) / (6.5 x number of stores in block)	

Key Notes

Three specifications are applied:

If space heating is proposed via an electric heat pump, the notional building has a heat pump solution.

If any other heating solution is proposed, the notional building has a mains gas boiler solution and assignment of both photovoltaics and wastewater heat recovery. Where more than one fuel is used to heat different parts of the building the calculation will assign each specification based upon the proportion of each solution present by heated floor area.

The cited PV element of the specification is calculated on the basis of a panel specification of 6.5 m²/kWp. For purpose of calculating the benefit of the PV element in TER/TDER reporting, the contribution will be capped to the amount of generated energy that is assessed as not being exported from the dwelling.

The Notional Dwellings

Domestic

The 2022 standards have now simplified the notional dwelling specifications with just 3 potential scenarios dependant on the proposed heating system - electric heat pumps, fossil fuel heating or heat networks. Irrespective of the proposed heating system, the fabric specifications in the notional dwelling remain the same but are an improvement of notional dwelling in the 2015 standards and the fabric backstop U-Values of the 2022 standards. The notional dwelling also has an improved air permeability target (down from 7.00 $m^3/(h.m^2)$@50Pa to 5.00 $m^3/(h.m^2)$@50Pa) than the 2015 standards and an improved overall Y-Value (Linear thermal bridging).

The notional dwelling also has continuous extract ventilation rather than intermittent extract fans which was specified in the previous standard.

Below discusses the 3 notional dwelling scenarios and their implications in more detail:

Electric Heating Scenario

If a dwelling is to use electric heating as its main heating system, the notional dwelling will have an air source heat pump with an efficiency of 250%. In this scenario, the notional dwelling does not have any PV specified or any wastewater heat recovery devices and therefore it is likely this would also not be essential for designers who specify electric heat pumps (ground or air) in their dwellings.

Electric boilers and direct electric heating such as electric panel heaters are also included in this scenario, but designers should be aware their proposed development would be up against a notional dwelling with a heating system that is 250% efficient which is far greater than the 100% efficiency electric boilers and panel heaters boast. Therefore, PV would likely be required to offset this difference.

With the cost of electricity being much higher than the cost of gas in SAP, specifying panels heaters will likely produce EPCs bands of E or D, potentially C if PVs and batteries are installed. This is less of a concern for electric heat pumps as they achieve much higher efficiencies – typically above 300%.

Where electric heating is specified, developments will no longer need to achieve a Dwelling Emission Rate (DER) below the Target Emission Rating (TER) in the SAP calculation. Only the Target Delivered Energy Rate will be required for compliance.

Combustion fuel - 'All other scenarios'

In a scenario where a combustion fuel is to provide the main heating requirements e.g. mains gas, LPG or oil, the notional dwelling will have time and temperature dual zone control and a wastewater heat recovery device specified. Houses will have a WWHR device with an efficiency of 55% efficiency and flats 36%. This scenario will also have an increased PV requirement than that of the 2015 standards. The formula used to calculate the PV is 0.40 x ground floor area (m^2) / 6.5.

This means for a dwelling with a ground floor of say 50m^2, the notional dwelling will have a PV array of 3.07 kWp. This translates to circa 8-10 panels of PV depending on individual panel capacities.

For flats, the formula is 0.40 x dwelling floor area (m^2) / 6.50 x the number of floors in the block. This means a flat with a floor area if 35m^2 in a 3-storey building would require 0.70 kWp which is 2-3 panels per plot dependant on individual panel capacities.

It's important to note that many designers/developers will look to achieve the fabric backstops discussed in the next section and may not have WWHR devices specified in their specifications. Therefore, the required PV capacities for compliance may be even higher than that of the notional dwelling. However, given the 'cap' on PV generation, which now only considers PV used in the dwelling and excludes any that is 'sent' to the grid - in many cases, it may be the case a domestic battery would be specified or even required to realistically achieve compliance with the new 'Delivered Energy Rate'.

Heat Networks

To coincide with the Government's proposals to increase connectivity to heat networks, the 2022 Standards include a notional specification for heat networks. The Heat Networks (Scotland) Act 2021 includes statutory targets to ensure that heat networks supply at least 2.6 terawatt hours of heat by 2027 and 6 terawatt hours of heat by 2030

When used in a SAP calculation, the specification of the heat network in the notional dwelling will have the same characteristics as the actual network of the dwelling, rather than specify a specific default efficiency.

Emissions and primary energy conversion factors for heat networks should be calculated to take account of the annual average performance of the whole system, including all distribution and heat generating characteristics and should be provided for the connecting network, from an assured source, by the network provider or from information registered in the SAP Product Characteristic Database.

Where a development is connected to a heat network, it will no longer need to achieve a Dwelling Emission Rate (DER) below the Target Emission Rating (TER) in the SAP calculation. Only the Target Delivered Energy Rate will be required for compliance.

The 'Notional Dwelling' – Non-domestic

Just like the domestic dwellings, the non-domestic buildings are also required to achieve a Building Emission Rate (BER) as good as or better than the Target Emission Rate (TER). As is the case in the domestic regulations, non-domestic buildings will also need to achieve compliance with the 'Delivered Energy Rate'.

'Notional' building - fabric and fixed building services values for TER/TDER	
Element	**Specification**
Roof	0.11 W/m²K
Wall	0.15 W/m²K
Floor	0.13 W/m²K
Window and Pedestrian Doors	1.2 (10% FF) g-Value 50%, light transmittance 77%
Rooflight	1.9 (15% FF) g-Value 52%, light transmittance 57%
Vehicle Access Doors	1.30 W/m²K
High Usage Doors	1.90 W/m²K
Thermal Capacity	Refer to NCM Modelling guide for details.
Thermal Bridging – Junctions	Refer to NCM Modelling guide for details.
Air Permeability	4.00 (m3/(hr.m2) @50Pa)
Lighting Efficiency (Luminaire lumens/Circuit watt)	95 (Luminaire lumens/Circuit watt)
Occupancy control (Yes/No)	Yes
Daylight control (Yes/No)	Yes
Space Heating	Electric heat pump (SCoP 300% @ 55 oC) if actual building uses electric heat pump. Otherwise, natural gas boiler (93%) or heat network
Water Heating	Electric heat pump (SCoP 270% @ 55 oC) if actual building uses electric heat pump. Otherwise, natural gas boiler (93%) or heat network Point-of-use electric (100%) for low DHW demand zones

Central Ventilation	1.80 (SFP, W/l/s)
Terminal Unit	0.30 (SFP, W/l/s)
Cooling (Where Present)	6.40 (SEER)
Heat recovery (% efficiency)	76.00%
Variable speed control of fans, pumps and circulators (including sensors)	Yes
Photovoltaic Panels (% of floor area)	15.00%

Key Notes

Assignment of PV to the notional building is reduced proportionately with the percentage of space heating demand met by an electric heat pump. The assigned value of this generation element is also limited by excluding any assessed export component.

The Notional Building

Non-domestic

The fabric and services specification of the notional building are assigned on a zone-by-zone basis. There is one specification, but certain elements are varied based upon the choice of main heating fuel and system for the actual building, as determined by the designer. The specification assigned to the notional building for space and water heating and assignment of PV differs between electric heat pump solutions, heat network and all other fuel solutions.

Irrespective of the proposed heating system, the fabric specifications in the notional building remain the same but are an improvement of notional dwelling in the 2015 Standards and the fabric backstop U-Values of the 2022 standards.

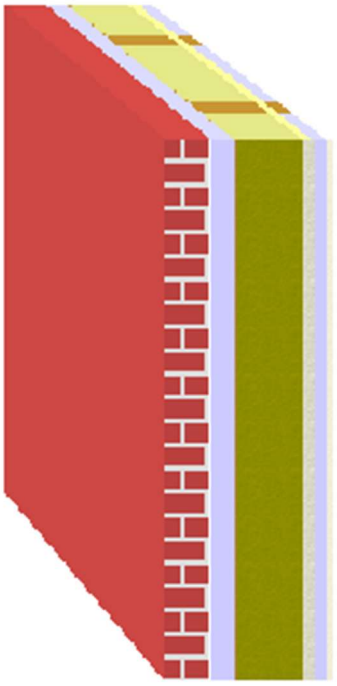
Where electric heating is specified, developments will no longer need to achieve a Dwelling Emission Rate (DER) below the Target Emission Rating (TER) in the SAP calculation. Only the Target Delivered Energy Rate will be required for compliance.

Where electric heating is specified, the notional dwelling will have an electric heat pump with a 300% efficiency, any other solution will assume a mains gas boiler with 93% efficiency.

When used in a SBEM calculation, the specification of the heat network in the notional building will have the same characteristics as the actual network connected to, rather than specify a specific default efficiency.

Fabric Specifications - U-values

Domestic



As is the case with previous uplifts to the energy standards, the fabric requirements have also improved. The regulations have maintained the 'elemental approach' used in the previous standard which sets robust maximum backstops for all fabric elements, rather than a 'heat demand target' used by other administrations.

Whilst the improvements in thermal performance are significant, the U-values referenced below are easily achievable with current available technologies and are often specified in affordable homes built for Local Authorities and Housing Associations. However, it is likely many developers and architects will need to increase the thickness of most construction elements in order to achieve the U-Values referenced below.

The localised U-value backstops have remained and are unchanged from the 2015 standards. These U-values are permissible in localised areas as long as the area weighted U-values in the middle column below are achieved.

As has previously been the case, all U-Values used in SAP and SBEM Calculations should be calculated in line with BR443 and BS EN ISO 6946.

Maximum U-values for building elements of the insulation envelope			
Fabric Element	**Current Backstop U-values**	**Section 6 – Energy 2022 Backstop U-values**	**Localised U-value Backstops**
Wall	0.22	**0.17**	0.70
Roof	0.15	**0.12**	0.35
Floor	0.18	**0.15**	0.35
Doors/Windows	1.60	**1.40**	3.30
Rooflights	1.60	**1.90**	3.30
Party Wall	0.20	**0.00**	N/A

Any localised areas (individual elements) should have a U-value no worse than 0.7 (Walls and floors) or 0.35 (roofs). Glazing with a U-value poorer than 3.3 should not be used. This is particularly important with regard to the control of surface and interstitial condensation

With a U-Value of 0.00 W/m^{2}K, all cavities should be full filled with insulation or be a solid wall with no cavities.

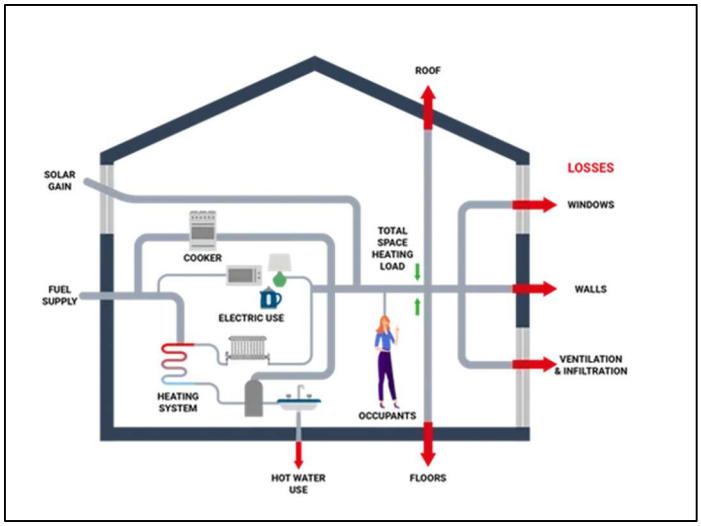
Conversions and Extensions

Where such a building, or part of a dwelling, is converted, or heating is introduced to a building that was previously designed to be unheated, the building should achieve a level of performance similar to that expected for new construction referenced above. Likewise, fabric elements proposed for extensions are expected to achieve the same level of thermal performance.

This will no doubt provide challenges where conversions are concerned as many existing buildings will struggle to achieve these robust thermal standards due to onsite constraints and other regulatory requirements e.g., sound, ventilation and fire safety.

The 'Compensatory approach' for extensions with an area of windows, doors and rooflights equal to 25% of the total extension floor area plus the area of built over openings remains under the new standards.

New dwellings – 'space heating demand limit' approach.



For new buildings, meeting Standard 6.1 may result in even better levels of thermal insulation being achieved unless the design of a building involves improved specification of building services or greater effective use of on-site generation of heat or power.

Effective limits to space heating demand can be achieved by a consistently high level of fabric insulation, either by a specification no worse than the area weighted values listed in table above, or where more design flexibility is sought, by demonstrating that the space heating demand is no greater than a 'dwelling space heating demand limit' which is calculated for the notional building.

In laymen's terms, this means in some instances, developments that achieve dwelling space heat demands lower than the target heat demands could specify U-Values above the backstops referenced in the table above and still achieve compliance. Until the approved software is available, it is difficult to provide clarity on how far the U-Values can be scaled back, but this is a new approach for demonstrating compliance with the energy standards.

To provide assurance of thermal comfort for occupants, where the 'space heating demand target' is applied, this target must be met by each individual dwelling. Unlike the DER and DDER it may not be averaged across a block or terrace.

Fabric Specifications - U-values

Non-Domestic

As with the domestic regulations, the thermal properties of all construction elements have improved and will likely require a number of developers increasing the thickness of many construction elements in order to achieve compliance.

Shell only buildings

Under the 2015 standards, more challenging fabric values were set for shell building to offer greater flexibility in fit-out specification. This is no longer the case setting improved fabric values is encouraged but is at the discretion of the applicant.

Whilst the NCM will assess shell and fit-out installations on a zone-by-zone basis, full details of the example specification, identifying uninstalled services, shall form part of information with the building warrant and should identify any installed low carbon equipment proposed to meet the Target Rates.

Where Standard 6.1 applies to a building, the verifier should issue a continuing requirement with a building warrant for the shell building. This will provide assurance that the subsequent fit-out, whether subject to a building warrant or not, demonstrates that the building, once completed, continues to comply with Standard 6.1

Maximum U-values for building elements of the insulation envelope			
Fabric Element	Current Backstop U-values	Section 6 - Energy 2022 Backstop U-values	Localised U-value Backstops
Wall	0.27	**0.21**	0.70
Roof	0.20	**0.16**	0.35
Floor	0.22	**0.18**	0.70
Doors/Windows	2.00	**1.60**	3.30
Rooflights	2.00	**2.20**	3.30
Pedestrian Doors	2.00	**1.40**	N/A

Conversions and Extensions

Where such a building, or part of a dwelling, is converted, or heating is introduced to a building that was previously designed to be unheated, the building should achieve a level of performance similar to that expected for new construction referenced above. Likewise, fabric elements proposed for extensions are expected to achieve the same level of thermal performance. The 'Compensatory approach' for extensions with large glazing's areas has remained.

Domestic Airtightness and Ventilation

Current guidance calls for representative sampling of buildings to be tested at a frequency of at least 1:20. A review of EPC data for 2020/21 indicates that around one third of new dwellings are subject to an air tightness test and commonly achieving air infiltration rates below 5.00 m³/(h.m²)@50Pa.

The updated requirement now states **all new homes should receive an air tightness test** . The rational for this being a test all strategy provides greater assurance that the infiltration rate achieved in the dwelling is a fair representation to that declared at the design stage. A test all strategy can also provide assurance that the ventilation strategy adopted in the building is appropriate for the level of air infiltration present within the dwelling.

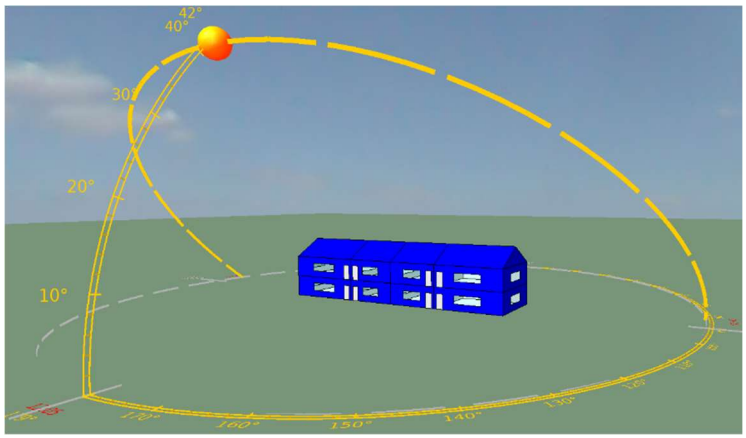
The recommended ventilation for various infiltration rates can be found in the table below.

Recommended ventilation solutions for design infiltration levels	
Ventilation type	**Suitable for infiltration rate:**
Natural ventilation (with intermittent mechanical extract)	≥ 5.00 m³/(h.m²)@50Pa
Continuous mechanical extract ventilation	≥ 3.00 m³/(h.m²)@50Pa
Continuous mechanical supply & extract ventilation e.g MVHR	Any

Although not new guidance, recommended ventilation rates with the use of decentralised mechanical extract ventilation can be found below for reference.

Recommended ventilation of a dwelling with dMEVs			
Location	**Ventilation Recommendations**	**Trickle ventilation**	**Min MEV rates (dMEV)**
Apartment	Ventilator opening at least 1/30th of floor area	12,000 mm^2	N/A
Kitchen	MEV capable of at least 30 l/sec above hob and at least 60 l/sec elsewhere or passive stack ventilation	10,000 mm^2	6 l/sec or 13 l/sec boost
Utility Room	MEV capable of at least 30 l/sec or passive stack ventilation	10,000 mm^2	4 l/sec or 8 l/sec boost
Bathroom	MEV capable of at least 15 l/sec or passive stack ventilation	10,000 mm^2	4 l/sec or 8 l/sec boost
WC	Ventilator opening at least 1/30th of floor area or MEV capable of 3 ACH	10,000 mm^2	3 l/sec or 6 l/sec boost

Over heating



Overheating in buildings has been highlighted as a key risk for the health and productivity of people and businesses in the UK. Increasing global temperatures and hot weather events put buildings at increasing risk of summertime overheating unless such risk is assessed and managed.

Whilst overheating risk may generally be considered an issue principally for southern regions of the UK, various research studies undertaken in recent years have identified the occurrence of overheating in a wide range of new dwelling types in both Scotland and northern England.

For new dwellings, a new Section, 'Section 3.28' introduces a new mandatory standard to assess and mitigate the summertime overheating risk.

Applying **only to new residential buildings** , the new standard requires dwellings to be designed and constructed in such a way as to limit solar gains through glazing and provide ventilation to assist in effective cooling. Two methods of assessments are provided:

- **Simple method**, - This specifies measures to adequately mitigate the risk of summer overheating This approach sets out provisions to limit solar gain through glazing and provide ventilation to assist in effective cooling.

- **Dynamic Thermal Analysis -** This uses the dwelling's characteristics to calculate the risk of overheating, modelling the impact of the build form and mitigation measures applied. Modelling may be useful for conversions, more complex dwellings, those where significant areas of glazing or where solutions such as effective use of thermal mass and night-time cooling are proposed.

What has changed in SAP 10?

To coincide with the updated regulations, the SAP methodology has also seen changes with a number of additional data now required to improve the accuracy of SAP calculations and EPC outputs. The new SAP methodology is called SAP 10 and the main changes include:

Changes to emission factors

To account for an ever-changing national energy grid, updates have been made to the various fuel types used in SAP calculations. A summary of these changes can be found below:

SAP emission factors 9.92 & SAP 10.20			
Fuel Type	SAP 2012 CO_2 ($kgCO_2/kWh$)	SAP 10 CO_2 ($kgCO_2/kWh$)	% Difference
Mains Gas	0.216	0.210	2.77 %
Bulk LPG	0.241	0.241	-
Oil	0.298	0.298	-
Wood Logs	0.019	0.028	47.36 %
Electricity	0.519	0.136	73.79%

The most significant change is electricity which has seen its CO_2 emission factor reduced from 0.519 $kgCO_2/kWh$ to 0.0.136 $kgCO_2/kWh$ in SAP 10. This is to reflect the increased influence of renewable energy technologies producing electricity.

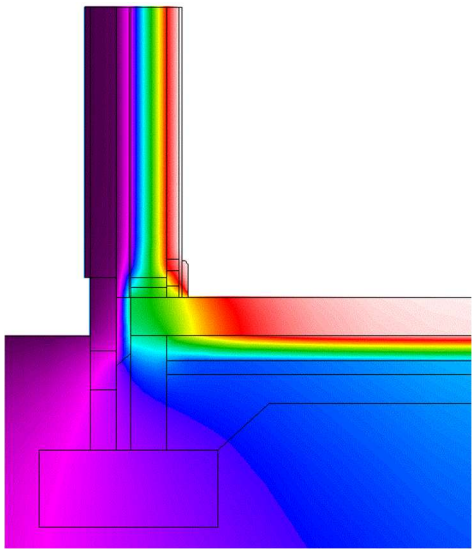
Energy from lighting

The current methodology for calculating lighting consumption in SAP is rudimentary at best. In SAP10, the methodology has had a significant overhaul. SAP 10 will calculate a 'reference lighting capacity' based on the dwellings floor area and solar gains. Should this capacity not be reached, or be exceeded, the predicted lighting energy will be increased as a result.

In this instance, power and efficacy of fixed lighting fittings will now be required to assess energy consumption. Default efficacy figures are provided where information cannot be obtained.

Linear Thermal Bridging

The default Y-value used in assessments where no details of thermal bridging are provided has been raised from 0.15 w/m^2k to 0.20 w/m^2k in SAP 10. This will further emphasis for the need for accurate assessment of construction details to ensure the SAP calculations are not onerously penalised with default values.



The Accredited Construction Details (ACDs) currently available England & Wales will no longer be available for use. In Scotland, it is understood no additional details will be produced to support the release of the new regulations but the existing assessed ACDs will still be available for selection.

Hot water Demand

Hot water demand calculations will now consider the number of showers and baths which are present in a dwelling. This will result in a more accurate assessment of hot water demand than currently in SAP 2012.

Photovoltaic Panels and Batteries

The calculation of electricity generated from PV and stored in a domestic battery can now be considered, which significantly increases the accuracy of the SAP methodology.

As previously discussed, in blocks of flats assessed under the SAP 2012 methodology, PV supplying a landlord's supply via a single inverter, would still resort in the flats benefitting from CO_2 savings from the electricity generated – a common form of compliance for many developers.

In SAP 10, this will no longer be permissible; only dwellings with their own inverters will be able to benefit from the energy cost and emission savings associated with PV generation on site.

PV is directly heating an immersion coil in a cylinder, known as a PV diverter, this will be able to be reflected in SAPs going forward.

Heating patterns

With the SAP 2012 methodology, different heating patterns for weekdays and weekends but recent studies had suggested weekend and weekday energy profiles are closer than previously anticipated.

Therefore, SAP 10 will move to using the same heating pattern for all days, which is on 07:00-09:00 and 16:00-23:00 hours. This will likely increase the annual cost figures referenced on Energy Performance Certificates.

Future Regulatory Requirements

In addition to the 2022 Standards, there are also additional legislation designers may want to consider as they are likely to have significant impact on future projects - particularly regarding how homes and businesses are heated.

New Build Heat Standard 2024

The Scottish Government has proposed that from April 1, 2024, all new buildings applying for a building warrant will only be permitted to use **zero direct emission heating systems.** A Zero direct emission heating system is defined as one by which '*the building is heated or cooled or by which hot water is made available using thermal energy located within building or it's curtilage and which does not emit greenhouse gases at the point of production'.* This change to the building regulations will effectively end the use of fossil-fuel and biomass-derived sources of heat in new buildings post April 2024.

Examples of zero direct emission heating systems include:

- Heat Pumps (Air or Ground)
- Heat Networks
- Solar thermal and solar thermal storage systems
- Electric storage heaters
- Electric boilers
- Fuel cells
- Direct electric heating (Including panel heaters, electric fan heaters, thermal flued radiators and electric radiant heaters)

The consultation is still open for comments and a link with additional information can be found below:

https://consult.gov.scot/energy-and-climate-change-directorate/new-build-heat-standard-part-two/

Local Heat & Energy Efficiency Strategies

Local Heat and Energy Efficiency Strategies (LHEES) aim to establish local authority area-wide plans and priorities for systematically improving the energy efficiency of buildings and decarbonising heat.

For each local authority area, the Strategies will draw on a standardised methodology to:

- Set out how each section of the building stock needs to change to meet national objectives, including achieving zero greenhouse gas emissions in the building sector, and the removal of poor energy efficiency as a driver of fuel poverty.
- Identify strategic heat decarbonisation zones and set out the principal measures for reducing buildings emissions within each zone.
- Prioritise areas for delivery, against national and local priorities.

Accompanying the Strategies will be LHEES Delivery Plans, which will be developed in partnership with key stakeholders, and provide a basis for action for local communities, government, investors, developers and wider stakeholders, pinpointing areas for targeted intervention.

Many councils have already run pilot studies including Inverclyde Council, North Lanarkshire, and east Lothian. More info can be found in the link below.

https://www.gov.scot/publications/local-heat-energy-efficiency-strategies-lhees-phase-2-pilots-evaluation/documents/

LHEES will also form a basis for local public engagement and will be in place for all local authority areas by the end of 2023.

Compliance manager role

Although not included in the 2022 Handbooks, it is anticipated there will be the creation of the role of Compliance Plan Manager to oversee compliance with building regulations from concept to completion on behalf of the Relevant Person and be the verifier's point of contact to support the verification process. The Compliance Manger's role would be to support the building owner and assume responsibility for managing the actions of others which are needed to provide assurance that work is completed in accordance with building regulations and all agreed verification compliance requirements are met and documented. Themes in which a Compliance Manager is expected to oversee include:

Design stage

- Commission building work to engage at an early stage with consultants who can demonstrate competence in the design and delivery of low energy buildings.
- Investigate and set out how compliance with the requirements of section 6 (energy) will be achieved.
- Avoidance of declaring design values without demonstrating an understanding of how these will be achieved in practice.
- Review the benefits that can be derived from improved compliance reporting output from SAP/SBEM calculation software.
- Correct use of calculation software, determination of thermal performance, design and specification of building systems and controls.
- A more comprehensive and standardised approach to summarising the commissioning and performance testing of installed building services. Supported,

at design or pre-construction stage, by a clear scheduling of specified services and their declared performance to assist in validation, post commissioning.

- The use of diagnostic tools which may be beneficially employed to verify the performance of aspects of construction, during or at the end of the construction process.

Completion Stage – As Built

- Documentary and pictorial evidence of installations at key stages to show the correct application of construction practice. This is now the case in England and Wales.
- Verification of installed products and services against the declared building warrant specification
- Submission of an as-built compliance calculation (SAP compliance check) to reflect any changes made during construction.
- Correct and complete installation, avoiding loose fitting of insulation and. Airtightness testing at key stages.

Conclusion

The amendments to the regulations significantly improve the energy efficiency of new build homes and continues to reduce their anticipated annual emissions. The government's ambition is to achieve 'Net Zero' by 2045 and therefore these proposed amendments make a meaningful step towards this goal.

As the Scottish Government looks to implement a 'fabric first' approach, many house builders will need to make a number of changes to their current specifications in order to achieve the required thermal performances.

For homeowners, homes built to these new standards will likely receive energy bills far cheaper than homes built to previous standards and the existing housing stock. As the cost of living and energy prices continue to rise, combined with the growth in hybrid working, many homeowners will benefit greatly from the use of robust thermal performance, domestic battery storage and or highly efficient electric heat pumps.

Likewise, for developers who build commercial developments, the upgrades to the non-domestic regulations will provide meaningful improvements that provide businesses with lower operational costs compared to other commercial developments.

As we move forward, increased emphasis of zero emission heating systems and community heating systems will result in most developers installing heat pumps or connecting to a growing network of district heating systems as we move ever closer to a zero-emission building stock in Scotland.

The SAP and SBEM software's are not currently available and is unlikely to be released until at least November and therefore we cannot provide detailed clarity at this stage. Once the software is available, we will again inform our clients about the proposed changes and what it means for their future projects.

There are still additional consultations and governmental calls for evidence on key topics such as electric charging points, the 'Compliance Manger Role' and heat decarbonisation in Scotland. Once the results from these public consultations are released, we will provide our clients with similar bulletins to ensure clients are prepared for any proposed changes.

How can SK/AD help?

SK/AD welcome the release of the updated regulations and look forward to helping our clients meet their obligations. The updated standards will be challenging but achievable and will result in new build dwellings which are increasingly energy efficient and offer the house buyers reassurance their homes have been built in line with the design intent.

For general Section 6 compliance, we have extensive experience providing SAP and SBEM calculations for our clients, and will continue to support architects, self-builders' developers and housing associations.

With the wide variety of services we offer, we can provide clients with a one-stop-shop for all Section 6 and Section 7 requirements and many of our clients will be interested in our **Full Compliance Service** which provides all the necessary documentation for Building Warrant approval. This service includes:

- SAP(s) and or SBEM(s) Calculations
- Predicted Energy Assessment(s) - (PEAs)
- U-Value Calculations
- Approved Certifier of Design Certificate(s)
- Energy Performance Certificate(s) - (EPCs)
- Sustainability Label(s)
- Air Permeability Test(s)
- Ventilation Commissioning
- Acoustic Test(s)
- Condensation Risk Calculations (If required)
- Overheating calculation – Simplified Assessment (Post December 1st, 2022)

In addition to Section 6 and 7 services, we also offer Passive House Certification, Operational Energy Assessments (TM54), Overheating Calculations (TM59), Embodied Carbon Assessments and Thermal Bridge Calculations (2D & 3D).

If you would like to discuss your project, or any of the topics discussed in the bulletin, please get in touch using the contact details found at the bottom of the page.

Best Regards,

Kenny Lampard

Kenny Lampard

Energy Team Lead

Helpful resources

- SK/AD Website

https://stuartkingarchitecture.com/ (New website coming soon!)

- Technical Handbooks – Domestic

https://drive.google.com/file/d/1Zz2akStdTb1uEc_db9KH72iySvmDC5X0/view

- Technical Handbooks – Non-Domestic

https://drive.google.com/file/d/1gxyE77IMD9uZQmZ1sBAMuswG0itcBO5J/view

- The Government's Standard Assessment Procedure for Energy Rating of Dwellings

SAP 10.2 - 21-04-2022.pdf

- Domestic Building Services Compliance Guide for Scotland

https://drive.google.com/file/d/1a6N6kSkZzdeVn1J80UzKSg5kXZaYN4Jn/view

- Non-domestic Building Services Compliance Guide for Scotland

https://drive.google.com/file/d/1aXayaiiNydh95uwtf-TyfLhNIIiimPBd/view

- National Calculation Methodology (NCM) Modelling Guide for Non-Domestic Buildings in Scotland

https://drive.google.com/file/d/1QrhYt3qnXU3DnelrvJKTvn13uTF7SHnZ/view

- The Scottish Government's Heat in Buildings Strategy (2021)

Heat In Buildings Strategy: Achieving Net Zero Emissions in Scotland's Buildings (www.gov.scot)