

Implementation of the EPBD in the United Kingdom STATUS IN DECEMBER 2014 Scotland

1. Introduction

This report provides information about the implementation of the Energy Performance of Buildings Directive (EPBD) in Scotland. It updates the previous UK-wide reports published in 2010 and 2012. The implementation of the EPBD in the other three UK jurisdictions (England, Wales and Northern Ireland) is addressed in separate reports.

The implementation of the EPBD in Scotland is the responsibility of the Local Government and Communities Directorate, Building Standards Division. The main legislation transposing the EPBD in Scotland includes:

- > *the Building (Scotland) Regulations* 2004;*
- > *the Energy Performance of Buildings (Scotland) Regulations* 2008.*

This report introduces the most recent requirements. It also addresses certification and inspection of systems including quality control mechanisms, the training of Qualified Experts (Energy Assessors), information campaigns, incentives and subsidies. For more details please visit the referenced websites or contact the responsible institution.

(This is the main Regulation. Subsequent amendments must also be considered, they include:*

- > *the Building (Miscellaneous Amendment) (Scotland) Regulations 2013;*
- > *the Building (Scotland) Amendment Regulations 2012 (SSI** 2012/209);*

- > *the Building (Scotland) Amendment Regulations 2011;*
- > *the Building (Scotland) Amendment Regulations 2010;*
- > *the Building (Scotland) Amendment Regulations 2009;*
- > *the Building (Scotland) Amendment Regulations 2008;*
- > *the Building (Scotland) Amendment Regulations 2007;*
- > *the Building (Scotland) Amendment Regulations 2006;*
- > *the Building Standards Advisory Committee (Scotland) Regulations 2004;*
- > *the Energy Performance of Buildings (Scotland) Amendment Regulations 2013;*
- > *the Energy Performance of Buildings (Scotland) Amendment (No. 3) Regulations 2012;*
- > *the Energy Performance of Buildings (Scotland) Amendment Regulations 2012 (SSI** 2012/190);*
- > *the Energy Performance of Buildings (Scotland) Amendment (No. 2) Regulations 2012 (SSI** 2012/208);*
- > *the Energy Performance of Building (Scotland) Regulations 2008.*

"The Sullivan Report, A Low Carbon Building Standards Strategy for Scotland", first published in 2007, and its updates have also steered work to reduce energy use and carbon dioxide emissions from buildings in Scotland.

*(**) SSI = Scottish Statutory Instrument.*



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NATIONAL WEBSITE

www.scotland.gov.uk/Topics/Built-Environment/Building/Building-standards

2. Current status of Implementation of the EPBD

I. ENERGY PERFORMANCE REQUIREMENTS

I.i. Progress and current status

In 2013, the Scottish Government reconvened to revisit the recommendations for staged improvements in energy standards for 2010 and 2013. Following a consultation exercise and in consideration of the economic impact and timing of the changes, a Ministerial announcement was made to defer the 2013 energy standards within Building Regulations until October 2015. It was recommended that subsequent reviews of energy standards for achieving Nearly Zero Energy new Buildings should be aligned with the Directive 2010/31/EU requirement for Nearly Zero-Energy Buildings (NZEBs) from 2019, where practical.

Minimum energy performance requirements, for new buildings and for work to existing buildings, are set out in the Building (Scotland) Regulations 2004 (as amended). Technical Handbooks provide guidance on achieving the

Figure 1: Residential Building Regulations improvements (historical and anticipated) for new buildings in Scotland.

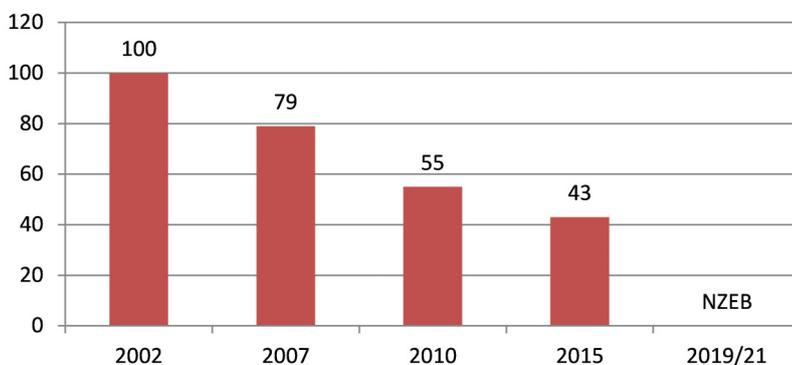
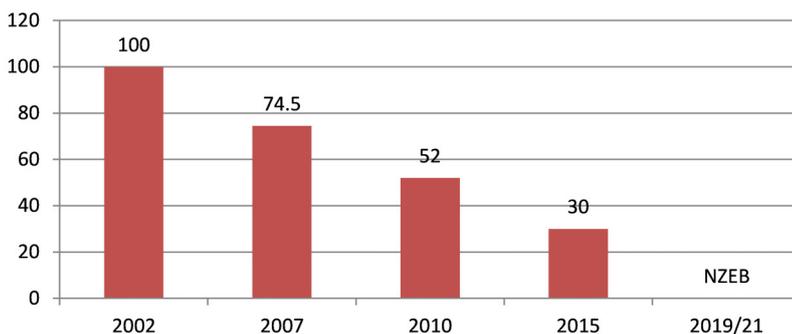


Figure 2: Non-residential Building Regulations improvements (historical and anticipated) for new buildings in Scotland.



standards set in the Regulations. These standards were reviewed and improved in 2002, 2007 and 2010 (Figures 1 and 2, where 2002 standards are used as the baseline). Following recent review, the latest updates of the Technical Handbooks^[1] were to be published in late 2014, setting out the changes to Building Regulations and guidance that will come into force on 1 October 2015. These Technical Handbooks are the documents most commonly used by building sector professionals rather than the Regulations themselves.

Scotland is continuing to make significant progress towards the EPBD requirement for new buildings to achieve 'nearly zero-energy'. In late 2014, proposals were expected to be put forward for further review of Building Regulations to meet the requirements of EPBD Article 9, i.e., all new buildings (occupied/owned by public authorities) to be NZEB from 2019, and for all other buildings from 2021. The Government will investigate whether recommendations for further reduction in carbon dioxide (CO₂) emissions will also deliver 'nearly zero-energy' new buildings.

I.ii. Format of national transposition and implementation of existing regulations

Two Technical Handbooks provide practical guidance on complying with Building Regulations. Two sections of these Technical Handbooks relate to the energy requirements of the Building Regulations: Technical Handbook Domestic (new and existing buildings) and Technical Handbook Non-domestic (new and existing buildings). These handbooks were last updated in 2014. The handbooks include references to best practice guides such as Eurocodes (EN). Ten criteria are set for residential and non-residential buildings (see below). Under particular circumstances (including those allowed by the EPBD), some existing buildings works may be exempted, for example small conservatories below 50 m². The ten criteria are:

1. Ensure that the estimated Building CO₂ Emission Rate (BER) is no greater than the Target Emission Rate (TER). A provision for photovoltaic panels (as a percentage of floor area) is included in

^[1] All Technical Handbooks (including Energy and Sustainability Handbooks) are available at www.scotland.gov.uk/Topics/Built-Environment/Building/Building-standards/techbooks/techhandbooks

- TER calculations for new residential and non-residential buildings.
2. Reduce heat losses through the insulated envelope (including minimum fabric performance values, thermal bridging at junctions and air permeability standards). Scotland-specific Accredited Construction Details are available and, subject to some exceptions, airtightness testing is required.
 3. Energy efficient space heating and hot water systems (including controls, minimum systems performance, etc.).
 4. Minimum insulation levels for pipes, ducts and vessels.
 5. Energy efficient artificial and display lighting (for example, a minimum of 60 lamp lumens/circuit-watt in offices) and controls.
 6. Reduce overheating (for example through the proportion and orientation of translucent glazing, solar shading/control, thermal mass, etc.) and ensure energy efficient mechanical ventilation and air-conditioning (AC) (including controls).
 7. Commissioning of building services to achieve optimum energy efficiency.
 8. Written information for building occupiers on the operation and maintenance of the building services and energy supply systems.
 9. The provision of Energy Performance Certificates (EPCs).
 10. Metering of fuel and power of separate buildings/building parts and of their various end-uses.

The Technical Handbooks detail the building specifications to calculate the Target Emission Rate (TER), and reference the Scottish Building Services Compliance Guides which set out recommended minimum energy efficiency standards. Standards higher than many of the recommended minimum will be required to achieve the TER.

For residential buildings, the Standard Assessment Procedure (SAP) 2012 (details at www.ncm.bre.co.uk) is the methodology used throughout the UK for producing EPCs and calculating the energy performance of residential units to demonstrate compliance with Building Regulations. An EPC includes both an Energy Efficiency (EE) Rating (which takes into account fuel costs) and an Environmental Impact (EI) Rating (which assigns carbon emissions from fuels against energy used). Both ratings are

based on the energy demand for a residential building which is calculated using the assessor's inputs that describe the building and a range of standard assumptions on occupancy and use. The EE Rating calculates energy used for heating, Domestic Hot Water (DHW), lighting and ventilation, and applies fuel costs to that energy use to give an overall rating for the residential building. Different fuels produce different amounts of CO₂ for every kWh of energy used. The Environmental Impact Rating of a residential unit is calculated by applying these 'carbon factors' to each of the fuels used (see Table 1 for examples).

For non-residential buildings, the Simplified Building Energy Model (SBEM), updated in 2014, must be used (details at www.ncm.bre.co.uk). SBEM uses an Asset Rating, i.e., predicted energy consumption based on standard conditions. The Government has developed the SBEM software which is available free of charge. Other proprietary software packages and interfaces (e.g., Dynamic Simulation Models - DSMs) may be used for more complex buildings, providing they have been approved by the Government. These tools are also used to produce EPCs on construction, sale, rent and for display in large "public buildings".

The Technical Handbooks refer to the use of Accredited Construction Details (ACDs) to assist compliance with Building Regulations. ACDs focus on providing insulation continuity at junctions (minimising cold bridging) and airtightness, to assist designers adopting a

Table 1:
Carbon emission factors, extracted from Table 12, SAP 2012.

| Fuel | Standing charge, £ ^(a) | Unit price p/kWh | Emissions kg CO ₂ per kWh ^(b) |
|--|-----------------------------------|------------------|---|
| Gas: | | | |
| mains gas | 120 | 3.48 | 0.216 |
| bulk LPG | 70 | 7.60 | 0.241 |
| bottled LPG | | 10.30 | 0.241 |
| LPG subject to Special Condition 18 ^(c) | 120 | 3.48 | 0.241 |
| biogas (including anaerobic digestion) | 70 | 7.60 | 0.098 |
| Oil: | | | |
| heating oil | | 5.44 | 0.298 |
| biodiesel from any biomass source ^(d) | | 7.64 | 0.123 |
| biodiesel from vegetable oil only ^(e) | | 7.64 | 0.083 |
| appliances able to use mineral oil or biodiesel | | 5.44 | 0.298 |
| B30K ^(f) | | 6.10 | 0.245 |
| bioethanol from any biomass source | | 47.0 | 0.140 |
| Solid fuel:^(g) | | | |
| house coal | | 3.67 | 0.394 |
| anthracite | | 3.64 | 0.394 |
| manufactured smokeless fuel | | 4.61 | 0.433 |
| wood logs | | 4.23 | 0.019 |
| wood pellets (in bags for secondary heating) | | 5.81 | 0.039 |
| wood pellets (bulk supply for main heating) | | 5.26 | 0.039 |
| wood chips | | 3.07 | 0.016 |
| dual fuel appliance (mineral and wood) | | 3.99 | 0.226 |
| Electricity:^(a) | | | |
| standard tariff | 54 | 13.19 | 0.519 |

practical approach to eliminate all reasonably avoidable thermal bridges. An example of the Scottish ACDs^[2] is given in Figure 3.

Local Authorities administer the Building Standards system. They are responsible for granting permission for work to be done (Building Warrant) and for a completed building to be occupied (Completion Certificate). An EPC (including EE and EI ratings) is required at both stages where the property is constructed, as well as when it is sold or rented out. Local Authorities are subject to regular monitoring and periodic inspection under a performance framework developed by the Scottish Government and launched in May 2012. The intention of the new national Key Performance Outcome (KPO) framework is to provide more effective comparisons of consistency and quality of customer service, and service outputs. Formal enforcement notices for non-compliance with EPC requirements are not currently reported under the framework.

I.iii. Cost-optimal procedure for setting energy performance requirements

A UK-wide cost-optimal report, covering Scotland, was published in May 2013. Tables 2 to 5 list the results for Scotland.

Please refer to the England report for further details.

I.iv. Action plan for progression towards Nearly Zero-Energy Buildings (NZEBs)

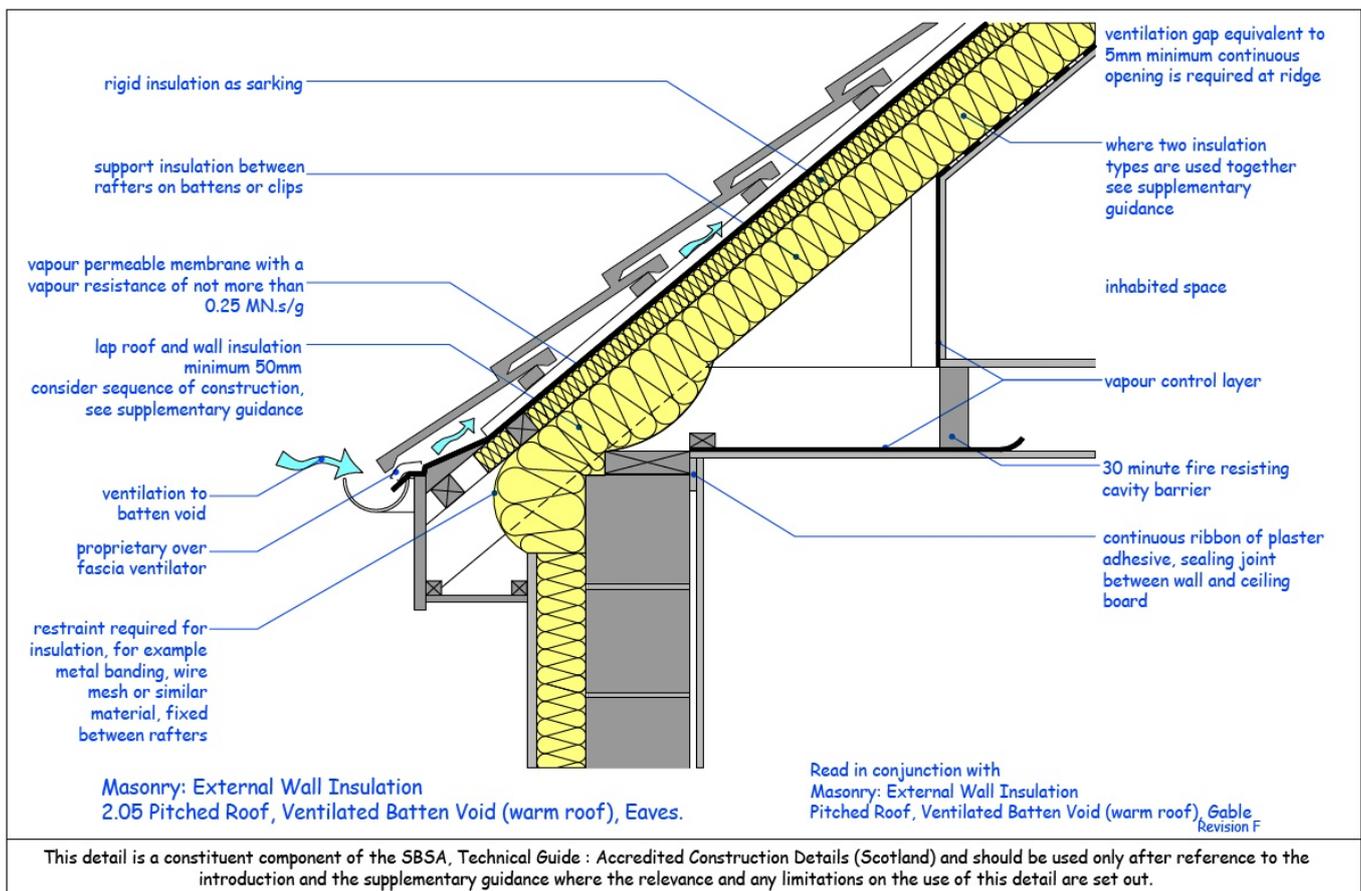
National application of the NZEB definition

The UK national plan titled “Increasing the number of Nearly Zero Energy Buildings” covers all four jurisdictions: England, Wales, Northern Ireland and Scotland. Please refer to the England report for details.

In Scotland, the Climate Change (Scotland) Act 2009 creates a statutory framework to deliver greenhouse gas emissions reductions. The Act sets an interim target of a 42% reduction in emissions (compared to 1990) by 2020, and an 80% reduction target for 2050. The Scottish Government’s “Low Carbon Scotland: Meeting the Emissions Reductions Targets 2010 - 2022” (dated 2011) sets out how Scotland can deliver its 42% target. This includes successive improvements in new-build energy standards through changes to the Building Regulations (see Figures 1 and 2 for historical trends).

NZEB statistics are not maintained at the Scottish or UK levels.

Figure 3:
Illustration from ACD
for pitched roof.
Extracted from ACDs
for masonry external
wall insulation.



[2] www.scotland.gov.uk/topics/built-environment/building/building-standards

I.v. Implementation of the Energy Efficiency Directive (EED) regarding building renovation and the exemplary role of public buildings

The UK Department of Energy & Climate Change (DECC) is responsible for the transposition of the Energy Efficiency Directive (EED) which will mostly be implemented on a UK-wide basis. In a number of areas, where the Devolved Administrations in Northern Ireland, Wales and Scotland have responsibility for implementation, they have opted to pursue a UK-wide approach, though in some areas implementation will be undertaken by the Devolved Administrations.

The UK National Energy Efficiency Action Plan (NEEAP) was published in April 2014. It includes a Building Renovation Strategy in compliance with Article 4 of the EED. The Scottish policies and programmes to deliver this strategy include:

- > the Sustainable Housing Strategy which sets targets for 2020 on insulation, boiler efficiency, and uptake of renewable heat for space and water heating;
- > the Home Energy Efficiency Programmes for Scotland (HEEPS) which includes insulation programmes;
- > the Energy Company Obligation (ECO) (to obligate larger energy suppliers to deliver energy efficiency measures to residential premises);
- > Section 63 of the Climate Change (Scotland) Act 2009 which requires non-residential building owners to improve energy performance and reduce emissions.

The UK decided to implement the alternative approach allowed for by Article 5(6) and notified the Commission of the alternative measures that will be adopted to achieve an equivalent improvement in the energy performance of the buildings within the Central Government estate, which includes Central Government buildings in England, and buildings for UK-wide Government departments and in the Devolved Administrations. Alternative measures include behavioural change, facilities management, estate management, installing energy efficient Information Technology (IT) hardware, and installing energy efficient technology.

Each year the Scottish Government publishes an assessment of progress

Table 2:

New residential units. Comparison table between current requirements and cost-optimal for Scotland.

| Reference building | Cost-optimal level (kWh/m ² .year) | Current requirements (kWh/m ² .year) | Gap (%) |
|--------------------|---|---|-------------------------------|
| Semi-detached | 141 | 110 | +22% better than cost-optimal |
| Mid-floor flat | 116 | 91 | |

Table 3:

Existing residential units. Comparison table between current requirements and cost-optimal for Scotland.

| Reference building (averages) | Cost-optimal level | Current requirements | Gap (%) |
|-------------------------------|----------------------------|----------------------------|----------------------------------|
| Cavity Walls | U=0.55 W/m ² .K | U=0.22 W/m ² .K | +60% better than cost-optimal |
| Solid Walls | U=0.4 W/m ² .K | U=0.22 W/m ² .K | S: +45% better than cost-optimal |
| Windows | U=1.6 W/m ² .K | U=1.6 W/m ² .K | cost-optimal |
| Roof | U=0.20 W/m ² .K | U=0.18 W/m ² .K | cost-optimal |
| Heating | 88% (gas boiler) | 88% (gas boiler) | cost-optimal |

Table 4:

New non-residential buildings. Comparison table between current requirements and cost-optimal for Scotland.

| Reference building | Cost-optimal level (kWh/m ² .year) | Current requirements (kWh/m ² .year) | Gap (%) |
|-----------------------|---|---|-----------------------------|
| Office (AC) | 163 | 162 | -7% worse than cost-optimal |
| Office (NV) | 89 | 76 | |
| Secondary school | 143 | 122 | |
| Hospital | 279 | 230 | |
| Hotel (AC) | 419 | 443 | |
| Dist. warehouse | 131 | 134 | |
| Retail warehouse (AC) | 193 | 348 | |
| Average | 202 | 216 | |

Table 5:

Existing non-residential buildings. Comparison table between current requirements and cost-optimal for Scotland.

| Reference building (averages) | Cost-optimal level | Current Requirement | Gap |
|-------------------------------|----------------------------|----------------------------|------------------------------|
| Cavity walls | U=0.30 W/m ² .K | U=0.30 W/m ² .K | cost-optimal |
| Other walls | U=0.20 W/m ² .K | U=0.30 W/m ² .K | -50% worse than cost-optimal |
| Roof | U=0.24 W/m ² .K | U=0.25 W/m ² .K | -4% worse than cost-optimal |
| Heating | 84% (gas boiler) | 86% | cost-optimal |
| Floor | U=0.22 W/m ² .K | U=0.25 W/m ² .K | -14% worse than cost-optimal |
| Windows | U=1.64 W/m ² .K | U=1.6 W/m ² .K | cost-optimal |
| Lighting | 61 lm/W | 55 lm/W | -10% worse than cost-optimal |
| Chiller | 3.9 | 3.5 | -10% worse than cost-optimal |

towards improving the energy efficiency and wider sustainability of buildings within the civil estate in Scotland^[3]. The Government has also updated its Environmental Policy^[4] which sets out its commitment to continuous improvement. Targets for the future performance of the civil estate, and actions necessary for their

[3] See www.scotland.gov.uk/Topics/Government/sustainabilityperformance/reporting/climatechangeact

[4] www.gov.uk/government/uploads/system/uploads/attachment_data/file/307993/uk_national_energy_efficiency_action_plan.pdf

Figure 4:
Domestic and Non-domestic Building Services Compliance Guides for Scotland, 2015 Editions.



Table 6:
Selected examples of recommended minimum energy efficiency standards.
Non-domestic Building Services Compliance Guide for Scotland, The Scottish Government, 2015 Edition.

| Building services type | Recommended minimum energy efficiency standard |
|---|--|
| Natural gas, single boiler system \leq 2 MW output (for new buildings) | Gross seasonal efficiency: 91% |
| Biomass, independent boiler, automatic [feed], pellet/ woodchip (for new buildings) | Gross seasonal efficiency: 75% |
| Oil, single boiler system (for new buildings) | Gross seasonal efficiency: 84% |
| Heat pump – electrically driven (not air to air): space heating | Heat generator Coefficient of Performance (COP) 2.5 at rating conditions in EN 14511 |
| Heat pump – electrically driven (not air to air): domestic hot water | Heat generator Coefficient of Performance (COP) 2.0 at rating conditions in EN 14511 |
| Air distribution systems, central balanced mechanical ventilation with heating only | Specific Fan Power (SFP) (max): 1.5 W/(l.s) |
| Air distribution systems, plate heat exchanger | Dry heat recovery efficiency: 50% |
| Internal lighting, general lighting in office, storage and industrial areas | Effective lighting efficacy: 60 lamp lumens per circuit-watt |
| Comfort cooling, vapour compression cycle chillers, water cooled $>$ 750 kW | Energy efficiency ratio (EER): 4.7 |

delivery, are embedded in an updated Carbon Management Plan that will be published in late 2014. The Carbon Management Plan is expected to save 27.5 GWh by 2020. Over the last three years, 1.5 £ million (ca. 2 M€) has been spent on energy efficiency projects in Scotland including voltage optimisation, lighting upgrades, building management systems, and building fabric improvements. The NEEAP^[5] includes further details of other initiatives for all UK jurisdictions.

II. REQUIREMENTS FOR TECHNICAL BUILDING SYSTEMS (TBS)

II.i. Coverage of heating, domestic hot water, air-conditioning and large ventilation systems

The 2013 Domestic and Non-domestic Building Services Compliance Guides, developed by the UK Government to support the English Building Regulations, have been adopted by Scotland. The two guides are referenced in the 2014 Scottish Technical Handbooks. Please refer to the England report for details.

Scotland published its own 2015 Domestic and Non-domestic Building Services Compliance Guides (Figure 4) for use from October 2015 in Scotland only with the 2015 Technical Handbooks. Selected extracts from the Non-domestic Guide are included in Table 6.

The Technical Handbooks, which support the Building Regulations, include minimum HVAC system efficiencies and reference the 2013 UK and 2015 Scottish Building Services Compliance Guides.

II.ii. Regulation of system performance, distinct from product or whole building performance

The commissioning of TBS is specifically addressed in the Technical Handbooks to help ensure HVAC systems are commissioned to achieve optimum energy efficiency. The Technical Handbooks reference relevant industry guidance, including the CIBSE Commissioning Codes and BSRIA Commissioning Guides.

II.iii. Applicability to new, replacement and upgraded systems in existing buildings

The Technical Handbooks include specific requirements for residential and non-residential buildings, they also reference the relevant Domestic and Non-domestic Building Services Compliance Guides.

In non-residential buildings, under certain circumstances (e.g., where new work to an existing building includes the provision of new fixed building services or extends the capacity of existing fixed building services), the existing fixed building services must be improved to meet the current performance recommendations given in the Technical Handbook.

II.iv. Provisions for installation, dimensioning, adjustment and control

The Technical Handbooks include specific requirements on controls and commissioning of building services systems. The handbooks also reference the relevant Domestic and Non-domestic Building Services Compliance Guides.

II.v. Encouragement of intelligent metering

Requirements for the metering of energy use within buildings are included in the Technical Handbook for non-domestic buildings. The overall aim is that each building or part of a building designed for different occupation is fitted with fuel and power meters. Sub-metering should be provided to allow monitoring of fuel and power consumption to the various end uses (heating, lighting, low carbon equipment, etc.). The handbook references industry best practice for the installation of sub-meters, i.e., CIBSE TM 39 Building Energy Metering. Automatic meter reading is referenced as a good practice measure, but it is not mandated.

[5] www.gov.uk/government/uploads/system/uploads/attachment_data/file/307993/uk_national_energy_efficiency_action_plan.pdf

There are no metering/sub-metering requirements for new and existing residential buildings in the Domestic Technical Handbook. The metering of incoming utilities in residential buildings is a matter reserved to the UK Government, i.e., it is addressed at the UK level, not by the Devolved Administrations such as Scotland. Utilities providers (e.g., gas companies) provide meters to enable correct charging for fuel used by residential customers. See England report for more details.

II.vi. Encouragement of active energy-saving control (automation, control and monitoring)

Provisions are included in both the Domestic and Non-domestic Technical Handbooks for TBS to be controlled to achieve optimum energy efficiency. From 2015, the Scottish Building Regulations will give credit for the installation of automated monitoring systems in new non-residential buildings where the Building Emission Rate may be reduced by 5% in buildings that feature Automatic Monitoring and Targeting (AMT) with alarms for out of range values.

III. ENERGY PERFORMANCE CERTIFICATES (EPCs) REQUIREMENTS

III.i. Progress and current status on sale or rental of buildings

Overview and administration system

The overarching systems in place to produce EPCs in Scotland are identical across all building sectors and broadly similar to those implemented in England and Wales.

The Scottish Government entered into protocols with a number of “Approved Organisations” to deliver EPCs. Regulations require Approved Organisations to “ensure that members are fit and proper persons who are qualified by their education, training and experience to carry out the preparation and issuing of EPCs”. Members of Approved Organisations prepare and issue EPCs (and other regulatory outputs) which must be created using Government-approved calculation methodologies and software tools.

Under an agreed Operating Framework, Approved Organisations have specific

Quality Assurance (QA) responsibilities, for example maintaining a register of assessors and checking at least 2% of EPCs produced by assessors for accuracy. Assessor members of these organisations must comply with the terms and conditions of the Framework. From 2014, each Approved Organisation will be audited by the Government to ensure compliance with the Operating Framework requirements.

All EPCs must be produced from data recorded on the Scottish EPC Register^[6] which holds both residential and non-residential EPCs data. EPCs may be retrieved from the register by members of the public using the EPC’s unique Report Reference Number (RRN). The Building (Scotland) Regulations require that the EPC is ‘affixed’ to the building, associated guidance suggests that the EPC be located in a boiler or meter cupboard.

How flats are certified in apartment buildings

- > *New residential units:* An EPC must be produced for each building unit (in the same building) which may be sold separately, for example each apartment in an apartment block must be provided with an individual EPC on completion of the construction works.
- > *Existing residential units:* Certification for individual apartments/units may be based on the assessment of another representative apartment/unit in the same block. The data used in the calculation must be verified by a visit to each apartment/unit to be certified. Dependent upon the quality and comprehensiveness of the existing data, such visit may not be as exhaustive as a full survey but would require the assessor to verify any data items that are either unrecorded or potentially subject to change. Supporting evidence is required to demonstrate the apartment/unit is representative. Alternatively, individual EPCs for each apartment/unit may also be produced.

Format and content of the EPC

- > *Residential buildings:* The EPC provides an asset rating (i.e., a calculated energy rating) of the current and potential energy efficiency of the building on a scale from A to G (Figure 5). A is very efficient and G is the least efficient. This asset rating is based on the characteristics of the building itself, its services, a standardised occupancy

[6] www.scottishepcregister.org.uk

profile and the building's energy consumption cost. The average Energy Efficiency (EE) rating for a residential building in Scotland is band D (61). The EPC also includes an Environmental Impact rating, which shows the effect of a residential unit on the environment in terms of CO₂ emissions (Figure 6). The average Environmental Impact (EI) rating for a residential building in Scotland is band D (59). The first page of the EPC for new and existing residential buildings is shown in Figure 7. The EPC includes a list of cost-effective recommendations specific to the residential unit to improve the

energy efficiency of the building, and indicates the potential Energy Efficiency and Environmental Impact ratings if all cost-effective measures were implemented.

> **Non-residential buildings:** The first page of the EPC for non-residential buildings is shown in Figure 8. Energy performance is shown as a single CO₂-based asset rating against an A to G scale, but differs significantly from the other UK EPCs as the banding is based on absolute CO₂ emissions, rather than the relative approach adopted in England and Wales (i.e., "actual building" vs "reference/notional building"). Absolute primary and delivered energy consumptions are shown on the EPC. The non-residential EPC includes one benchmark, the energy rating if the property were constructed to the Building Regulations applicable at the time of the assessment (Figure 9). Cost-effective recommendations are included in the accompanying Recommendations Report and are categorised as:

- short term - payback less than three years;
- medium term - payback between three and seven years;
- long term - payback more than seven years.

Other recommendations may also be provided, based on the assessor's inspection.

EPC activity levels

Until October 2012, only EPCs for existing residential units were recorded on the Scottish central register, the Home Energy Efficiency Database (HEED). EPCs for new residential units were submitted to Local Authorities as part of the Building Warrant process, and EPCs for existing non-residential units were not recorded. A new Scottish register has been developed and, as of January 2013, EPCs for all building types (new and existing, residential and non-residential) have been recorded. The number of EPCs reported in Tables 7 and 8 and Figures 10 and 11 reflects these historical arrangements.

Asset rating-based EPCs are produced for buildings on construction, sale, rent and for display in large public buildings. Both residential and non-residential EPCs are valid for 10 years. EPCs become legally valid after the data used to produce them have been recorded on the central register.

Figure 5:
Example of residential Energy Efficiency bands, asset ratings, current and potential ratings.

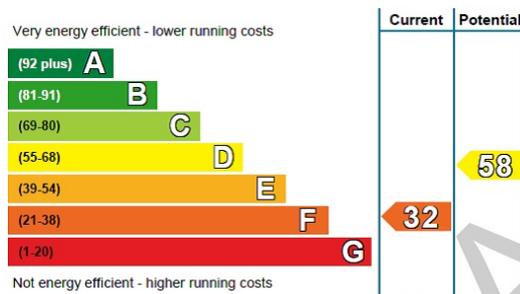


Figure 6:
Example of residential EPC Environmental Impact Ratings, current and potential ratings.

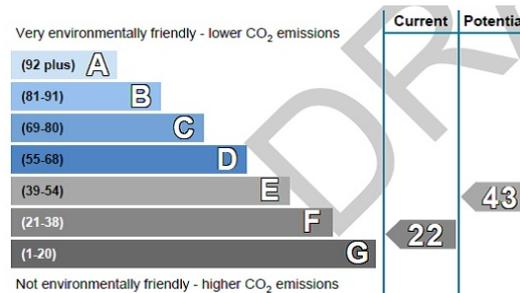
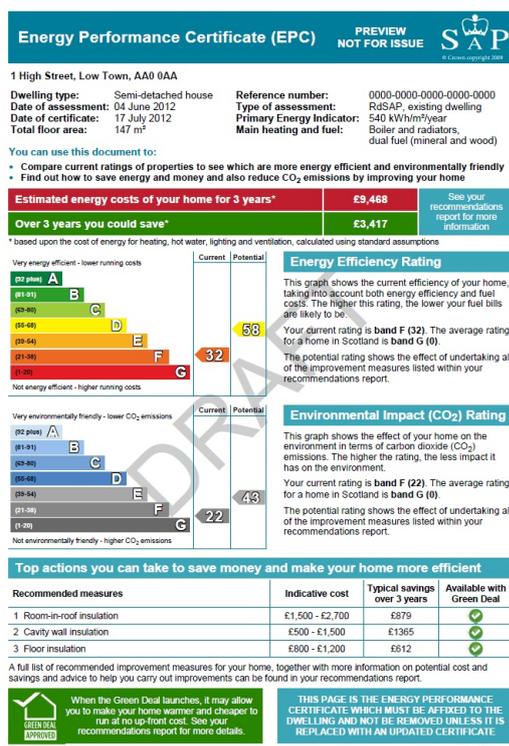


Figure 7:
First page of residential EPC^[7].



[7] www.scotland.gov.uk/Resource/0041/00414384.pdf

EPCs that are recorded on the Scottish central register are only accessible to building owners and their agents who have access to the EPC unique Report Reference Number (RRN). Historical data to July 2014 is included in Tables 7 and 8, Figures 10 and 11.

Typical EPC costs

The cost of EPCs varies greatly. Indicative starting costs, i.e., lowest market costs (based on internet search in July 2014) are comparable to England and Wales:

> for residential buildings: from 35 £ to 60 £ (ca. 44 € to 75 €);

> for non-residential buildings: from 129 £ to 150 £ (ca. 160 € to 190 €).

The above costs include the registration fee payable each time an EPC is recorded on the Scottish register. The fee for registering a residential EPC is maximum 1.15 £ (ca. 1.5 €) and 5.36 £ (ca. 7.25 €) for a non-residential EPC record.

Assessor corps

The Scottish Government worked with those delivering EPBD services to produce an Operating Framework for Approved Organisations. The Framework requires Approved Organisations to reference the UK National Occupational Standards (NOS) when establishing requirements for Energy Assessors to deliver EPCs. The NOS specify

the qualifications and skills Energy Assessors should meet to be accredited to produce regulatory outputs. These are described in the England report. However, only four types of registration (instead of eight for the rest of the UK) are available

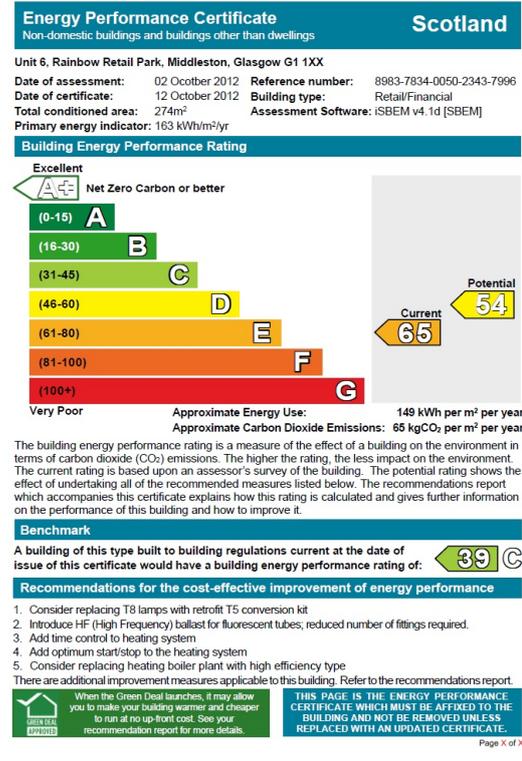


Figure 8: First page of non-residential EPC^[8].



Figure 9: Non-residential EPC benchmark.

| Domestic EPC lodgements by band | | | | | | | | |
|---------------------------------|------------|------|--------|---------|---------|---------|--------|--------|
| | Total EPCs | A | B | C | D | E | F | G |
| Total | 1,140,600 | 684 | 48,590 | 374,573 | 448,484 | 184,891 | 63,189 | 20,189 |
| Percentage | 100% | 0.1% | 4.3% | 32.8% | 39.3% | 16.2% | 5.5% | 1.8% |

Table 7: Residential EPCs to July 2014, Scotland.

| Non-domestic EPC lodgements by band | | | | | | | | |
|-------------------------------------|------------|------|------|-------|-------|-------|-------|-------|
| | Total EPCs | A | B | C | D | E | F | G |
| Total | 12,216 | 73 | 340 | 1,000 | 1,639 | 2,254 | 1,802 | 5,108 |
| Percentage | 100% | 0.6% | 2.8% | 8.2% | 13.4% | 18.5% | 14.8% | 41.8% |

Table 8: Non-residential EPCs to July 2014, Scotland.

Figure 10: Residential EPCs to July 2014, Scotland. Percentages by EPC band.

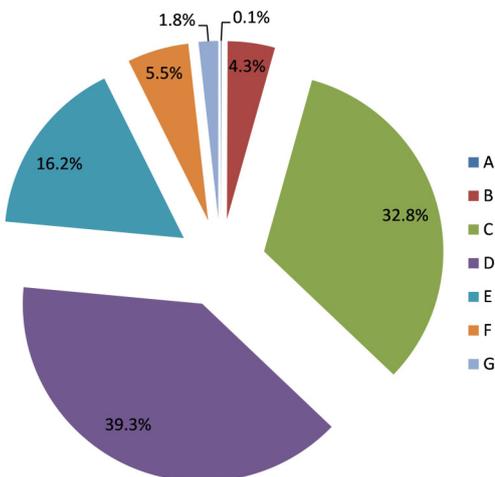
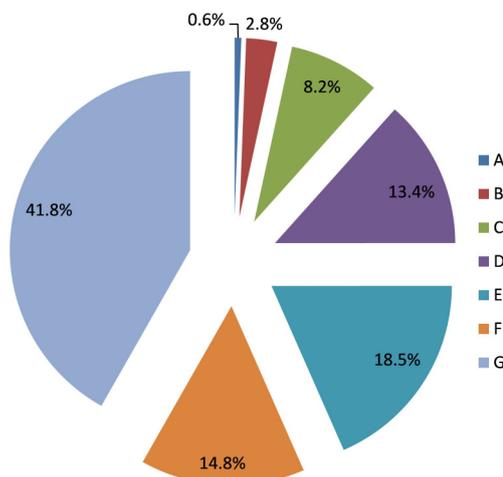


Figure 11: Non-residential EPCs to July 2014, Scotland. Percentages by EPC band.



[8] www.scotland.gov.uk/Resource/0041/00414385.pdf

to would-be Energy Assessors depending on the type of the assessed building (residential or non-residential) and whether the building is existing or new (Table 9). Continued Professional Development (CPD) is required by the Operating Framework. A minimum number of CPD hours per year is not specified by the Scottish Government, but a minimum level of CPD hours is usually specified by each Approved Organisation.

Compliance levels by sector

Compliance is the responsibility of Local Authorities. The Scottish Government does not monitor or hold central compliance data.

Enforcement with building owners and real estate actors

Local Authorities are the enforcement authorities in their respective jurisdictions. They have the powers to require building owners to produce copies of the EPC for inspection and to take copies if necessary. Failing to include the EPC rating in commercial media (when marketing a property) can also result in enforcement actions and penalties for building owners. Penalties depend on the type of building:

> for residential units the penalty is 500 £ (ca. 625 €);

> in any other case, the penalty is 1,000 £ (ca. 1,250 €).

Local Authorities can also consider criminal action.

At the time of writing this report, the Scottish Government has no statistical information detailing enforcement proceedings or penalties paid for non-

compliance since the coming into force of the EPC requirements in 2008.

Government is aware that complaints have been investigated and, where appropriate, EPCs obtained.

Quality Assurance (QA) of EPCs

From January 2013, the Scottish Government requires Approved Organisations to undertake sample checking of a statistically representative sample of EPCs as outlined in the Operating Framework. In effect, sample checking repeats the calculation process using data recorded (on the Scottish central register) to verify the outcome reported and to confirm that sufficient evidence was gathered and correct processes were used. For example, the Operating Framework requires Approved Organisations to undertake QA of at least 2% of the total number of EPCs produced by their Energy Assessors. Other requirements apply with regard to the frequency of checks (depending on the level of activity of assessors), the accuracy target from the QA (e.g., 95% of assessed EPCs within $\pm 5\%$), etc. The Operating Framework also establishes the requirements for Scottish Government audits of Approved Organisations.

In 2013, the total number of EPCs produced was 252,520 of which 6,181 (i.e., 2.45%) were subject to sample checking. Most sample checks are desk-based, i.e., no building site visit. Assessors' outputs are checked at least every six months, poor performance can lead to targeted auditing, retraining and ultimately suspension, or being struck off. Approved Organisations who fail to meet the terms of their protocol agreement could ultimately have their agreement terminated by the Scottish Government.

III.ii. Progress and current status on public and large buildings visited by the public

Overview

Unlike other UK jurisdictions, in Scotland the asset rating EPC (produced on construction, sale and rent) is also used for display in "public buildings", rather than the operational rating (i.e., measured energy rating) Display Energy Certificate used in England, Wales, and Northern Ireland.

From January 2013, the requirement to display an EPC applies to two categories of larger non-residential buildings which are frequently visited by the public:

Table 9:
Energy Assessors
qualifications and
numbers.

| Assessor types | Assessor numbers |
|---|------------------|
| Domestic EPCs (existing buildings) | 2,316 |
| Domestic EPCs (new buildings) | 139 |
| Non-domestic EPCs (existing buildings)* | 435 |
| Non-domestic EPCs (new buildings) | 216 |
| AC inspection (level 3, simple) | 24 |
| AC inspection (level 4, complex) | 211 |
| Total Assessors | 3,341 |
| Notes | |
| * includes public buildings | |
| EPC: Energy Performance Certificate | |
| AC: Air-Conditioning | |
| AC level 3: simple/ packaged AC | |
| AC level 4: complex/ central AC | |

Note: levels 1 and 2 do not exist.

- > buildings occupied by public authorities with a floor area of 500 m² or more which are frequently visited by members of the public (“public buildings”) until 9 July 2015, and 250 m² or more after this date;
- > other non-residential buildings with a floor area of 500 m² or more which are frequently visited by members of the public.

The key difference between the two categories is that public buildings must obtain and display an EPC, while other large buildings, which are frequently visited by members of the public, must display the EPC only if they have one.

The EPC displayed is the same as the non-residential EPC produced on construction, sale and rent and described in section III.i.

EPCs are valid for 10 years, but may be updated before their expiry date, e.g., after refurbishment works. Activity levels for the display of EPCs are not specifically recorded. Non-residential EPCs activity levels are provided in section III.i.

III.iii. Implementation of mandatory advertising requirement

An EPC must be produced when a new building has been constructed (at the completion stage of the building warrant process) and if the building owner intends to sell or rent the building to a new tenant.

For sale or rental, an existing EPC can be used if it is still valid. Otherwise a new EPC must be obtained. The EPC and accompanying Recommendations Report must be available to any prospective buyer or tenant. From January 2013, any commercial advertising of a building for sale or rent must contain the ‘energy performance indicator’ from the EPC to identify the rating of the property, e.g., EPC = C. These responsibilities rest with the building owner. An enforcement authority may, if it believes that an owner has breached the Regulations, give a penalty charge notice to the owner. The amount payable is 500 £ (ca. 675 €) for residential units, or 1,000 £ (ca. 1,350 €) for non-residential buildings.

III.iv. Information campaigns

Government invested in excess of 40 million £ (ca. 50 M€) in non-residential energy efficiency advice and support programmes since 2007. Government continues to fund the Energy Saving Trust

to provide advice and support to businesses, public sector organisations, and the wider public at large to reduce energy consumption and associated costs through improved energy efficiency and carbon management.

National information campaigns have used a diversity of outlets including website, advertising (through radio, press and information leaflets, e.g., Figure 12), targeted seminars, guidance documents, roadshows, and proactive enforcement by a dedicated team. Information is also available on the Government website^[9].

Other Government initiatives to improve the energy efficiency of buildings have benefited from publicity campaigns such as the launch of the Green Deal in 2013.

III.v. Coverage of the national building stock

This section is adapted from the UK National Energy Efficiency Action Plan (NEEAP) and gives a statistical overview of the main features of the building stock in the UK. The UK’s building stock (including Scotland) varies widely both in age and type. The data presented in Figure 13 is taken from the Scottish central register of EPCs. EPCs are only required under specific circumstances so this is not fully representative of all building types.

The UK has 27 million homes, roughly 2.4 million in Scotland across a wide

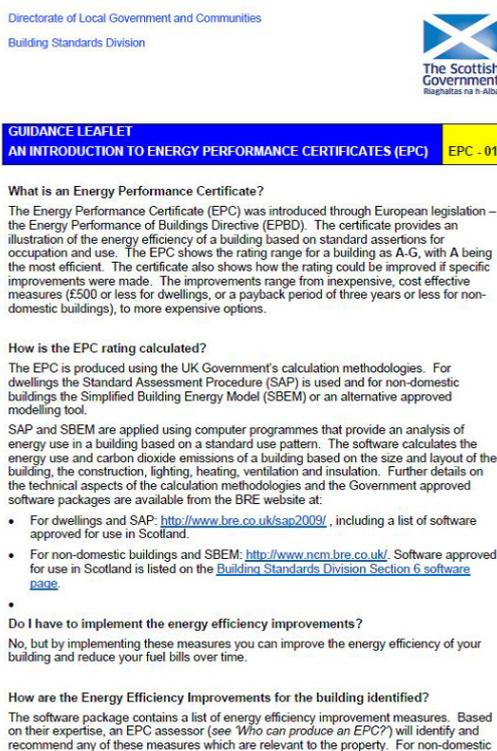
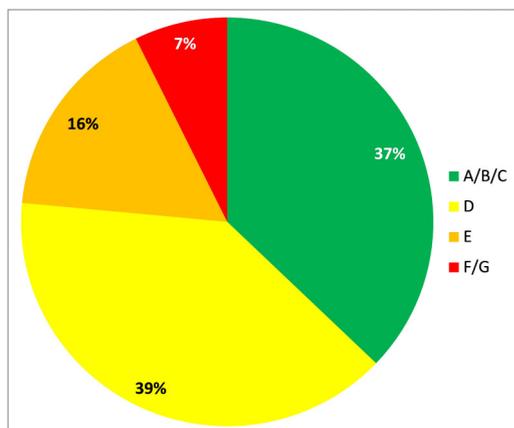


Figure 12:
Guidance leaflet “An introduction to Energy Performance Certificates (EPCs)”, Scottish Government.

[9] www.scotland.gov.uk

Figure 13:
Energy efficiency
rating of Scottish
housing stock (based
on EPC records from
2008 to July 2014).



range of housing types, including a significant proportion of older buildings. Figure 13 shows the distribution of ca. 1.14 million residential EPCs in Scotland at the end of 2014.

There are over 1.8 million non-residential premises in the UK, about 200,000 in Scotland. Specific data for the energy efficiency rating by building type in Scotland is not available.

EPCs recorded in 2013, for new and existing, residential and non-residential buildings in Scotland was 252,520. There was a total of about 12,000 non-residential EPCs on the Scottish register at July 2014.

IV. INSPECTION REQUIREMENTS – HEATING AND AIR-CONDITIONING (AC) SYSTEMS

The UK (England, Wales, Scotland and Northern Ireland) adopted alternative measures for heating systems and inspections for Air-Conditioning (AC) systems. Please refer to the England report for details of the heating systems measures. Scotland-specific schemes include the Energy Assistance Package, which targets fuel poverty and aims to reduce fuel bills and improve the energy efficiency of homes, Home Energy Efficiency Programmes, and Warmer Homes Scotland.

IV.i. Progress and current status on AC systems

Overview, technical method and administration system

The inspections of AC equipment was phased between January 2011 (for systems over 250 kW) and January 2013 (for systems over 12 kW). In the same building, individual systems each 12 kW or

less, but totalling more than 12 kW together, only qualify if they are linked by a central control. Portable systems and AC of processes only (e.g., computer equipment rather than for occupiers' comfort) do not qualify.

Building owners are subject to a continuing requirement. This means inspections are required throughout the life of a new or existing building, for as long as it has an AC system. Building owners must ensure that installations are inspected by an accredited expert who is a member of a "Protocol Organisation". Accredited experts issue a report to the occupier of the building which sets out the timescales for the next inspection, i.e., three to five years, subject to the efficiency of the system at the time of the inspection. There is no requirement for AC inspection reports to be recorded on a central register.

Arrangements for assurance, registration and promotion of competent persons

The procedures to undertake AC inspections are set out in the Government's General Technical Handbook Non-domestic (section 0). For the assessment process and reporting of advice, reference is made to the Technical Memorandum 44 (TM 44) Inspection of Air-conditioning Systems published by the Chartered Institution of Building Services Engineers (CIBSE)^[10]. The handbook also lists the issues that should be considered in setting an inspection frequency greater than five years.

An Operating Framework has been established for organisations that have entered into a protocol with the Government for the inspection of AC systems in existing buildings. The framework requires these "Protocol Organisations" to reference the UK National Occupational Standards (NOS), which have been established for AC inspections. NOS set the minimum competencies and skills Energy Assessors must demonstrate to become accredited. Two levels of competence are available to assessors: "Level 3" for simple/package cooling systems, and "Level 4" for complex/centralised systems. See England report for details.

Promotional activities

To date, the Government has not run promotional activities specifically focused on the inspection of AC systems.

[10] [www.cibse.org/Knowledge/CIBSE-TM-\(1\)/TM44-Inspection-of-Air-Conditioning-Systems](http://www.cibse.org/Knowledge/CIBSE-TM-(1)/TM44-Inspection-of-Air-Conditioning-Systems)

Enforcement and penalties

Local Authorities are responsible for ensuring that building owners have commissioned an inspection of AC systems (over 12 kW) and that building occupiers are in possession of a valid inspection report.

Local Authorities may serve an enforcement notice where the building owner is failing to comply. If the building owner has not complied by the date specified on the enforcement notice, the Local Authority may carry out such work as is necessary to comply with the notice and may recover, from the building owner, any expenses reasonably incurred.

At the end of 2014, there are no published Scotland-wide records of enforcement notices imposed by Local Authorities for non-compliance.

Quality control of inspection reports

The Operating Framework for Protocol Organisations sets out minimum requirements for the QA of inspector output and process, and for the Audit of Protocol Organisations by the Government. These requirements include:

- > ensuring that at least 2% of the total number of inspection reports are checked for accuracy;
- > ensuring that output from active inspectors is checked at least every six months; all new members should have output checked within the first month of active membership;
- > Protocol Organisations to maintain records in a form that allows Government audit of the successful implementation of the functions set out in the Operating Framework.

Inspection activity figures

A total of 966 inspection reports were produced in 2013. Note that due to the climate in Scotland, there are relatively few large AC systems.

At least 2% of these reports should have been randomly selected and checked for accuracy. The actual number of AC inspection reports controlled in 2013 was 26, i.e., 2.7% of the reports produced in the year.

Impact assessment

The costs of the mandatory inspection of AC systems over 12 kW and reporting are comparable to England and Wales costs which are estimated as follows:

- > for a centralised system 600 £ (ca. 750 €);
- > for packaged units 100 £ (ca. 125 €).

The principal benefit of AC inspections was expected to arise from the improved efficiency and reduced electricity consumption of existing and new systems if the measures recommended in the inspection report were implemented. Benefits are difficult to quantify accurately, but very large energy savings are expected from the replacement of older systems. Other benefits such as improved workplace conditions are also expected.

3. A success story in EPBD implementation

Integration of the EPC into the Scottish 'Home Report'

In Scotland, the introduction of EPCs coincided with the introduction of domestic legislation to provide comprehensive information to potential purchasers of marketed residential units. All owners of residential units marketed for sale have to provide a 'Home Report'. This is a pack of three documents: a Single Survey, an Energy Report (which includes the EPC) and a Property Questionnaire. The Home Report is provided free of charge to prospective home buyers.

The Single Survey contains an assessment by a surveyor of the condition of the home, a valuation and an accessibility audit for people with particular needs.

The Energy Report contains an assessment by a surveyor of the energy efficiency of the home and its environmental impact. It also recommends ways to improve its energy efficiency. The EPC and the Recommendations Report are provided with the Energy Report.

The Property Questionnaire is completed by the seller of the home. It contains additional information about the home, such as Council Tax banding and factoring costs that will be useful to buyers.

The generation of the EPC as part of this process provides a 'one-stop-shop' for the seller, in that a building expert provides all documents, following just one visit to the property and for a fixed fee. This process also ensures that the EPC rating is available for inclusion in the advertisement and ensures a significantly high rate of compliance with Energy Performance of Buildings legislation. The provision of the EPC recommendations with the building survey also assists potential buyers to make informed choices in deciding how to improve the energy efficiency of the building if sale contracts are exchanged.

4. Conclusions, future plans

The UK is divided into four jurisdictions: England, Wales, Scotland and Northern Ireland. In many instances the mix of approaches transposing the requirements of the Energy Performance of Buildings Directive (EPBD) differs between jurisdictions. In some instances similar approaches were adopted by two or more jurisdictions. The transposition of the EPBD and associated benefits have been and continue to be reviewed by each UK jurisdiction as part of their respective programmes to achieve national energy efficiency objectives and carbon emissions reduction.

In some instances, these reviews validated the current implementation approach, for example the Display Energy Certificates (DECs) review by CIBSE. Changes have and will continue to be made to the implementation instruments where deemed appropriate.

In Scotland, since late 2007, the recommendations of “The Sullivan Report,

A Low Carbon Building Standards Strategy for Scotland” have steered work to reduce energy use and carbon dioxide emissions from buildings. Amongst the recommendations of the 2013 updated report from the Sullivan Panel was the review of energy standards beyond 2015 to be aligned with the European Commission’s timetable for delivery of Nearly Zero-Energy new Buildings.

In addition to action to transpose the EPBD, in 2015 Scotland plans to introduce DECs and the reporting of operational energy use as a component of legislation for the assessment and improvement of existing non-residential buildings.

The Scottish Government recognises that the data recorded on the Energy Performance Certificate (EPC) register is a valuable asset, already used in support of a number of domestic policies and initiatives. Government plans to publish this data to support research, modelling uses, and broader carbon and energy efficiency improvements to the building stock.



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