

The Building Bye-Laws (Jersey) 2007

**TECHNICAL GUIDANCE DOCUMENT
11.2A**

**PART 11
CONSERVATION OF FUEL AND POWER
IN NEW BUILDINGS
OTHER THAN DWELLINGS**

2017
EDITION

MAIN CHANGES IN THE 2011 EDITIONS

1. This Technical Guidance Document 11.2A comes into force on 01 January 2011 in support of the Building Bye-laws (Jersey) 2007 as amended. From that date the 2002 edition of Approved Document L2 will become obsolete. The main changes in the legal requirements and the supporting technical guidance in this edition of Technical Guidance Document 11.2A are as follows.

Changes in the legal requirement

2. The main legal changes are reproduced at the front of this Technical Guidance Document and interleaved as well in the relevant text for ease of reference. In cases of doubt however refer to the SI itself.
3. Part 11 of schedule 2 has been consolidated into a single requirement 11.1, covering all types of building with no limits on application.
4. As well as changes to Part 11, there are changes to the definitions of building works and exempt works, new minimum energy performance requirements, and new requirements for pressure testing, commissioning and energy calculations.

Changes in the technical guidance

5. Four Technical Guidance Documents are published reflecting the specialisation in the construction market. In the new Technical Guidance Documents regulatory requirements are shown on a blue background and defined terms are highlighted. More use has been made of more comprehensive and detailed technical reference publications that therefore form part of the approved guidance. Commentary text has been added in places to explain, for instance the aims of the guidance and how outcomes are calculated.
6. In this Technical Guidance Document the Elemental, Whole Building and Carbon Intensity methods are omitted. There is now only one approach to showing compliance with the energy efficiency requirements. This addresses five criteria:
 - a. The annual energy rate of the completed building, as calculated using an approved calculation tool, must not exceed the target set by a reference building. The approved calculation tools comprise the Simplified Building Energy Model (SBEM) or other software that has been approved by the department.
 - b. Building fabric and services performance specifications are within reasonable limits.

- c. Non-air-conditioned buildings will not cause high internal temperatures in summer as a result of excessive solar gains.
- d. Fabric insulation and airtightness, as built, are as intended. More guidance is given on testing the achievement of the intended energy performance including arrangements for obligatory pressure testing in most circumstances.
- e. Satisfactory information must be provided enabling occupiers to achieve energy efficiency in use.

7. New technical references give guidance on compliance regarding the use of the calculation tools, ways of complying when providing heating, cooling and ventilation systems, and the benefits of low and zero carbon systems.
8. The technical provisions will mean that higher performance of the fabric, heating, ventilation, air conditioning and lighting systems designs will be necessary. The improvement will be in the region of 24%.
9. The standard of improvement has been set so that low and zero carbon energy sources will have attractions in many cases.

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Use of Guidance

THE TECHNICAL GUIDANCE DOCUMENTS

This document is one of a series that has been approved and issued by the Minister for Planning and Environment for the purpose of providing practical guidance with respect to the requirements of Schedule 2 and Bye-law 7 of the Building Bye-laws (Jersey) 2007.

A list of all technical guidance documents that have been approved and issued by the Planning and Environment Minister for this purpose can be obtained from the department.

Technical Guidance Documents are intended to provide guidance for some of the more common building situations. However, there may well be alternative ways of achieving compliance with the requirements. Thus, there is no obligation to adopt any particular solution contained in a Technical Guidance Document if you prefer to meet the relevant requirement in some other way.

OTHER REQUIREMENTS

The guidance contained in a Technical Guidance Document relates only to the particular requirements of the Bye-laws which the document addresses. The building work will also have to comply with the requirements of any other relevant parts in Schedule 2 to the Bye-laws.

There are Technical Guidance Documents which give guidance on each of the parts of Schedule 2 and on Bye-law 7.

LIMITATION ON REQUIREMENTS

In accordance with Bye-law 8, the requirements in Parts 1 to 7, 10 and 12 (except for requirements 3.6 and 6.2) of the Second Schedule to the Building Bye-laws do not require anything to be done except for the purpose of securing reasonable standards of health and safety for persons in or about buildings (and any others who may be affected by buildings or matters connected with buildings). This is one of the categories of purpose for which Building Bye-laws may be made.

Requirements 3.6 and 6.2 are excluded from Bye-law 8 because they deal directly with prevention of the contamination of water. Parts 8 and 9 (which deal, respectively, with access to and use of buildings and resistance to the passage of sound,) are excluded from Bye-law 8 because they address the welfare and convenience of building users. Part 11 is excluded from Bye-law 8 because it addresses the conservation of fuel and power. All these matters are amongst the purposes, other than health and safety, that may be addressed by Building Bye-laws.

MATERIALS AND WORKMANSHIP

Any building work which is subject to the requirements imposed by Schedule 2 to the Building Bye-laws should, in accordance with Bye-law 7, be carried out with proper materials and in a workmanlike manner.

You may show that you have complied with Bye-law 7 in a number of ways. These include the appropriate use of a product bearing CE marking in accordance with the Construction Products Directive (89/106/EEC)¹, the Low Voltage Directive (73/23/EEC and amendment 93/68/EEC)² and the EMC Directive (89/336/EEC)³ as amended by the CE Marking Directive (93/68/EEC)⁴ or a product complying with an appropriate technical specification (as defined in those Directives), a British Standard, or an alternative national technical specification of any state which is a contracting party to the European Economic Area which, in use, is equivalent, or a product covered by a national or European certificate issued by a European Technical Approval Issuing body, and the conditions of use are in accordance with the terms of the certificate. You will find further guidance in the Technical Guidance Document supporting Bye-law 7 on materials and workmanship

INDEPENDENT CERTIFICATION SCHEMES

There are many UK product certification schemes. Such schemes certify compliance with the requirements of a recognised document which is appropriate to the purpose for which the material is to be used. Materials which are not so certified may still conform to a relevant standard.

Many certification bodies which approve such schemes are accredited by UKAS.

TECHNICAL SPECIFICATIONS

Building Bye-laws are made for specific purposes: health and safety, energy conservation and the welfare and convenience of disabled people. Standards and technical approvals are relevant guidance to the extent that they relate to these considerations. However, they may also address other aspects of performance such as serviceability, or aspects which although they relate to health and safety are not covered by the Bye-laws.

¹ As implemented by the Construction Products Regulations 1991 (SI 1991/1620).

² As implemented by the Electrical Equipment (Safety Regulations 1994)

³ As implemented by the Electromagnetic Compatibility Regulations 1992 (SI 1994/3260).

⁴ As implemented by the Construction Products (Amendment) Regulation 1994 (SI 1994/3051) and The Electromagnetic Compatibility (amendment) Regulations 1994 (SI 1994/3080)

When a Technical Guidance Document makes reference to a named standard, the relevant version of the standard is the one listed at the end of the publication. However, if this version has been revised or updated by the issuing standards body, the new version should be used as a source of guidance provided it continues to address the relevant requirements of the Bye-laws.

The appropriate use of a product which complies with a European Technical Approval as defined in the Construction Products Directive will meet the relevant requirements.

The Department intends to issue periodic amendments to its Technical Guidance Documents to reflect emerging harmonised European Standards. Where a national standard is to be replaced by a European harmonised standard, there will be a co-existence period during which either standard may be referred to. At the end of the co-existence period the national standard will be withdrawn.

MIXED USE DEVELOPMENT

In mixed use developments part of a building may be used as a dwelling while another part has a non-domestic use. In such cases, if the requirements of this part of the Bye-laws for dwelling and non-domestic use differ, the requirements for non-domestic use should apply in any shared parts of the building.

The Requirement

This Technical Guidance Document, which takes effect on 01 January 2011, deals with the energy efficiency requirements in the Building Bye-laws (Jersey) 2007, as amended. The energy efficiency requirements are conveyed in Part 11 of schedule 2 to the Building Bye-laws and Bye-laws 5A, 17B and 17C as described below

Requirement

Part 11 Conservation of Fuel and Power.

- 1 Reasonable provision shall be made for the conservation of fuel and power in buildings by:
 - a limiting heat gains and heat losses:
 - i through thermal elements and other parts of the building fabric; and
 - ii from pipes, ducts and vessels used for space heating, space cooling and hot water services;
 - b providing and commissioning energy efficient fixed building services with effective controls; and
 - c in a case where building work is carried out in connection with a building that is (or any component of which is) required to comply with any provision of sub-paragraph (a) or (b), providing to the owner of the relevant building on completion of that building work sufficient information about the building, the fixed building services and their maintenance requirements so that the building can be operated in such a manner as to use no more fuel and power than are reasonable in the circumstances.

Other changes to the Bye-laws

There are new Bye-laws that introduce new energy efficiency requirements and other relevant changes to the existing bye-laws. For ease of reference the principal elements of the bye-laws that bear on energy efficiency are repeated below and, where relevant, in the body of the guidance in the rest of this Technical Guidance Document. However it must be recognised that the Statutory Instrument takes precedence if there is any doubt over interpretation.

Interpretation

“building work” means –

- (a) the erection or extension of a building;
- (b) the provision or extension of a controlled service or fitting in or in connection with a building;
- (c) a material alteration in relation to a building;
- (d) work required by bye-law 5A, 5B, 6, or 17C, in relation to a building;
- (e) work involving the underpinning of a building;
- (f) the provision, alteration or extension of an electrical installation in a building, including, where such an installation is altered or extended, any work on the existing electrical installation of the building;

“change to a building’s energy status’ means a change to a building, being a change that has the result that the building becomes one to which any of the energy efficiency requirements applies where previously the requirement did not so apply;

‘energy efficiency requirements’ means the requirements of –

- (a) bye-laws 5A and 5B;
- (b) Part 3A; and
- (c) Part 11 of Schedule 2;

“fixed building service’ means –

- (a) a fixed internal or external lighting system (other than an emergency escape lighting system or a specialist process lighting system); or
- (b) a fixed system for heating, providing hot water, providing air conditioning or providing mechanical ventilation;

‘technical guidance document’ means a technical guidance document published under Article 32 of the Law;

‘thermal element’ has the meaning set out in bye-law 2A;

‘thermally conditioned’ means capable of being maintained at or near a given temperature by the use of one or more mechanical devices.

Bye-law (2) is amended to include the following new definitions.

- (k) the building is used as an office, where previously it was not; or
- (l) in the case of a building that is or contains a dwelling or garage, part of the building is used as a habitable room where previously the part was not so used.

A new Bye-Law 2A has been added as follows:

- (1) In these bye-laws, ‘thermal element’ means a wall, floor, or roof, that separates a thermally-conditioned part of a building from –
 - (a) part or all of the external environment; or
 - (b) in the case of a wall or floor, another part of the building, being a part that is –
 - (i) not thermally conditioned,
 - (ii) an extension falling within Class 6 in Schedule 1, or
 - (iii) where this clause applies, thermally conditioned to a different temperature, and includes all parts of the wall, floor, or roof, between the surface bounding the thermally-conditioned part of the building and the surface exposed to the external environment or to the other part of the building.
- (2) Paragraph (1)(b)(iii) only applies if –
 - (a) the relevant building is not a dwelling; and
 - (b) the other part of the relevant building is used for a purpose that is not similar or identical to the purpose for which the thermally-conditioned part is used.
- (3) In this bye-law –
 - (a) a reference to the external environment includes the ground;
 - (b) a reference to a wall, floor or roof does not include a window, door, roof-window or roof-light.

Requirements relating to building work.

Bye-law 5 is amended as follows:

- (4) Despite paragraphs (1) and (2) and without affecting the operation of paragraph (3), if building work is only of a kind required by bye-law 5A, 5B or 17C and does not constitute a material alteration to a building, paragraphs (1)

and (2) shall not apply to or in relation to the building work so long as the requirements of bye-law 5A, 5B or 17C (as the case requires) are met in relation to the work.

Requirements relating to thermal elements.

A new bye-law 5A is added as follows:

- (1) Where a thermal element is renovated, such building work shall be carried out as is necessary to ensure that the whole thermal element as so renovated complies with requirement 11.1(a)(i).
- (2) Where a thermal element is replaced, the replacement thermal element shall comply with requirement 11.1(a)(i).

Requirements relating to a change to energy status.

A new bye-law 5B is added as follows:

- (1) Where there is a change to a building's energy status, such building work shall be carried out as is necessary to ensure that the building complies with the requirements of Part 11 of Schedule 2.
- (2) However, if the change concerns the energy status of only part of the building, being a part designed, or altered, to have fixed building services that are separate from those of other parts of the building, then it shall be sufficient compliance with paragraph (1) if the building work that is carried out ensures that the part complies with the requirements of Part 11 of Schedule 2.

Requirements relating to a material change of use.

Bye-law 6 is updated to take account of the changes to Part 11.

Application for a building permit.

Bye-law 10 is amended as follows:

For sub-paragraphs (a) and (b) of bye-law 10(1) the following sub-paragraphs have been substituted –

- (a) to carry out building work;
- (b) to replace or renovate a thermal element that forms part of a building in relation to which any of the energy efficiency requirements apply;
- (c) to make a change to a building's energy status; or
- (d) to make a material change of use.

ENERGY PERFORMANCE OF BUILDINGS

New bye-laws are added as follows:

17A Interpretation

In this Part, 'building' means an entire building or such part of a building as is designed, or altered, to have fixed building services that are separate from those of other parts of the building.

17B New buildings

- (1) This bye-law applies where a new building is constructed.
- (2) The building, once constructed, shall not exceed the target rate of the energy performance for the building that has been specified in the relevant technical guidance document.
- (3) For the purposes of this bye-law, the relevant technical guidance document is one concerning minimum energy performance requirements for buildings and setting out a methodology of calculation for the energy performance of buildings.

17C Consequential improvements to energy performance

- (1) Paragraph (2) applies to an existing building with a total useful floor area over 1000m² in respect of which building work is proposed if the proposed building work consists of or includes –
 - (a) an extension of the building; or
 - (b) the initial provision of any fixed building services, or an increase to the installed capacity of any fixed building services, in relation to the building.
- (2) Subject to paragraph (3), such work, if any, shall be carried out as is necessary to ensure that the building complies with Part 11 of Schedule 2.
- (3) Nothing in paragraph (2) requires work to be carried out if it is not technically, functionally and economically feasible.

17D Notice of energy performance to Minister

- (1) This bye-law and bye-law 17E apply where a new dwelling is created by building work or by a material change of use in connection with which building work is carried out.
- (2) The person carrying out the relevant building work shall calculate a rating of the energy

- performance of the dwelling, once constructed, in accordance with the relevant technical guidance document and give notice of that rating to the Minister.
- (3) For the purposes of this bye-law, the relevant technical guidance document is one concerning minimum energy performance requirements for buildings and setting out a methodology of calculation for the energy performance of buildings.
- (4) The notice shall be given not later than –
- the date on which the notice required by bye-law 13(6) is given in relation to the building work; and
 - at least 5 days before occupation of the dwelling.

17E Notice of energy performance to occupant

- (1) The person carrying out the relevant building work shall affix, as soon as practicable, in a conspicuous place in the dwelling, a notice stating the rating of the energy performance of the dwelling, calculated as referred to in bye-law 17D.
- (2) The notice shall be affixed not later than –
- the date on which the notice required by bye-law 13(6) is given in relation to the building work; and
 - at least 5 days before occupation of the dwelling.
- (3) This bye-law shall not apply in a case where the person carrying out the relevant building work intends to occupy, or occupies, the dwelling as a residence.

17F Calculations and targets

- (1) This bye-law applies to a building in relation to which requirement 11.1(a)(i) applies.
- (2) A person carrying out building work to construct the building shall ensure that pressure testing is carried out on the building in such circumstances, and in accordance with such procedures, as are set out in the relevant technical guidance document.
- (3) The person carrying out the building work shall give notice of the results of the pressure testing to the Minister not later than 7 days after the testing is completed.
- (4) The notice shall set out the results of the testing and the data on which they are based in the manner set out in the relevant technical guidance document.

- (5) For the purposes of this bye-law, the relevant technical guidance document is one concerning pressure testing in a building in order to determine heat gains and losses in the building from its thermal elements and other parts of its building fabric.

17G Commissioning

- (1) This bye-law applies to a building in relation to which requirement 11.1(b) applies and building work is carried out, but does not apply where the building work consists only of exempt electrical certifiable work (within the meaning of bye-law 15).
- (2) The person carrying out the building work shall give to the Minister a notice confirming that the relevant fixed building services have been commissioned in accordance with the procedure set out in the relevant technical guidance document.
- (3) The notice shall be given not later than –
- in every case, the date on which the notice required by bye-law 13(6) in relation to the building work is given; and
 - in the case of certifiable building work (within the meaning of bye-law 15), not more than 30 days after completion of the work.
- (4) For the purposes of this bye-law, the relevant technical guidance document is one concerning pressure testing in a building in order to determine heat gains and losses in the building from its pipes, ducts, and vessels, used for space heating, space cooling and hot water services.

17H Energy performance rate calculations

- (1) A person carrying out building work to construct a new building shall give notice of the calculated energy performance rate for the building, as constructed, to the Minister.
- (2) The notice shall be given not later than –
- the date on which the notice required by bye-law 13(6) is given in relation to the building work; and
 - at least 5 days before occupation of the building.

Exempt building and work.

Schedule 1 is altered as follows:

For Class 6(1)(c) and (d) of Schedule 1 to the principal bye-laws the following sub-paragraphs have been substituted –

- (c) its glazing satisfies requirement 10.1;
- (d) it does not cause a contravention of these bye-laws in respect of the dwelling or any service or fitting; and
- (e) in the case of an extension that is a conservatory –
 - (i) the extension is thermally separated from the dwelling with construction that achieves a maximum U-value of $2.0 \text{ W/m}^2 \text{ K}$ (where U represents how much thermal energy in watts (W) is transmitted through one square metre (m^2) of the construction at a temperature difference of one degree Kelvin (K) between the dwelling and the extension); and
 - (ii) the extension is constructed so that its external fabric achieves a maximum U-value of $2.0 \text{ W/m}^2 \text{ K}$ (where U represents how much thermal energy in watts (W) is transmitted through one square metre (m^2) of the external fabric at a temperature difference of one degree Kelvin (K) between the extension and the outside).

Section 0: General guidance

CONVENTIONS USED IN THIS DOCUMENT

1 In this document the following conventions have been adopted to assist understanding and interpretation:

- a Texts shown on a blue background are extracts from the Building Bye-laws as amended and convey the legal requirements that bear on compliance with Part 11. It should be remembered however that building works must comply with all the other relevant provisions.
- b Key terms are printed in **bold italic text** and defined for the purposes of this Technical Guidance Document in Section 5 of this document.
- c References given as footnotes and repeated as end notes are given as ways of meeting the requirements or as sources of more general information as indicated in the particular case. The Technical Guidance Document will be amended from time to time to include new references and to refer to revised editions where this aids compliance.
- d Additional *commentary in italic text* appears after some numbered paragraphs. The commentary is intended to assist understanding of the immediately preceding paragraph or sub-paragraph, but is not part of the approved guidance.

TYPES OF WORK COVERED BY THIS APPROVED DOCUMENT

2 This Technical Guidance Document is intended to give guidance in relation to works comprising:

- a The construction of new buildings other than **dwelling**s;
- b **fit-out works** where this is included as part of the construction of the building. TGD 11.2B is intended to apply to **fit-out works** in other circumstances.
- c The construction of extensions to existing buildings that are not dwellings where the **total useful floor area** of the extension is greater than 100m² and greater than 25% of the **total useful floor area** of the existing building.

3 When constructing a building that contains **dwelling**s, account should also be taken of the guidance in Technical Guidance Document 11.1A. In most instances, Technical Guidance Document 11.1A should be used for guidance relating to the work on the individual **dwelling**s, with this Technical

Guidance Document 11.2A giving guidance relating to the parts of the building that are not a **dwelling** such as heated common areas and, in the case of mixed-use developments, the commercial or retail space.

*It should be noted that **dwelling**s refer to self-contained units. **Rooms for residential purposes** are not **dwelling**s, and so Technical Guidance Document 11.2A applies to, for instance, guest houses, hostels and student accommodation blocks.*

4 If a building that is to be used for industrial or commercial purposes (e.g. a workshop or an office) also contains living accommodation, it should be treated as a **dwelling** if the industrial or commercial part could revert to domestic use on a change of ownership. This could be the case if:

- a. there is direct access between the industrial or commercial space and the living accommodation; and
- b. both are contained within the same thermal envelope; and
- c. the living accommodation occupies a substantial proportion of the total area of the building.

*Sub paragraph c) means that a small manager's flat in a large non-domestic building would not mean the whole building should be treated as a **dwelling**.*

TECHNICAL RISK

5 Building work must satisfy all the technical requirements set out in Bye-laws 5A, 5B, 17B, 17C and Schedule 2 of the Bye-laws. Part 2 (Fire safety), Part 3 (Combustion appliances and fuel storage systems), Part 4 (Site preparation and resistance to moisture), Part 5 (Ventilation), Part 9 (Resistance to the passage of sound), and Part 12 (Electrical safety) are particularly relevant when considering the incorporation of energy efficiency measures.

6 The inclusion of any particular energy efficiency measure should not involve excessive technical risk. BR 262⁵ provides general guidance on avoiding risks in the application of thermal insulation.

DEMONSTRATING COMPLIANCE

7 In the Minister's view, compliance with Part 11 and bye-law 17B would be demonstrated by meeting the five separate criteria as set out in the following paragraphs.

8 **Criterion 1:** the calculated energy rate for the building as constructed (the building energy rate,

⁵ BR 262 *Thermal insulation, Avoiding Risks, BRE 2001*

BER) must not be greater than the target rate (the target energy rate, TER) which is determined by following the procedures set out in paragraphs 15 to 20; and

This is required by Bye-law 17B - see page 8.

9 Criterion 2: the performance of the building fabric and the heating, hot water and fixed lighting systems should be no worse than the design limits set out in paragraphs 30 to 59; and

10 Criterion 3: demonstrate that the building has appropriate passive control measures to limit solar gains. The guidance given in paragraphs 60 to 62 of this Technical Guidance Document provides a way of demonstrating that suitable provisions have been made: and

The purpose is to limit solar gains to reasonable levels during the summer period, in order to reduce the need for air conditioning systems.

11 Criterion 4: the performance of the building, as built, is consistent with the prediction made in the **BER**. The procedures described in Section 2 can be used to show this criterion has been met; and

12 Criterion 5: The necessary provisions for enabling energy efficient operation of the building are put in place. The procedures described in Section 3 can be used to show this criterion has been met.

Modular buildings

13 Special considerations apply to modular and/ or portable buildings which may be created by dismantling, transporting and re-erecting on a different site. In those situations where the intended life of the building is more than one year, reasonable provision would be to follow the guidance in *Energy Performance Standards for Modular and Portable Buildings*⁶.

Buildings that are exempt from the requirements in Part 11

14 The provisions for exempting buildings and building work from the Building Bye-laws are set out in Bye-law 3.

⁶ *Energy Performance for Modular and Portable Buildings, Modular and Portable Buildings Association (MPBA) 2006. Available from www.mpba.biz*

Section 1: Design standards

BYE-LAWS.

15 New bye-law 17B states that:

17B New buildings

- (1) This bye-law applies where a new building is constructed.
- (2) The building, once constructed, shall not exceed the target rate of the energy performance rate for the building that has been specified in the relevant technical guidance document.
- (3) For the purposes of this bye-law, the relevant technical guidance document is one concerning minimum energy performance requirements for buildings and setting out a methodology of calculation for the energy performance of buildings.

In this Part, 'building' means an entire building or a part of a building, being a part designed, or altered, to have fixed building services that are separate from those of other parts of the building.

Target Energy Rate (TER)

16 The Target Energy Rate (**TER**) is the minimum energy performance requirement for new buildings approved by the Minister in accordance with Bye-law 17B. It is expressed in terms of energy used in kilowatt hours per year per square metre of the total useful floor area of the building (kWh/m²/year)

17 The **TER** must be calculated using one of the calculation tools that have been approved by the Planning and Environment Minister. Those tools include:

- a. The latest available version of the UK Governments' Simplified Building Energy Model (SBEM)⁷ for those buildings whose design features are capable of being adequately modelled by SBEM; or
- b. Other software tools which have been approved by the Minister.

As part of the submission to the Department the applicant must show that the software tool used is appropriate to the application.

18 The **TER** is calculated in two stages as described below.

- a. Firstly, use an approved calculation tool to calculate the Energy rate ($e_{\text{reference}}$) from a reference building with specified properties as described in paragraph 19.
- b. Secondly, adjust the Energy rate calculated in

step (a) according to the procedure outlined in paragraph 20.

19 The reference building must:

- a. be the same size and shape as the actual building; and
 - b. comply with the energy performance values set out in the detailed definition of the reference building as set out in the SBEM⁷ in respect of both the building fabric and the **fixed building services**. Under the specific circumstances set out in paragraph 73, the **air permeability** used in the calculation of the **TER** may be varied from the value set out in the detailed definition of the reference building as set out in the SBEM. Other values must not be varied; and
 - c. have the same area of vehicle access doors and **display windows** as the actual building; and
 - d. exclude any service that is not a **fixed building service** (such as vertical transport systems); and
 - e. have the same activity areas and heating in those areas as the actual building; and
 - f. be provided with a seasonal mixed mode cooling system as defined for the reference building in the current UK National Calculation Methodology, and
 - g. be subject to the occupancy times and environmental conditions (temperatures, illuminance, ventilation rate etc) in each activity area as defined by the standard data associated with the reference schedules; and
- It is recognised that in some cases, designers may vary illumination levels in the actual building from that specified in the reference. However, in order to make the comparison on a like for like basis, the reference and actual buildings should deliver the same level of service provision. In this way, the compliance check tests energy efficiency (W/m². 100 lux), not energy conservation (W/m²).*
- h. be subject to the climate defined by ASHRAE IWEC weather data for Jersey; and
 - i. assume grid mains electricity as the heating fuel where it is to be used in the actual building and LPG as the heating fuel in all other cases.
 - j. assume grid mains electricity will be used as the energy source for all other building services.
 - k. assume the most energy intensive fit-out specifications will be adopted throughout

⁷ Simplified Building Energy Model (SBEM) user manual and Calculations Tool, available at www.ncm.bre.co.uk

Table 1 Improvement factors and LZC benchmarks for use in the TER equation¹

(a) Improvement factor	(b) LZC benchmark
0.15	0.10

Note:

1. Thus, the TER is $e_{\text{reference}} \times (1-0.15) \times (1-0.1) = 0.765 \times e_{\text{reference}}$; an improvement over the ADL2 2002 standard of 23.5%

where a building is proposed for approval excluding **fit-out works** (for example "shell and core" building developments) and space is to be offered with a range of services options. In addition, any spaces should also comply with criterion 3.

For example, if a speculative shell and core office building has the potential to be fitted out as heated and naturally ventilated or air conditioned, the BER and TER at completion of the shell and core building works should be based on assuming that air-conditioning will be installed throughout. In addition to this the shell and core building should meet Criterion 3 (limiting solar gain).

Guidance on ways of showing fit-out works comply is given in TGD11.2B.

20 The **TER** is obtained from the following formula:

TER = $e_{\text{reference}} \times (1 - \text{improvement factor}) \times (1 - \text{LZC benchmark})$, where

- a 'improvement factor' is the improvement in energy efficiency as given in column (a) of Table 1.
- b 'LZC benchmark' is the benchmark provision for low and zero carbon (LZC) energy sources as given in column (b) of Table 1 (see paragraph 29 for additional guidance).

Designers can choose to include more renewable systems in their actual building than the LZC benchmark, although the extent to which this extra can be traded off against fabric measures is limited by paragraphs 31 to 36. A lesser renewable systems provision would have to be compensated by enhanced energy efficiency measures.

CRITERION 1 – ACHIEVING AN ACCEPTABLE BUILDING ENERGY RATE (BER)

21 To demonstrate that the requirement in Bye-law 17B has been met, the actual building's **BER** must be no greater (worse) than the **TER** calculated as set out in paragraphs 16 to 20.

Calculating the energy performance rate for the actual building – Bye-law 17H

22 The **BER** must be calculated using the same calculation tool as used for establishing the **TER**.

- a. The final calculation produced in accordance with Bye-law 17H must be based on the building as constructed, incorporating:
- any changes to the performance specifications that have been made during construction.
 - the measured air permeability, ductwork leakage and fan performances as commissioned.

23 Bye-law 17H is as follows.

- A person carrying out building work to construct a new building shall give notice of the calculated rate of energy performance for the building, as constructed, to the Minister.
- The notice shall be given not later than –
 - the date on which the notice required by bye-law 13(6) is given in relation to the building work; and
 - at least 5 days before occupation of the building.

24 In addition to this final calculation a preliminary calculation based on the plans and specification accompanying the building application must be provided. The calculation tool will give a firm indication of whether a design is compliant and it produces a list of those features of the design that are critical to achieving compliance.

Achieving the *TER*

28 Certain management features offer improved energy efficiency in practice. Where these management features are provided in the actual building, the *BER* can be reduced by an amount equal to the product of the factor given in Table 2.

29 In appropriate circumstances, LZC energy supply systems such as solar hot water, photovoltaic power, bio-fuels (e.g. wood fuels and oil blends), combined heat and power (at the building or community levels), and heat pumps can make substantial and cost effective contributions to achieving *TERs*. The 'Low or Zero Carbon Energy Sources – Strategic Guide'⁸ describes a range of possible systems and how their contribution to the *BER* can be assessed at the feasibility stage.

CRITERION 2: LIMITS ON DESIGN FLEXIBILITY

30 Whilst the approach to complying with Criterion 1 allows considerable design flexibility, Part 11 requires that reasonable provision should be made to limit heat gains and losses (Part 11.1(a)), and that energy efficient *fixed building services* and effective controls be provided (11.1(b)). These requirements would be met by specifying performance standards that are no worse than those given in paragraphs 31 to 59.

*Implementation of these standards alone will NOT achieve the *TER*; better performance will be required in some or all areas to meet the target.*

Design limits for envelope standards

31 This section sets out the design limits for the building fabric to meet requirements 11.1(a)(i).
U-values

32 U-values shall be determined in accordance with the methods and conventions as set out in BR 443: Conventions for U-value calculations⁹. The CAB/CWCT publication¹³ gives guidance on calculating thermal performance factors for curtain walling.

33 Table 3 sets out limits on design flexibility that are considered reasonable for the purposes of achieving the *energy efficiency requirements*:

- a. Column (a) sets out limits for area-weighted average U-values for the elements of the stated type.

The area-weighted average is calculated by summing the UA values of all elements of a given type (e.g. wall elements) and dividing by the total area of those same elements.

- b. column (b) gives limits for U-values for individual elements of the stated type.

To minimise condensation risk in localised parts of the envelope. An individual element is defined as those areas of the given element type that have the same construction details. In the case of windows, doors and rooflights, the assessment should be based on the whole unit (i.e. in the case of a window, the combined performance of the glazing and the frame).

34 When comparing against the values in Table 3, the U-value of a window, roof window or rooflight or personnel door can be taken as the value for either:

- a. the standard configuration set out in BRE 443; or
- b. the particular size and configuration of the actual unit.

SAP 2005 Table 6e gives values for different window configurations that can be used in the absence of test data or calculated values.

35 In buildings with high internal gains, a less demanding area weighted average U-value for the glazing may be an appropriate way of reducing the need for cooling and hence the *BER*. If this case can be made, then the average U-value for windows can be relaxed from the values given in column (a) of Table 3. However values should be no worse than 2.7W/m²·K. The limit for individual glazing elements given in column (b) should not be exceeded unless there are exceptional circumstances.

Table 2 **Enhanced management and control features**

Features	Adjustment factor
Automatic monitoring and targeting with alarms for out of range values	0.050
Power factor correction to achieve a whole-building power factor of at least 0.90 ¹	0.010
Power factor correction to achieve a whole building power factor of at least 0.95 ¹	0.025

Notes:

1. The power factor adjustment can only be taken if the whole building power factor is corrected to the level stated. The two levels of power factor correction are alternative values, not additive

⁸ *Low or Zero Carbon Energy Sources: Strategic Guide NBS, 2006*

⁹ *BR 443 Conversions for U value Calculations, BRE, 2006*

Table 3 Limiting U-value standards (W/m².K)

Element	(a) Area-weighted average	(b) For any individual element
Wall	0.35	0.70
Floor	0.25	0.70
Roof	0.25	0.35
Windows ¹ , roof windows, rooflights ² and curtain walling	2.2	3.3
Pedestrian doors	2.2	3.0
Vehicle access and similar large doors	1.5	4.0
High usage entrance doors	6.0	6.0
Roof ventilators (inc smoke vents)	6.0	6.0

Notes:

1. Excluding **display windows** and similar glazing. There is no limit on design flexibility for these exclusions but their impact on energy performance must be taken into account in calculations.
2. The U-value for roof windows and roof lights in this table are based on the U-value having been assessed with the roof windows or rooflight in the vertical position. If a particular unit has been assessed in a plane other than the vertical, the standards given in this Technical Guidance Document should be modified by making an adjustment that is dependent on the slopes of the unit following the guidance given in BR 443

Air permeability

36 A reasonable limit for the **design air permeability** is 10m³/(h.m²) @ 50 Pa. Guidance on some ways of achieving this is given in the TSO publication on robust construction details¹⁰.

Better standards of air permeability are technically desirable in buildings with mechanical ventilation and air conditioning.

Design limits for building services

37 This section sets out the design limits for **fixed building services** to meet requirement 11.1(b).

Controls

38 Systems should be provided with appropriate controls to enable the achievement of reasonable standards of energy efficiency in use. In normal circumstances, the following features would be appropriate for heating, ventilation and air conditioning system controls:

- a. The systems should be sub-divided into separate control zones to correspond to each area of the building that has a significantly different solar exposure, or pattern, or type of use; and
- b. Each separate control zone should be capable of independent timing, and temperature control, and, where appropriate ventilation and air recirculation rate; and
- c. The provision of the service should respond to the requirements of the space it serves. If both heating and cooling are provided, they should

be controlled so as not to operate simultaneously; and

- d. Central plant should only operate as and when the zone systems require it. The default condition should be off

39 In addition to these general control provisions, the systems should meet specific control and efficiency standards as set out in the paragraphs below.

Energy meters

40 Reasonable provision for energy meters would be to install energy metering systems that enable: at least 90% of the estimated annual energy consumption of each fuel to be assigned to the various end-use categories (heating, lighting etc.). Detailed guidance on how this can be achieved is given in CIBSE TM 39¹¹; and

- a. the performance of any LZC system to be separately monitored; and
- b. in buildings with a **total useful floor area** greater than 1000m², automatic meter reading and data collection facilities.

Heating and hot water service system(s)

41 Reasonable provision for the performance of heating and hot water service systems would be to follow the guidance in the Non-domestic Building Services Compliance Guide¹², in providing:

- a. suitably efficient heating plant; and
- b. effective control systems.

¹⁰ Limiting Thermal Bridging and Air Leakage: Robust construction details for dwellings and similar buildings, Amendment 1, TSO 2002. See www.est.org.uk

¹¹ TM 39 Building Energy Metering, CIBSE, 2006

¹² Non-domestic Building Services Compliance Guide, 2010 Edition.

The checklists included in the Non-domestic Building Services Compliance Guide can help in demonstrating that reasonable provision has been made.

Cooling plant

*The carbon emissions associated with the operation of cooling systems are comparatively severe. Reducing solar and internal heat gains and arranging plant and control systems to match the demand effectively over the cooling season can therefore significantly reduce the **BER**.*

42 Reasonable provision for the performance of cooling systems would be to follow the guidance in the Non-domestic Building Services Compliance Guide in providing:

- a. suitably efficient cooling plant; and
- b. effective control systems.

The checklists included in the Non-domestic Building Services Compliance Guide can help in demonstrating that reasonable provision has been made.

Air handling plant

43 Reasonable provision for the performance of air handling plant would be to follow the guidance in the Non-domestic Building Services Compliance Guide in providing:

- a. suitable efficient air handling plant; and
- b. effective control systems.

44 In addition, the system should be capable of achieving a **specific fan power** at 25% of design flow rate no greater than that achieved at 100% design flow rate. Reasonable provision for ventilation system fans rated at more than 1,100 Watts would be to equip them with variable speed drives.

Following this guidance would facilitate commissioning and provide flexibility for future changes of use. The guidance is not applicable to smoke control fans and similar ventilation systems only used in abnormal circumstances

45 In order to limit air leakage, ventilation ductwork should be made and assembled so as to be reasonably airtight. One way of achieving this would be to comply with the specifications given in HVCA DW/144¹³.

Insulation of pipes, ducts and vessels

46 Reasonable provision for compliance with Part 11.1(a)(ii) would be demonstrated by insulating pipes, ducts and vessels to standards not less than those set out in the Non-domestic Building Services Compliance Guide.

¹³ DW/144 Specification for Sheet Metal Ductwork, HVCA, 1998

General lighting efficacy in office, industrial and storage areas in all building types

47 For the purposes of this Technical Guidance Document, office areas include those spaces that involve predominantly desk-based tasks, including classrooms, seminar rooms and conference rooms, including those in schools.

48 Reasonable provision would be to provide lighting with an average initial efficacy of not less than 45 luminaire-lumens/circuit-Watt as averaged over the whole area of these types of space in the building.

This allows design flexibility to vary the light output ratio of the luminaire and the luminous efficacy of the lamp.

49 The average luminaire-lumens/circuit-Watt is calculated by:

(Lamp lumens x LOR) summed for all luminaires in the relevant areas of the building, divided by the total circuit Watts for all the luminaires where:

Lamp lumens = the sum of the average initial (100 hour) lumen output of all the lamp(s) in the luminaire and

LOR = the light output ratio of the luminaire, i.e. the ratio of the total light output under stated practical conditions to that of the lamp or lamps contained in the luminaire under reference conditions.

*Note that in Technical Guidance Document 11.2B, this equation is modified to include the impact of lighting controls. This is not appropriate in Technical Guidance Document 11.2A, where the calculation tool used to determine the **BER** accounts for the impact of controls.*

General lighting efficacy in all other types of space

50 For lighting systems serving other types of space, it may be appropriate to provide luminaires for which photometric data is not available and/or are lower powered and use less efficient lamps. For such spaces, the requirement would be met if the installed lighting has an average initial (100 hour) lamp plus ballast efficacy of not less than 50 lamp lumens per circuit-Watt.

Controls for general lighting in all types of spaces

51 Lighting controls should be provided so as to avoid unnecessary lighting during the times when daylight levels are adequate or when spaces are unoccupied.

For safety reasons automatically switched lighting systems should be subjected to risk assessment which may indicate safety should take precedence over energy efficiency.

52 Reasonable provision would be local switches in easily accessible positions within each working area, or at boundaries between working areas and general

circulation routes, that are manually operated by the deliberate action of the occupants.

Manual switches include rocker switches, push buttons and pull cords and remote switching devices such as wireless transmitters and telephone handsets.

53 For the purposes of this Technical Guidance Document, switches include dimmer switches and switching includes dimming. It would usually be reasonable for dimming to be effected by reducing rather than diverting the energy supply.

54 The distance on plan from any local switch to any luminaire it controls should generally be not more than six metres or twice the height of the luminaire above the floor if this is greater. Where a space is a **daylit space** served by side windows, it would be reasonable for the perimeter row of luminaires to be separately switched.

55 Occupant control of local switching can be supplemented by other controls such as automatic systems which:

- a switch the lighting off when they sense the absence of occupants; or
- b either dim or switch off the lighting when there is sufficient daylight. When installed in appropriate locations, such control systems can make a useful contribution towards reducing the **BER**.

56 A way of meeting the requirement would be to follow the recommendations in BRE Digest 498¹⁴.

Display lighting in all types of space

57 Reasonable provision for **display lighting** would be to demonstrate that the installed **display lighting** has an average initial (100 hour) efficacy of not less than 15 lamp-lumens per circuit-watt. In calculating this efficacy, the power consumed by any transformers or ballasts should be taken into account

58 Spaces where **display lighting** is present would normally be expected to also have general lighting used for circulation and for purposes of cleaning and restocking outside public access hours. Paragraphs 47 to 56 apply to this general lighting, depending on the type of space.

Controls for display lighting in all types of space

59 A way of meeting the requirement would be to connect **display lighting** in dedicated circuits that can be switched off at times when people will not be inspecting exhibits or merchandise or attending entertainment events. In a retail store, for example, this could include timers that switch the **display lighting** off outside store opening hours, except for displays designed to be viewed from outside the building through **display windows**.

CRITERION 3: LIMITING THE EFFECTS OF SOLAR GAINS IN SUMMER

60 This section sets out the approach to limiting heat gains as required by requirement 11.1(a) (i) of Schedule 2 to the Building bye-laws.

The following guidance applies to all buildings, irrespective of whether they are air conditioned or not. The intention is to limit solar gains during the summer period to either:

- a reduce the need for air-conditioning; or
- b reduce the installed capacity of any air-conditioning system that is installed.

If the criterion set out below is satisfied in the context of a naturally ventilated building, this is NOT evidence that the internal environment of the building will be satisfactory, since many factors that are not covered by the compliance assessment procedure will have a bearing on the incidence of overheating (incidental gains, thermal capacity, ventilation provisions, etc.).

Therefore the developer should work with the design team to specify what constitutes an acceptable indoor environment in the particular case, and carry out the necessary design assessments to develop solutions that meet the agreed brief. Some ways of assessing overheating risk are given in CIBSE TM37¹⁶ and, for education buildings, in BB101¹⁷.

61 For the purposes of Part 11, reasonable provision for limiting solar gain through the building fabric would be demonstrated by showing that, for each space in the building that is either occupied or mechanically cooled, the solar gains through the glazing aggregated over the period from April to September inclusive are no greater than would occur through one of the following reference glazing systems with a defined total solar energy transmittance (g-value) calculated according to BS EN 410¹⁸:

- a For every space that is defined in the NCM database as being side lit, the reference case is an east-facing façade with full-width glazing to a height of 1.0m having a framing factor of 10 per cent and a normal solar energy transmittance (g-value) of 0.68.
- b For every space that is defined in the NCM database as being top lit, and whose average zone height is not greater than 6m, the reference case is a horizontal roof of the same total area that is 10 per cent glazed as viewed from the inside out and having rooflights that have a framing factor of 25 per cent and a normal solar energy transmittance (g-value) of 0.68.
- c For every space that is defined in the NCM database as being top lit and whose average

¹⁴ BRE Digest 498 *Selecting Lighting Controls*, BRE 2006.

zone height is greater than 6m, the reference case is a horizontal roof of the same total area that is 20 per cent glazed as viewed from the inside out and having rooflights that have a framing factor of 15 per cent and a normal solar energy transmittance (g-value) of 0.46;

In double-height industrial-type spaces, dirt on the rooflights and internal absorption within the rooflight reduce solar gains. These effects, combined with temperature stratification, will reduce the impact of solar gains in the occupied space and so increased rooflight area may be justified. In such situations, the developer should pay particular attention to the design assessments referred to in paragraph 61 b.

- d. For the purpose of this specific guidance, an occupied space means a space that is intended to be occupied by the same person for a substantial part of the day. This excludes circulation spaces, and other areas of transient occupancy, such as toilets, as well as spaces that are not intended for occupation (e.g. display windows).

¹⁶ TM37 Design for improved solar shading control, CIBSE, 2006

¹⁷ Ventilation of school buildings, Building Bulletin 101, School Building and Design Unit, Department for Education and Skills, 2006 See HYPERLINK "<http://www.teachernet.gov.uk/iaq>" www.teachernet.gov.uk/iaq

¹⁸ BS EN 410 Glass in building: Determination of luminous and solar characteristics of glazing, BSI 1998

Section 2: Quality of construction

CRITERION 4 – QUALITY OF CONSTRUCTION AND COMMISSIONING

63 Buildings should be constructed and equipped so that performance is consistent with the predicted **BER**. As indicated in paragraph 23(b), a final calculation of the **BER** is required to reflect:

- a. any changes in performance between design and construction; and
- b. the achieved **air permeability**, ductwork leakage and commissioned fan performance.

Building fabric

64 The building fabric should be constructed to a reasonable quality so that:

- a. The insulation is reasonably continuous over the whole building envelope; and
- b. the **air permeability** is within reasonable limits.

Continuity of insulation

65 The building fabric should be constructed so that there are no reasonably avoidable thermal bridges in the insulation layers caused by gaps within the various elements, at the joints between elements and at the edges of elements such as those around window and door openings.

66 Reasonable provision would be to:

- a. Adopt design details such as
 - i. For construction styles similar to **dwelling**s, details from *Limiting thermal bridging and air leakage*; or

These might apply to small-scale buildings such as shops and community centres etc

- ii. For cladding systems, to adopt the guidance given in the MCRMA Technical note¹⁵; or
- b. to demonstrate that the specified details deliver an equivalent level of performance using the guidance in BRE IP 1/06¹⁶.

67 In addition, the builder should have an appropriate system of site inspection in place to give confidence that the construction procedures achieve the

¹⁵ Guidance for design of metal cladding and roofing to comply with Approved Document L2, MCRMA. www.mcrma.co.uk

¹⁶ IP 1/06 Assessing the Effects of Thermal Bridging at Junctions and Around Openings in the external elements of building, BRE, 2006

required standards of consistency. For those using the accredited details approach (paragraph 66(a)) a way of achieving this would be to produce a report demonstrating that the construction checklists such as those included in the accredited design details publication have been completed and show satisfactory results.

Such reports should be signed by a suitably qualified person.

Air permeability and pressure testing

68 Bye-law 17F states that:

17F Calculations and targets

- (1) This bye-law applies to a building in relation to which requirement 11.1(a)(i) applies.
- (2) A person carrying out building work to construct the building shall ensure that pressure testing is carried out on the building in such circumstances, and in accordance with such procedures, as are set out in the relevant technical guidance document.
- (3) The person carrying out the building work shall give notice of the results of the pressure testing to the Minister not later than 7 days after the testing is completed.
- (4) The notice shall set out the results of the testing and the data on which they are based in the manner set out in the relevant technical guidance document.
- (5) For the purposes of this bye-law, the relevant technical guidance document is one concerning pressure testing in a building in order to determine heat gains and losses in the building from its thermal elements and other parts of its building fabric.

69 The circumstances under which the Minister requires pressure testing to be carried out are set out in paragraph 71.

70 The approved procedure for pressure testing is given in the ATTMA publication 'Measuring Air Permeability of Building Envelopes'¹⁷. The manner approved for recording the results and the data on which they are based is given in section 4 of that document.

71 All buildings that are not **dwelling**s (including extensions which are being treated as new buildings for the purposes of complying with Part 11) must be subject to pressure testing, with the following exceptions:

- a. buildings less than 500m² **total useful floor**

¹⁷ *Measuring Air Permeability of Building Envelopes, Air Tightness Testing and Measurement Association (ATTMA) 2006*

area; in this case the developer may choose to avoid the need for a pressure test provided that the air permeability used in the calculation of the **BER** is taken as $15\text{m}^3/(\text{h}\cdot\text{m}^2)$ @ 50Pa.

*Compensating improvements in other elements of the building fabric and building services will be needed to keep the **BER** no worse than the **TER**.*

- b. factory-made modular buildings where no site assembly work is needed; provided that the particular module type has been subjected to an in-situ test programme and certified by an approved pressure testing firm as having satisfactory **design air permeability** and that this is routinely achieved on site.

Site based testing is necessary to demonstrate the building is sufficiently robust to resist flexure during lifting and transportation.

- c. Large extensions (whose compliance with Part 11 is being assessed as if they were new buildings, Technical Guidance Document 11.2B refers) where sealing off the extension from the existing building is impractical. The ATTMA publication gives guidance both on how extensions can be tested and situations where pressure tests are inappropriate. Where it is agreed with the Department that testing is impractical, the extension should be treated as a large, complex building, with the guidance in paragraph 71(d) then applying.
- d. Large complex buildings, where due to building size or complexity, it may be impractical to carry out pressure testing of the whole building. The ATTMA publication indicates those situations where such considerations might apply. Before adopting this approach developers must produce in advance of construction work in accordance with the approved procedure a detailed justification of why pressure testing is impractical. This should be endorsed by a suitably qualified person such as a Competent Person approved for pressure testing. In such cases, a way of showing compliance would be to appoint a suitably qualified person to undertake a detailed programme of design development, component testing and site supervision to give confidence that a continuous air barrier will be achieved. In such cases it would not be reasonable to claim **air permeability** better than $5\text{m}^3/(\text{h}\cdot\text{m}^2)$ @ 50Pa has been achieved.
- e. Compartmentalised buildings; where buildings are compartmentalised into self-contained units with no internal connections it may be impractical to carry out whole building pressure tests. In such cases reasonable provision would be to carry out a pressure test on a representative area of the building as detailed in the ATTMA guidance. In the event of a test failure, the provisions of paragraphs 72 and 75 would apply, but it would be

reasonable to carry out a further test on another representative area to confirm that the expected standard is achieved in all parts of the building.

One example of a suitably qualified person would be an ATTMA member. The $5.0\text{m}^3/\text{hour}\cdot\text{m}^2$ at 50Pa limit has been set because at higher standards, the actual level of performance becomes too vulnerable to single point defects in the air barrier.

72 Compliance with the requirement in Part 11.1(a)(i) would be demonstrated if:

- a. the measured **air permeability** is not worse than the limit value set out in paragraph 36; and
- b. the **BER** calculated using the measured **air permeability** is not worse than the **TER**.

*If it proves impractical to meet the design **air permeability**, any shortfall must be compensated through improvements to subsequent fit-out activities. Builders may therefore wish to schedule pressure tests early enough to facilitate remedial work on the building fabric, e.g. before false ceilings are up.*

Consequences of failing a pressure test

73 If satisfactory performance is not achieved, then remedial measures should be carried out on the building and new tests carried out until the building achieves the criteria set out in paragraph 72. Alternatively, the **TER** should be revised by substituting the measured **air permeability** for the value given in the detailed definition of the reference building as set out in the SBEM to demonstrate that the **BER** is no worse than the revised **TER**.

COMMISSIONING OF THE BUILDING SERVICES SYSTEMS

74 The building services systems should be commissioned so that at completion, the system(s) and their controls are left in working order and can operate efficiently for the purposes of the conservation of fuel and power. Bye-law 17G states that:

17G Commissioning

- (1) This bye-law applies to a building in relation to which requirement 11.1(b) applies and building work is carried out, but does not apply where the building work consists only of exempt electrical certifiable work (within the meaning of bye-law 15).
- (2) The person carrying out the building work shall give to the Minister a notice confirming that the relevant fixed building services have been commissioned in accordance with the

procedure set out in the relevant technical guidance document.

- (3) The notice shall be given not later than –
- (a) in every case, the date on which the notice required by bye-law 13(6) in relation to the building work is given; and
 - (b) in the case of certifiable building work (within the meaning of bye-law 15), not more than 30 days after completion of the work.
- (4) For the purposes of this bye-law, the relevant technical guidance document is one concerning pressure testing in a building in order to determine heat gains and losses in the building from its pipes, ducts, and vessels, used for space heating, space cooling and hot water services.

75 The procedure approved by the Minister is that set out in:

- a. CIBSE Commissioning Code M on Commissioning Management¹⁸; and

This provides guidance on the overall process and includes a schedule of all the relevant guidance documents relating to the commissioning of specific building services systems.

- b. The procedures for leakage testing of ductwork are given in paragraph 77.

76 The notice should include a declaration confirming that:

- a. a commissioning plan has been followed so that every system has been inspected and commissioned in an appropriate sequence and to a reasonable standard; and
- b. the results of tests confirm that the performance is reasonably in accordance with the actual building designs, including written commentaries where excursions are proposed to be accepted.

Declarations should be signed by someone suitably qualified by relevant training and experience. A way of achieving this would be to employ a member of the Commissioning Specialists Association or the Commissioning Group of the HVCA in respect of HVAC systems or a member of the Lighting Industry Commissioning Scheme in respect of fixed internal or external lighting.

Air leakage testing of ductwork

77 Ductwork leakage testing should be carried out in accordance with the procedures set out in HVCA

DW/143¹⁹ on systems served by fans with a design flow rate greater than 1m³/s and for those sections of ductwork where:

- a. the pressure class is such that DW/143 recommends testing; and
- b. the **BER** calculation assumes a leakage rate for a given section of ductwork that is lower than the standard defined in DW/144 for its particular pressure class. In such cases, any low pressure ductwork should be tested using the DW/143 testing provisions for medium pressure ductwork.

Membership of the HVCA specialist ductwork group or the Association of Ductwork Contractors and Allied Services could be a way of demonstrating suitable qualifications for this testing work.

78 If a ductwork system fails to meet the leakage standard, remedial work should be carried out as necessary to achieve satisfactory performance in re-tests and further ductwork sections should be tested as set out in DW/143.

¹⁸ CIBSE Code M: *Commissioning Management*, CIBSE 2003, ISBN 1 90328 733 2

¹⁹ DW/143 *A Practical Guide to Ductwork Leakage Testing*, HVCA, 2000

Section 3: Operating and Maintenance Instructions

CRITERION 5 – PROVIDING INFORMATION

79 In accordance with Requirement 11.1(c), the owner of the building should be provided with sufficient information about the building, the **fixed building services** and their maintenance requirements so that the building can be operated in such a manner as to use no more fuel and power than is reasonable in the circumstances.

Building log-book

80 A way of showing compliance would be to produce information following the guidance in CIBSE TM 31 Building Log Book Toolkit²⁰. The information should be presented in templates as or similar to those in the TM. The information could draw on or refer to information available as part of other documentation, such as the Operation and Maintenance Manuals and the Health and Safety file required by the CDM Regulations.

81 The data used to calculate the **TER** and the **BER** should be included in the log-book.

It would also be sensible to retain an electronic copy of the input file for the energy calculation to facilitate any future analysis that may be required by the owner when altering or improving the building.

²⁰ TM 31 Building Log Book Toolkit, CIBSE, 2006

Section 4: Model Designs

82 Some builders may prefer to adopt model design packages rather than to engage in design for themselves. Such model packages of fabric U-values, boiler seasonal efficiencies, window opening allowances etc would achieve compliant overall performance within certain constraints. The construction industry may develop model designs for this purpose and make them available on the Internet at www.modeldesigns.info

83 It will still be necessary to demonstrate compliance in the particular case by going through the procedures described in paragraphs 7 to 12.

Section 5: Definitions

84 For the purposes of this Technical Guidance Document, the following definitions apply.

85 Air permeability is the physical property used to measure airtightness of the building fabric. It is defined as air leakage rate per envelope area at the test reference pressure differential across the building envelope of 50 Pascal (50N/m²). The envelope area of the building, or measured part of the building, is the total area of all floors, walls and ceilings bordering the internal volume subject to the test. This includes walls and floors below external ground level. Overall internal dimensions are used to calculate this area and no subtractions are made for the area of the junctions of internal walls, floors and ceilings with exterior walls, floors and ceilings.

86 BER is the Building Energy Rate.

87 Daylit space means any space:

- a. within 6m of a window wall, provided that the glazing area is at least 20% of the internal area of the window wall; or
- b. below rooflights and similar provided that the glazing area is at least 10% of the floor area. The normal light transmittance of the glazing should be at least 70%, or, if the light transmittance is reduced below 70%, the glazing area could be increased proportionately.

88 Design air permeability is the value of **air permeability** selected by the building designer for use in the calculation of the **BER**.

89 Display window means an area of glazing, including glazed doors, intended for the display of products or services on offer within the building, positioned:

- a. at the external perimeter of the building;
- b. at an access level and immediately adjacent to a pedestrian thoroughfare.

There should be no permanent workspace within one glazing height of the perimeter. Glazing more than 3m above such an access level should not be considered part of a **display window** except:

- a. Where the products on display require a greater height of glazing;
- b. In existing buildings, where replacing display windows that already extend to a greater height;
- c. In cases of building work involving changes to the façade and glazing requiring planning consent, where planners should have discretion to require a greater height of glazing, e.g. to fit in with surrounding buildings

or to match the character of the existing façade.

It is expected that **display windows** will be found in buildings in use classes A1, A2, A3 and D2 as detailed in Table 5.

90 Display lighting means lighting intended to highlight displays of exhibits or merchandise, or lighting used in spaces for public leisure and entertainment such as dance halls, auditoria, conference halls, restaurants and cinemas.

91 Dwelling means a self-contained unit designed to accommodate a single household.

Rooms for residential purposes are not dwellings so *Technical Guidance Document 11.2A is applicable to their construction.*

92 Emergency escape lighting means that part of emergency lighting that provides illumination for the safety of people leaving an area or attempting to terminate a dangerous process before leaving an area.

93 Energy efficiency requirements means the requirements of Bye-laws 5A, 5B Part 3A and Part 11 of schedule 2.

94 Fit-out work means that work needed to complete the partitioning and building services within the external fabric of the building (the shell) to meet the specific needs of incoming occupiers. **Fit-out work** can be carried out in whole or in parts:

- a. In the same project and time frame as the construction of the building shell; OR
- b. At some time after the shell has been completed.

95 Fixed building services means –

- (a) a fixed internal or external lighting system (other than an emergency escape lighting system or a specialist process lighting system); or
- (b) a fixed system for heating, providing hot water, providing air conditioning or providing mechanical ventilation;

96 High usage entrance door means a door to an entrance primarily for the use of people that is expected to experience large traffic volumes, and where robustness and/or powered operation is the primary performance requirement. To qualify as a **high usage entrance door**, the door should be equipped with automatic closers, and except where operational requirements preclude, be protected by a lobby.

Table 5 **Building classes**

Class	Use
A1	Shops including retail-warehouse, undertakers, showrooms, post offices, hairdressers, shops for sale of cold food for consumption off the premises
A2	Financial and professional services, banks, building societies, estate and employment agencies, betting offices
A3	Food and drink restaurants, pubs, wine bars, shops for sale of hot food for consumption off premises
D2	Assembly and leisure cinemas, concert halls, bingo halls, casinos, sports and leisure uses

97 Room for residential purposes is defined in Bye-law (1) as follows:

“room for residential purposes” means a room, or suite of rooms –

- (a) that is not a dwelling house or flat; and
- (b) that is used by one or more persons to live and sleep in, and includes rooms in hotels, hostels, guest houses, halls of residence and residential homes but does not include rooms in hospitals, or similar establishments, used for patient accommodation;

98 Specialist process lighting means lighting intended to illuminate specialist tasks within a space, rather than the space itself. It could include theatre spotlights, projection equipment, lighting in TV and photographic studios, medical lighting in operating theatres and doctors’ and dentists’ surgeries, illuminated signs, coloured or stroboscopic lighting, and art objects with integral lighting such as sculptures, decorative fountains and chandeliers.

99 TER is the Target Energy Rate.

100 Total useful floor area is the total area of all enclosed spaces measured to the internal face of the external walls, that is to say it is the gross floor area as measured in accordance with the guidance issued to surveyors by the RICS. In this convention:

- a the area of sloping surfaces such as staircases, galleries, raked auditoria, and tiered terraces should be taken as their area on plan; and
- b areas that are not enclosed such as open floors, covered ways and balconies are excluded.

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www.narm.org.uk

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