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# Applying Fabric First principles

## Complying with UK energy efficiency requirements

Steven Stenlund


IHS

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# Contents

# Acronyms

| | |
|---|---|
| ACDs | Approved Construction Details |
| CSH | Code for Sustainable Homes |
| DER | Dwelling Emission Rate |
| DFEE | Dwelling Fabric Energy Efficiency |
| DG | Double Glazing |
| ECD | Enhanced Construction Details |
| FGHR | Flue Gas Heat Recovery |
| FITs | Feed In Tariffs |
| MEV | Mechanical Extract Ventilation |
| P/A | Perimeter to Area |
| PRT | Programmer Room Thermostat Radiator Valves |
| PV | Photovoltaic |
| RHI | Renewable Heat Incentive |
| SAP | Standard Assessment Procedure |
| TER | Target Emission Rate |
| TFEE | Target Fabric Energy Efficiency |
| TRV | Thermostatic Radiator Valves |
| WER | Window Energy Rating |
| WWHR | Waste Water Heat Recovery |

# Executive summary

This guide aims to provide an understanding of the principles of a 'Fabric First' approach to help developers and house builders design and build homes to meet the more advanced energy efficiency requirements (including possible future zero carbon or near zero energy homes).

The guide explains the principles of Fabric First – how improved thermal performance, examined with reference to SAP 2009 calculations for a sample housing development (Figure 11 on page 18), can lead to optimising the fabric design of dwellings which includes:

- position and orientation of dwelling types
- fabric improvements
- airtightness
- thermal bridging
- services improvements
- developing a standard main specification for application across the site.

## Current building regulation energy efficiency requirements

Since 2010, building regulations have required more advanced energy efficiency compliance. The building regulation editions currently in force are:

- The Building Regulations 2010 (England). Approved Document L1A: Conservation of fuel and power in new dwellings. 2014 edition[1].
- The Building Regulations 2010 (Wales). Approved Document L1A: Conservation of fuel and power in new dwellings. 2014 edition[2].
- Building Regulations (Northern Ireland). Technical Booklet F1: Conservation of fuel and power in dwellings. 2012 edition[3].
- The Building (Scotland) Regulations 2010. Technical Handbook: Domestic, Section 6: Energy. 2015 edition[4].

However, a significant number of developments which are currently being constructed do not yet need to comply with the more advanced energy efficiency requirements specified in the current building regulations. This is because the buildings were approved prior to the introduction of these requirements and therefore compliance with the most recent requirements is not required.

## Previous building regulation energy efficiency requirements

The 2010 edition of Part L1A Conservation of fuel and power in new dwellings (for England, which also applied to Wales)[5] specified a minimum 25% reduction of $CO_2$ from 'regulated' energy consumption, compared to the requirements of the 2006 edition of Part L1A[6].

In Wales, although Part L1A 2010 edition[5] provisions applied, the Technical Advice Note 22[7] required a minimum Code for Sustainable Homes (CSH) Code Level 3 rating, plus at least one credit from the Ene1 section of the 2010 version of the CSH[8]. This equated to at least a further 8% reduction in $CO_2$ emissions compared to the Target Emission Rate (TER) set by Part L1A 2010 edition[5].

In Scotland, Section 6 of the Technical Handbook: Domestic 2010 edition[9] required a 30% improvement compared with the previous 2007 requirements. However, it should also be recognised that in Scotland there is a different methodology used to set the target.

In Northern Ireland, Technical Booklet F1 2012 edition[3], required a 25% improvement compared with the previous 2006 building regulations[10].

## Current practice

For most developers, their only previous experience of achieving this level of energy efficiency was the CSH[8] Code Level 3 rating for state-funded social housing. Planning authorities may have also required developers to achieve a Code Level 4, as well as specific targets for energy production from renewable technologies.

However, evidence[11] has shown that 'bolt on' renewables have been used widely with little regard to improving the fabric of dwellings, even although this has turned out to be a less economical approach.

In economic terms it makes more sense to optimise the fabric and services first. This is to ensure that any additional requirement for renewables can be kept to an absolute minimum level and thus the energy generated is used within the dwelling.

The principles explored in this guide are mainly with reference to the requirements specified in The Building Regulations 2010 (England), Approved Document L1A 2010 edition[5], using SAP 2009. However, these principles can also be applied to the more advanced current regulations as demonstrated in the site scenario specification tables shown in the Appendix in Section 5 at the end of this guide.

This guide hopes to both influence decision making while at the same time reassure developers that they do not need to 'throw out the baby with the bath water'. Tried and trusted methods of construction can still be used, although the actual construction will need to improve. It is time to start to build smarter.

It should be noted that if building regulation approval was sought before the introduction of the current building regulations, requirements still need to be met according to the building regulations in force at the time of the application for approval.

# 1 Introduction

## 1.1 Background

Significant improvements to the regulatory requirements for energy efficiency in national building regulations are now in force. However, many buildings received building regulation approval prior to the changes to current, and more advanced, building regulations requirements.

For new homes that were given building regulation approval prior to the introduction of the more advanced requirements, developers and house builders do not have to comply with these requirements, but may want to apply the energy-saving principles.

Table 1 lists the building regulations that applied before the introduction of current building regulations, and the current editions that now apply.

**Table 1: Previous and current building regulations**

| Previous building regulation energy efficiency requirements using SAP 2009 | Current building regulation energy efficiency requirements |
|---|---|
| England | |
| The Building Regulations 2000 (England). Approved Document L1A: Conservation of fuel and power in new dwellings. 2010 edition[5] | The Building Regulations 2010 (England). Approved Document L1A: Conservation of fuel and power in new dwellings. 2014 edition[1] |
| Wales | |
| Planning Policy Wales. Technical Advice Note (TAN) 22 Planning for sustainable buildings. 2010[7] | The Building Regulations 2010 (Wales). Approved Document L1A: Conservation of fuel and power in new dwellings. 2014 edition[2] |
| Northern Ireland | |
| Building Regulations (Northern Ireland) 2000. Technical Booklet F1: Conservation of fuel and power in dwellings. 2006 edition[10] | Building Regulations (Northern Ireland) 2010. Technical Booklet F1 Conservation of fuel and power in dwellings. 2012 edition[3] |
| Scotland | |
| The Building (Scotland) Regulations 2010. Technical Handbook: Domestic. Section 6: Energy. 2010 edition[9] | The Building (Scotland) Regulations 2010. Technical Handbook: Domestic. Section 6: Energy. 2015 edition[4] |

This guide focuses on the 'Fabric First' approach and will demonstrate how to achieve compliance with building regulations introduced prior to the current building regulations.

These improvements will further reduce the energy demand for space heating and cooling, therefore improving the fabric will become a necessity. These improvements include:

- achieving low elemental U-values by optimising the insulation used
- assessing the effects of thermal bridging
- improving airtightness
- providing energy-efficient ventilation systems
- making use of services improvements and using other energy-efficient technologies.

It is these energy efficiency improvements that are the main focus of this guide – gaining a fuller understanding of the principles of a Fabric First approach which can be implemented on current sites over the next few years. Using Fabric First principles may also help to meet the more advanced current and future energy efficiency requirements towards achieving zero carbon and near zero energy homes.

For most developers, their previous experience of achieving this level of energy efficiency was by meeting Code for Sustainable Homes (CSH) Level 3 or 4 rating for state-funded social housing. However, evidence has shown that there seems to be a widely-held belief in the house-building industry that to achieve the reductions in $CO_2$ emissions at this level requires a 'bolt on' renewables solution. It would therefore be necessary to resort to use microgeneration technology such as solar thermal hot water and heat pumps. Little regard has been made to improving the fabric, even though using Fabric First principles may well be a more economical approach.

However, renewable technologies still have an important role to play. Not only to achieve the Government's target of producing 15% of the UK energy needs through non-fossil fuel energy sources by 2020 (which could potentially be as high as 30%[12]), or by helping to reduce overall $CO_2$ emissions to 80% of their 1990 level by 2050[13] by decarbonising the grid. Over and above these targets, renewable technologies are needed to help provide affordable energy for our homes and all other buildings.

Feed In Tariffs (FITs) and the Renewable Heat Incentive (RHI) are available to help achieve the Government's targets. Making renewable energy cost effective will allow for a growth in the renewable technologies market so that at some point they will become cost-effective measures in their own right. However, it will continue to make little sense to waste the renewable energy generated in new (and for that matter existing) dwellings which are not energy efficient. This guide shows that taking an improved Fabric First approach can also be a viable option.

Using Fabric First principles can reduce, or even eliminate, the number of renewable technologies needed to comply with the Government's overall energy efficiency targets.

This publication has been funded by BRE Trust

# Applying Fabric First principles

Significant improvements for energy efficiency in national building regulations are now in force. However, a significant number of buildings currently being constructed do not yet need to comply with these requirements, as the buildings were approved prior to their introduction.

This guide aims to help developers and house builders design and build homes to meet the more advanced energy efficiency requirements (including possible future zero carbon homes requirements) by using 'Fabric First' principles. It also reviews how to achieve compliance with energy efficiency requirements where approval for the site is sought up until 2019.

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