Approved Document Part L 2010: special edition

Technical Extra

September 2011 | Issue 03

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NHBC

Foreword

Welcome to this special edition of *Technical Extra*, which focuses on the challenges for house builders of complying with Part L 2010 of the Building Regulations in England and Wales.

Similar requirements will soon exist in Scotland, Northern Ireland and the Isle of Man, and much of the information will be relevant to all registered builders, regardless of location.

The revised Approved Document L1A was published last October and marks a key milestone in the industry's transition towards the zero carbon future. The transitional arrangements mean that most new homes currently under construction need to comply with the previous 2006 edition, but that will gradually change over forthcoming months and years, with an increasing proportion needing to comply with the 2010 edition.

The overall aim of achieving a reduction in carbon dioxide emissions of 25% is challenging and will require significant changes to specification, design and detailing. I do hope that you will find this guide useful in helping to rise to this challenge.

As ever, NHBC is here to help and contact details are included in the Information and Support section at the back of this edition if you would like to discuss specific issues in more detail. Or you can email us at **technicalextra@nhbc.co.uk**.

Electronic copies of this document can also be found on our website: **www.nhbc.co.uk//techextra**.

Ian Davis

NHBC Operations Director

Glossary of terms used in this edition

ACD Accredited construction details.

ALT Air leakage tester.

APR Air permeability rate, expressed as m^3 of air flow per hour per m^2 of dwelling envelope area at a pressure differential of 50 Pascals, $m^3/(h.m^2)$ @ 50Pa.

ATTMA Air Tightness Testing and Measurement Association.

BCB Building Control Body.

BINDT British Institute of Non-Destructive Testing.

CO_2 Carbon dioxide – the main greenhouse gas.

DER Dwelling Emission Rate – the calculated CO_2 emissions of an actual dwelling in kilograms per m^2 of floor area per annum, $kg/(m^2yr)$.

EPC Energy Performance Certificate.

SAP Standard Assessment Procedure – the Building Regulations methodology for calculating CO_2 emissions for dwellings.

SEDBUK Seasonal Efficiency of Domestic Boilers in the UK – the methodology used to calculate the performance figures contained in HM Government's Boiler Efficiency Database.

TER Target Emission Rate – the calculated CO_2 emissions of a notional dwelling in kilograms per m^2 of floor area per annum, $kg/(m^2yr)$. The DER must be no higher than the TER to meet Part L requirements.

TMP Thermal Mass Parameter – the heat capacity of the dwelling in kilojoules per m^2 of floor area per degree, $kJ/(m^2K)$.

y y-value – the overall dwelling heat loss due to thermal bridging at junctions, expressed in Watts per m^2 of exposed dwelling area per degree, $W/(m^2K)$.

Ψ Ψ-value (or 'psi-value') – the heat loss due to thermal bridging at a junction, expressed in Watts per linear metre of the junction per degree, W/(mK).

REGULATION AND COMPLIANCE

Approved Document Part L 2010

Who should read this: Technical and construction directors and managers; architects and designers; energy assessors; site managers.

INTRODUCTION

In April 2010, the Government's Department for Communities and Local Government informed the industry of revised requirements for Parts L, F and J of the Building Regulations 2000, and the publication of six supporting Approved Documents (L1A, L1B, L2A, L2B, F and J), and two second tier documents (the Domestic Ventilation Compliance Guide and the Domestic Building Services Compliance Guide).

- Part L deals with the conservation of fuel and power.
- Part F deals with ventilation.
- Part J deals with combustion appliances and fuel storage systems.

This special edition of *Technical Extra* reviews the changes to Approved Document L1A (ADL1A 2010) which refers to new dwellings, clarifies the new requirements and identifies sources of guidance on how to meet them. It covers both the technical and compliance requirements, including the requirements of service providers such as energy assessors and air leakage testers.

Whilst the focus of this issue is ADL1A in England and Wales, similar requirements apply in Scotland (Building Standards Section 6), Northern Ireland (Part F) and the Isle of Man (Part L).

Sources of additional information on how NHBC can help you are included in the Information and Support section at the back of this issue.

Transitional provisions end on 30 September 2011 (see box on page 2), after which the new Regulations will be fully in force, so it is important to understand how these changes will affect your developments after this date.

Changes to Approved Documents F and J will be covered in *Technical Extra 4*.

KEY CHANGES AND TRANSITIONAL PROVISIONS

The key changes to Approved Document L1A for new dwellings, from 1 October 2010, are as follows:

- **Changed:** Target Emission Rate (TER) is now set approximately 25% lower (i.e. more stringent) than the previous Regulations in 2006. This means that, from 2010, new homes must be designed to emit 25% less CO_2 using a variety of means, including reducing the heat loss and improving the building services.
- **New:** TER and Dwelling Emission Rate (DER) calculations, with supporting information, must be submitted to the Building Control Body (BCB) **prior** to works starting on site. This is in addition to the previous requirement to submit after completion, and is to enable BCBs to check that the home is actually built according to its approved design.
- **New:** Notional dwelling used for the TER assumes a party wall U-value of 0.0W/(m^{2}K), i.e. a non-heat loss wall. The DER, however, assumes that there **is** some heat loss through a cavity party wall unless specific measures are taken to prevent it.
- **Changed:** More detailed calculation of thermal bridges at junctions, based on the length of each junction and its ψ-(psi) value. A simpler approach based on the overall y-value can still be used but, in that instance, an extremely conservative value must be assumed.
- **Changed:** Limiting U-values have been strengthened.
- **Changed:** Amount of on-site air leakage testing is increased. For large developments, this can be many times the previous requirement. Emphasis is placed on the early phases of the development. Smaller developments can opt not to test, but use a very conservative default figure instead.

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KEY CHANGES AND TRANSITIONAL PROVISIONS (CONTINUED)

- **New:** Full-site air leakage testing is encouraged; for dwellings which are **not** tested for air permeability, the as-built DER calculation must assume the average of the test results achieved for the other dwellings of that type, **plus a penalty**.
- **Changed:** Secondary heating systems are only included in calculations if they are actually provided by the builder (i.e. 2006 default assumption removed).
- **Changed:** Low energy lights are given full credit up to the amount provided (previously fixed at 30% of lighting provision).
- **New:** Thermal mass of the building now affects the DER as well as the likelihood of summertime overheating.
- **New:** Cooling and air conditioning energy use is now included in the DER calculation.
- **Changed:** Previous exemption for conservatories and porches is only allowed if there is thermal separation from the main dwelling **and** the heating system is not extended into the conservatory/porch.

Photograph by Kippa Matthews and courtesy of Joseph Rowntree Foundation

Transitional provisions

The new requirements of ADL1A came into effect on 1 October 2010. However, the requirements do not apply to sites where:

- work on site commenced prior to 1 October 2010, or
- an Initial Notice has been given or full-plans building notice deposited with the local authority prior to 1 October 2010, provided work commences on site prior to 1 October 2011.

There are supplementary provisions for cases where an Initial Notice was given before 1 October 2010 and then varied by an amendment notice given on or after that date. Work added to the scope of the Initial Notice by such an amendment notice will be subject to the amended (2010) regulations.

For the avoidance of doubt, the following work constitutes site commencement:

- Excavation for a foundation.
- Installation of a length of drain or a manhole.
- Formation of a raft foundation.
- Pile installation.

Target Emission Rate and Dwelling Emission Rate (SAP calculations)

REQUIREMENTS

The annual CO_2 emission rate of the dwelling (the 'dwelling emission rate', or DER) must be calculated using the Standard Assessment Procedure (SAP) 2009, version 9.90. The DER must not exceed the target set by reference to a notional dwelling (the 'target emission rate', or TER), which represents an overall improvement of 25% relative to the previous ADL1A, 2006.

The notional dwelling assumes that all party walls have zero heat losses when its TER is calculated. The default assumption for the DER, however, is that heat loss **does** occur through cavity party walls due to external ventilation of the cavity. Hence, a cavity party wall will have a detrimental effect on the DER unless specific measures are taken to reduce the heat loss. This will be discussed in more detail on page 12.

Unlike in ADL1A 2006, it is no longer assumed in ADL1A 2010 that all dwellings will have some form of secondary heating. Emissions from secondary heating systems are only calculated when one is actually being provided. It is also possible to specify two separate central heating systems for the first time; for example, where the ground floor is heated by one boiler and the rest of the home is heated by a separate boiler which uses a different fuel.

Specifying a proportion of energy efficient lighting above the previous limit of 30% will now improve the DER accordingly – see page 14.

Thermal bridges at junctions should be calculated in more detail, and the use of accredited construction details (ACDs) is encouraged. The overall heat loss from junctions is based on the length of each junction and its ψ-(psi) value. If non-accredited construction details (non-ACDs) are used, a penalty of 0.02 W/(mK) or 25%, whichever is greater, must be applied to the ψ-(psi) value. A simpler approach based on the overall dwelling y-value can still be used, but an extremely conservative value of 0.15 W/(m^2K) must be assumed in this instance. This is discussed further on pages 6 to 9.

Thermal mass, i.e. the ability of the materials used in the dwelling's construction to absorb, store and release heat, now affects the heating load (hence the DER) as well as the likelihood of summertime overheating. The effect is complex, and is discussed on page 5.

The energy used by cooling and air conditioning systems, where installed, is now included in the DER calculation. Clearly this will have a detrimental effect on the DER. System efficiencies are explicitly modelled, so a more efficient system will have less effect on the DER.

The calculation of hot water energy use has been improved, and a credit is given where the dwelling is designed to use less than 125 litres per person per day[1] (hot and cold water combined).

TER and DER calculations must now be carried out and submitted as follows:

a) at the design stage, before work starts on site,

and

b) not later than 5 days after work has been completed.

The design-stage submission must include a list of specifications for the dwelling, and to assist the BCB the post-construction submission must include a schedule of changes to that list (including better as well as worse specifications). Air leakage test results can also affect the post-construction DER (This is discussed on pages 10 and 11).

[1]125 litres per person per day is the maximum amount mandated by Approved Document G 2010

YOU NEED TO...

- Consider the effect on your house types of these changes in the TER/DER calculation. Modify your designs/specifications accordingly so that the DER is no greater than the TER.
- Ensure that TER/DER calculations and specifications are submitted to the BCB before building work commences. Liaising with your energy assessor early in the process will help.
- Be aware that the TER/DER submitted at the design stage may be accepted as the as-built TER/DER, as long as no changes in the specification have been made and the measured air permeability meets the design value.
- Where the specification has changed or the measured air permeability is different to that assumed in the design stage submission, ask your energy assessor to produce an as-built TER/DER and submit it to the BCB.

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REGULATION AND COMPLIANCE

Limiting U-values

REQUIREMENTS

ADL1A has, for some time, required the calculation of an area-weighted average U-value for each element (walls, roofs, floors, windows) and has set a maximum value which must not be exceeded for each element, regardless of the overall DER achieved. This is in order to prevent excessive 'trading-off', where basic fabric performance might be down-rated in favour of (for example) installing large quantities of renewable energy generation. It is a fundamental principle of low-energy design that **demand reduction** should take priority over other technologies, and the most robust and long-lasting way of achieving this is through the performance of the fabric of the building. This has become known as the 'fabric first' approach. Most of the area-weighted limiting U-values have been made more onerous by ADL1A 2010.

Approved Document C of the Building Regulations also sets 'backstop' maximum U-values for any part of each individual construction element, independently of the area-weighted U-values. These backstops must be met in order to reduce the risk of surface condensation and mould growth occurring on or within any part of an element. The backstop U-values are unchanged in 2010[2].

The changes in limiting U-values, both area-weighted and backstop, are shown in Table 1.

Limiting U-values	Maximum area-weighted U-value, W/(m²K) (Approved Document L1A)		Maximum backstop U-value, W/(m²K) for any part of an element (Approved Document C)
	2006	2010	
Roof	0.25	0.20	0.35
External wall	0.35	0.30	0.70
Party wall	-	0.20	-
Floor	0.25	0.25	0.70
Windows, roof windows, glazed rooflights, curtain walling and pedestrian doors	2.20	2.00	-

Table 1: Limiting U-values

[2]Reference: Approved Document C, sections 4.22, 5.36 and 6.14

YOU NEED TO...

- Ensure that your energy assessor confirms that your area-weighted U-values do not exceed the values shown in Table 1.
- Get your energy assessor to check that no part of an individual element's U-value exceeds the relevant backstop U-value shown in Table 1.

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Thermal Mass Parameter

REQUIREMENTS

The thermal mass of the materials in a structure governs its ability to absorb, store and release heat.

A timber or steel frame home, or a masonry dwelling lined internally with insulation, has a lower thermal mass, and will therefore heat up and cool down faster than a masonry home with an insulated cavity. This can have advantages and disadvantages – low thermal mass will be faster to heat up in the winter, but high thermal mass will store more solar gains and other 'free' heat in the daytime for later release during the evening heating period. Low thermal mass will also tend to have less ability to soak up excess heat in the summer, and may therefore have a higher risk of overheating.

The overall building services, and the strategy for using passive solar gain, should be carefully designed taking the thermal mass into account. For example, a design with higher thermal mass is inherently well placed to exploit solar gains to fulfil part of its heating load, yet a design with lower thermal mass can similarly exploit solar gains as long as it includes a good overshading strategy to exclude the gains when the sun is at its highest angles in summer. In both instances, good passive solar design also requires a very responsive heating system with effective room temperature controls.

The Thermal Mass Parameter (TMP) is the total heat capacity of a dwelling divided by its floor area, and is expressed in kilojoules per square metre of floor area per degree, kJ/(m^{2}K). Under the previous version of ADL1A, the thermal mass was only used to indicate the risk of summertime overheating, but ADL1A 2010 has introduced a new procedure which also takes it into account when calculating heating and cooling energy. Hence the TMP now affects the DER.

Designers can either use a simplified procedure which categorises the TMP as low, medium or high, or can carry out a more accurate calculation of the TMP which might provide further reductions in the DER. However, there is not a simple relationship between TMP and DER – a higher TMP can have a positive or negative impact on the DER, depending on circumstances; the effect is more marginal at higher latitudes. As a result, changes to the TMP should not be introduced merely to improve ADL1A performance, unless the changes have been carefully modelled and the implications are fully understood.

Barratt Green House
Photograph courtesy of Peter White, BRE

YOU NEED TO...

- Think carefully if you are considering making changes to the TMP of your designs, and ensure that your energy assessor (or other competent person) understands the intricacies of the modelling.
- As with the previous ADL1A, ensure that your dwellings are designed to take account of the risk of summertime overheating.

REGULATION AND COMPLIANCE

Thermal bridging at junctions

REQUIREMENTS

Thermal bridging, where a building element breaches an insulation layer and provides an easier path for heat to be lost from the dwelling, has been mentioned in Approved Document L since 1995. In 2002, changes to the required U-value calculation took into account 'repeating' thermal bridges such as wall ties, mortar joints and timber joists and studs. 'Non-repeating' thermal bridges, such as junctions between walls and floors or lintels, only found their way into the SAP calculation, and thereby into Regulations compliance, in ADL1A 2006.

Thermal bridging has recently become more important because the increasing insulation standards for building elements mean that the previously insignificant losses through bridges have now become increasingly significant. In a house insulated to the standards of ADL1A 2010, thermal bridging can, in some cases, account for more heat loss than all the walls put together. This additional heat loss obviously increases CO_2 emissions and hence has a detrimental effect on the DER, which has to be compensated for through other measures such as improved building services, renewable energy technology, etc.

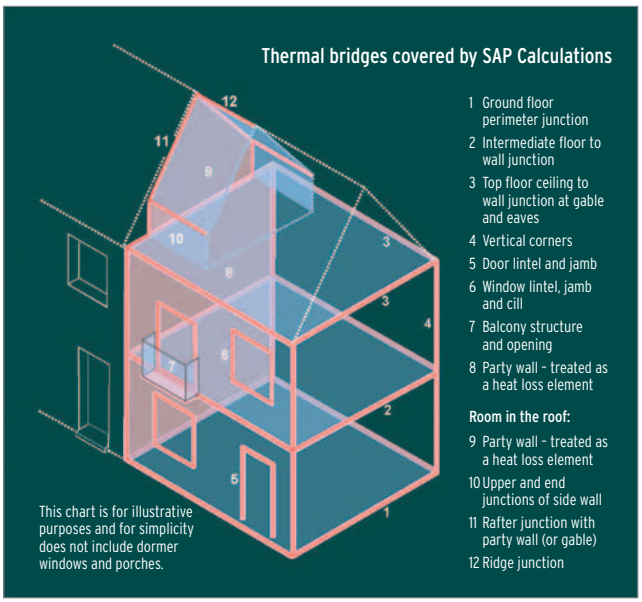

Figure 1: Part L thermal bridge

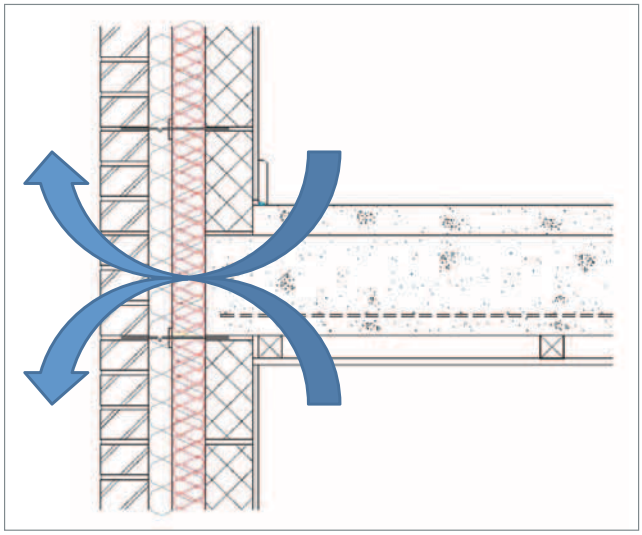

Figure 2: Thermal bridging at intermediate floor level

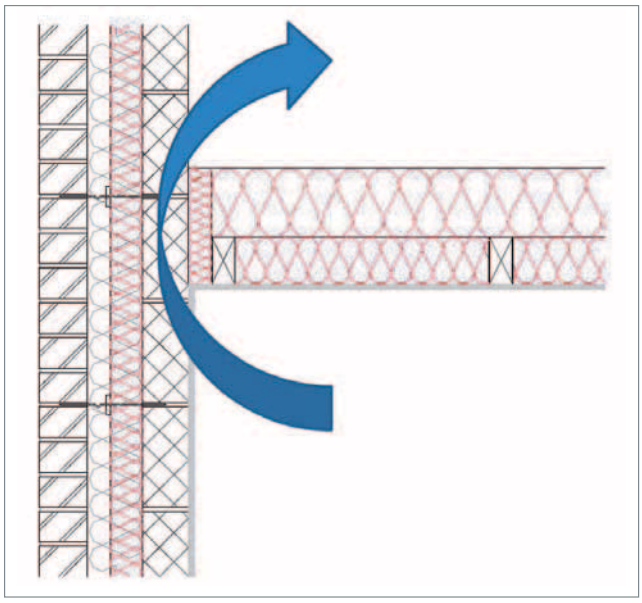

Figure 3: Thermal bridging at gable (roof level)

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REQUIREMENTS (CONTINUED)

As Figures 1-3 show, at every junction between two parts of a building, and at all openings, there is the potential for a break in continuity of insulation which can lead to additional heat loss not accounted for in the U-values. This extra heat loss is expressed per metre run of the junction as a psi-value (or Ψ, pronounced 'sigh', value), which is then multiplied by the length of the particular junction to give the heat loss in W/K. The heat losses for all of the key junctions are then added together to give the total heat loss through these thermal bridges.

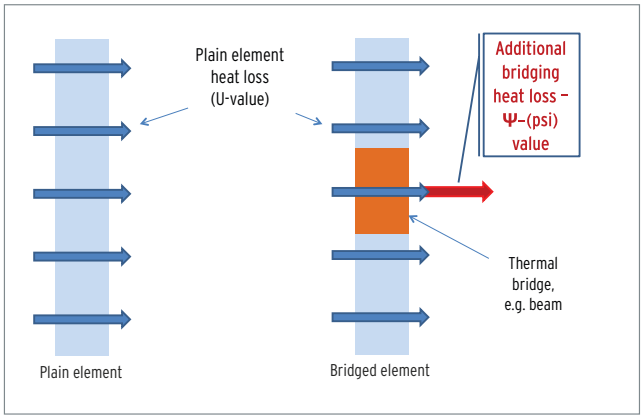


Figure 4: The psi-value is the additional heat loss over and above that calculated by U-values

Changes to building practice have begun to address thermal bridging. For instance, in masonry construction, reveals are normally now closed with an insulated closer, rather than returning the blockwork.

ADL1A also has an important part to play. The previous version in 2006 contained a system of Accredited Construction Details (2006 ACDs) which helped to get rid of many of the worst offenders. But even where the 2006 ACDs were used, the heat loss was still significant – roughly equivalent to that from the floor and roof put together. ADL1A 2006 required designers to add an approximated additional heat loss to the whole dwelling using a single y-value – the heat loss per m^2 of exposed area, based on the Ψ-(psi) values of a set of typical details. The y-value to be assumed was 0.08 W/(m^{2}K) if the 2006 ACDs were used, or 0.15 otherwise.

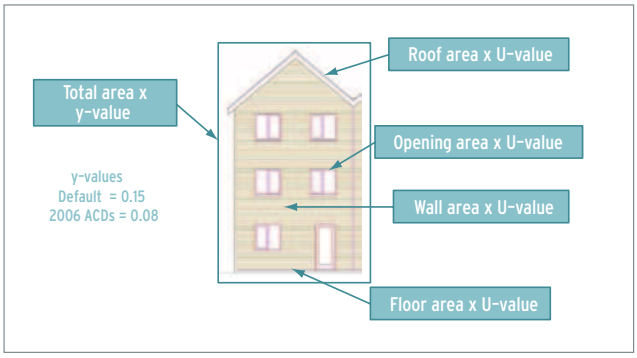


Figure 5: y-values add an extra heat loss based on the total heat loss area and an assumed mix of details

Within ADL 2006, there was always the option to improve detailing beyond the 2006 ACDs and have this reflected in the DER; this calculation option has in effect become mandatory in ADL1A 2010. To do this, it is necessary to know where to focus one's attention. This is done by listing all of the key junctions with their individual Ψ-(psi) values and multiplying those by the lengths of the junctions; the results show up the big numbers (as highlighted in Table 2). This calculation option has, in effect, become mandatory in ADL1A 2010.

REQUIREMENTS (CONTINUED)

Table 2: Typical junction heat losses for three-storey end of terrace

Junction	ψ-(psi) value, W/(mK)	Length, m	Heat loss, W/K
Steel lintel with perforated base plate	0.50	11.58	**5.79**
Sill	0.04	11.58	0.46
Jamb	0.05	27.60	1.38
Ground floor	0.16	17.67	**2.83**
Eaves (insulation at ceiling level)	0.06	8.00	0.48
Gable (insulation at ceiling level)	0.24	9.67	**2.32**
Intermediate floor within dwelling	0.07	35.34	**2.47**
Vertical corner (external)	0.09	14.80	1.33
Party wall between dwelling	0.03	14.80	0.44
Total bridging heat loss			**17.50**
Equivalent y-value			**0.086 W/(m²K)**

What causes the highlighted thermal bridges in the above example?

- **Steel lintels:** These can cause a very significant heat loss since their ψ-(psi) value is so high and they provide a clear break in the insulation layer. The polystyrene insulation sometimes built into them makes very little difference.
- **Ground floors:** Depending on the location of the floor insulation, it is very difficult to link to the wall insulation – although not a massive bridge, it can be very long.
- **Gables:** The inner leaf makes it impossible to link cavity wall insulation and loft insulation.
- **Intermediate floors:** Although the ψ-(psi) value is low, the length of this detail (especially in three-storey houses) means that the heat loss is very high.

Dividing the total bridging heat loss by the exposed area of the dwelling (walls, roofs, floors and windows) gives the y-value, 0.086 W/(m²K) – slightly worse than the default 2006 ACDs assumption of 0.08. However, if different lintels are used, e.g. a concrete lintel to the inner leaf, or a steel lintel without base plate, and if the gable is changed to a hip giving an eaves junction, the changes in ψ-(psi) value and measured lengths can significantly reduce the bridging heat loss – by nearly 25% in this example. Balanced against other possible methods of improving the DER, this 'smart' approach to thermal bridging will often prove worthwhile.

The conservative ψ-(psi) values assigned to most of the 2006 ACDs mean that it is fairly easy to improve on them – either through changes of materials, or by reworking them altogether. The drawback is that re-calculating the actual values is a specialist job, which comes at a cost, involving the use of sophisticated modelling software. However, it is not uncommon to

REQUIREMENTS (CONTINUED)

achieve a 75% to 95% improvement on a 2006 ACD Ψ-(psi) value. Carrying out these calculations for only the largest thermal bridges, identified on the previous page, can halve the heat loss due to thermal bridging.

The options formally available to builders, designers and energy assessors under ADL1A 2010 will ultimately be as follows, (but see 'important note' below):

(a) Use the latest 2010 ACDs once available, and carry out the detailed 'Ψ-(psi) value x length' calculations using the Ψ-(psi) values listed for the ACDs. In this instance, you must also register with an ACD quality assurance scheme approved by the Secretary of State, which will include testing of a sample of details on site;

or

(b) Use the 2006 ACDs, and carry out the detailed 'Ψ-(psi) value x length' calculations using the Ψ-(psi) values listed for those ACDs. This option requires a penalty of 0.02 W/(mK) or 25%, whichever is the greater, to be added to the Ψ-(psi) values; but even so, this can still make typically a 4% improvement in the DER;

or

(c) Carry out the detailed 'Ψ-(psi) value x length' calculations using Ψ-(psi) values which result from modelling your own junctions. This option requires a penalty of 0.02 W/(mK) or 25%, whichever is greater, to be added to the Ψ-(psi) values; but even so, this can still make typically a 4% improvement in the DER;

or

(d) Simply add a y-value of 0.15 W/(m^2K) to the overall heat loss of the dwelling. Note that this is an extremely punitive value – a best practice Passivhaus dwelling will achieve around 0.01 W/(m^2K), for example – meaning, in effect, that option (a) or option (b) will have to be used to avoid an unacceptable increase in the DER.

IMPORTANT NOTE

Several commercially competitive ACD quality assurance schemes are in development at the time of writing. However, the Secretary of State has not yet formally approved any schemes. Until such time as at least one scheme is approved, the addition of the 0.02 W/(mK) or 25% penalty is **not required**, and the calculated Ψ-(psi) values of options (b) and (c) may be used unmodified.

YOU NEED TO...

- Review current details used, and consider the use of Accredited Construction Details (ACDs).
- Identify which details you will use for dwellings being built under ADL1A 2010.
- Ensure your energy assessor calculates the dwelling's overall thermal bridging value, and verifies that this is suitable for the overall compliance strategy.
- Inform the BCB which option for thermal bridging details you are using for the development, to ensure that they consider them to be compliant with ADL1A 2010.
- Communicate the junction design details at site level.
- Closely supervise the construction process and monitor workmanship to ensure that junction detailing is in accordance with the design.

REGULATION AND COMPLIANCE

Air permeability testing

REQUIREMENTS

Air permeability testing (also known as air leakage testing, or pressure testing) is effectively a mandatory requirement of ADL1A 2010 for all but the smallest developments. A sample is selected, and all tested units must achieve a maximum air permeability rate (APR) of $10m^3/(h.m^2)$. Any unit **not** tested will be assigned the average of the tested units plus a penalty. These requirements are discussed in detail below.

ADL1A 2010 dictates that, on every development, three units of each dwelling type (or 50% of each type if fewer) should be tested. The sample will be selected by the BCB in conjunction with the air leakage tester (ALT), and about half of the scheduled tests for each dwelling type should be carried out during construction of the first 25% of that type. This is to identify any issues with compliance early on, when remedial measures can be carried out more easily and lessons can be learnt for the later construction phases.

ADL1A 2010 gives a more detailed definition of 'dwelling type' than previously. To enable dwellings to be considered as the same dwelling type, they must have:

- the same generic form (e.g. detached, semi-detached, ground floor flat)
- the same number of storeys
- the same design APR
- similar adjacency to unheated spaces (such as stairwells or integral garages)
- the same principal construction details (whether ACDs or bespoke)
- the same number, plus-or-minus one, of significant penetrations (i.e. windows, doors, flues/chimneys, supply/exhaust terminals and waste water pipes)
- envelope areas that do not differ by more than 10%.

This revised definition of a dwelling type will lead to a considerable increase in the number of dwellings requiring an air permeability test, since a greater number of discrete dwelling types will be defined for a given site than was the case under ADL1A 2006.

As in the previous ADL1A, each block of flats must be treated as a separate 'development' when determining the test regime, regardless of the number of blocks on the site. In other words, the sampling rules are applied separately for each block of flats, even if there are several identical blocks.

All test results, including failed tests, should be reported to the BCB. Results should also be passed to the energy assessor for use in the as-built DER calculations. As well as checking compliance with the prescribed sampling methodology, the BCB will require that:

- the testing is carried out according to Technical Standard L1 published by the Air Tightness Testing and Measurement Association (ATTMA), and
- the equipment used has been calibrated within the last 12 months by a UKAS-accredited facility.

As evidence of the above, a BCB will accept APR results on a certificate issued by a person registered with the British Institute of Non-Destructive Testing (BINDT).

The measured APR must be no leakier than $10m^3/(h.m^2)$, and the as-built DER (calculated using the measured APR) must be no greater than the TER. Note that the measured APR is allowed to be leakier than the **design** APR, as long as it is not leakier than $10m^3/(h.m^2)$ and the DER is still no worse than the TER.

Where a dwelling is not part of the selected sample, and therefore is not tested, the APR to be used in its as-built DER and SAP assessment is the average result obtained from the tests of the other units of the same dwelling type on the same development, **plus a penalty of $2m^3/(h.m^2)$.** This penalty is only avoided by testing every single unit, and means that, unless every single unit **is** tested, **in reality it is necessary to achieve an average result of $8m^3/(h.m^2)$, not 10, for the tested units.** (Only in this way will the non-tested units comply with the prescribed maximum of $10m^3/(h.m^2)$ after the penalty is added.)

If a satisfactory result is not achieved for a dwelling in the test sample, remedial measures must be carried out on the dwelling and a repeat test carried out until the dwelling complies. ADL1A 2010 also advises that other dwellings of the same type should be examined and, if appropriate, similar remedial measures applied to those too. For every unit which fails, a further dwelling of the same type must also then be tested, which will increase the overall sample size.

For **Building Regulations advice and support**, call **0844 633 1000** and ask for **'Building Control'** or visit **www.nhbc.co.uk/bc**

REQUIREMENTS (CONTINUED)

Special arrangements exist for small developments **of two dwellings or less.** In this instance, testing can be avoided by either:

(a) providing evidence that the same dwelling type has been constructed by the same builder during the preceding 12 months and achieved its design APR,

or

(b) using a cautious default value of 15m³/(h.m²) in the DER calculation. If this default value were used, higher standards would have to be applied elsewhere in the design to ensure that the DER still complies. In practice, however, the default value is so punitive that it will normally be preferable to test the dwelling or to follow option (a) above.

In conclusion, it is clear that achieving a good APR is critical in complying with ADL1A 2010. Figure 6 shows the effect on the DER of typical dwellings of improving the APR below the prescribed maximum value. Achieving an enhanced result of 5m³/(h.m²) rather than the maximum of 10, for example, will typically improve the DER by between 5% and 7%.

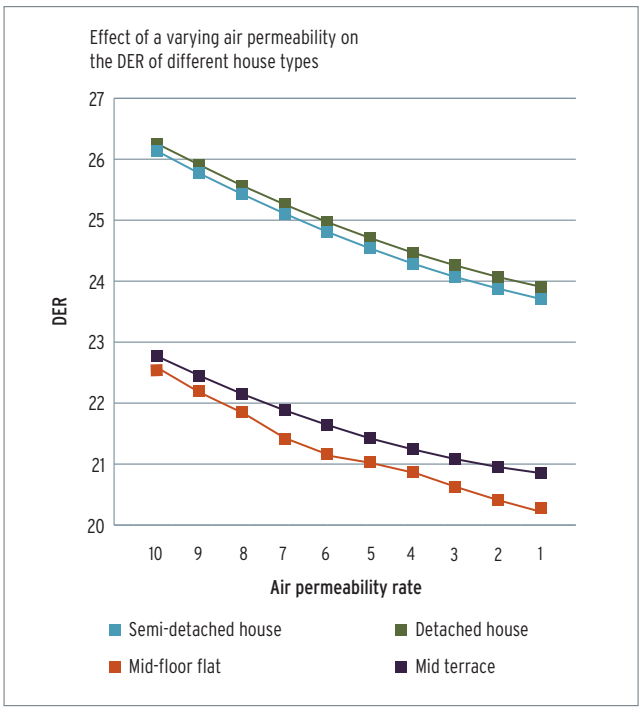


Figure 6: How tighter air permeability improves the DER

Build tight, ventilate right

The ventilation provisions in Approved Document F 2010 (Ventilation) are more onerous for dwellings with a design APR of 5m³/(h.m²) or tighter, **or** with an as-built APR of 3m³/(h.m²) or tighter.

Where a dwelling's design APR is 5m³/(h.m²) or less, significantly more background ventilation will be required (through either extra trickle vents in the windows, airbricks, etc., or through whole-house mechanical ventilation).

When tested dwellings are found to achieve an as-built APR of 3m³/(h.m²) or less, designers are asked to revisit the ventilation strategy to ensure that the dwellings still have adequate ventilation for the achieved APR.

YOU NEED TO...

- Appoint your air leakage tester (ALT) early, so that they can consult with the BCB and agree the schedule of tests.
- Ensure that your ALT will use the ATTMA methodology, and is preferably BINDT registered.
- Be aware that, if you are not planning to test every dwelling, your target is effectively 8, rather than 10, m³/(h.m²).
- Pass the air leakage test results to your energy assessor for calculation of the as-built DERs and SAP ratings.
- Where the measured APR is leakier than the value assumed at the design stage, this may be acceptable, as long as it is no leakier than 10m³/(h.m²) **and** the as-built DER is still no greater than the TER. Your energy assessor will need to verify this.
- Ensure that all air permeability test results are reported to the BCB, including failed tests.

For **Building Regulations advice and support**, call **0844 633 1000** and ask for **'Building Control'** or visit **www.nhbc.co.uk/bc**

Heat loss through party walls

REQUIREMENTS

The previous ADL1A considered cavity party walls to have zero heat loss. However, recent research has shown that the air movement within the cavity can lead to a chimney effect, which may result in significant heat loss through the party wall; in certain conditions, this heat loss can be extremely high. As a result of this research, ADL1A 2010 now considers cavity party walls to be heat loss elements, and so minimising the amount of heat lost through the cavity is a mandatory requirement for new dwellings.

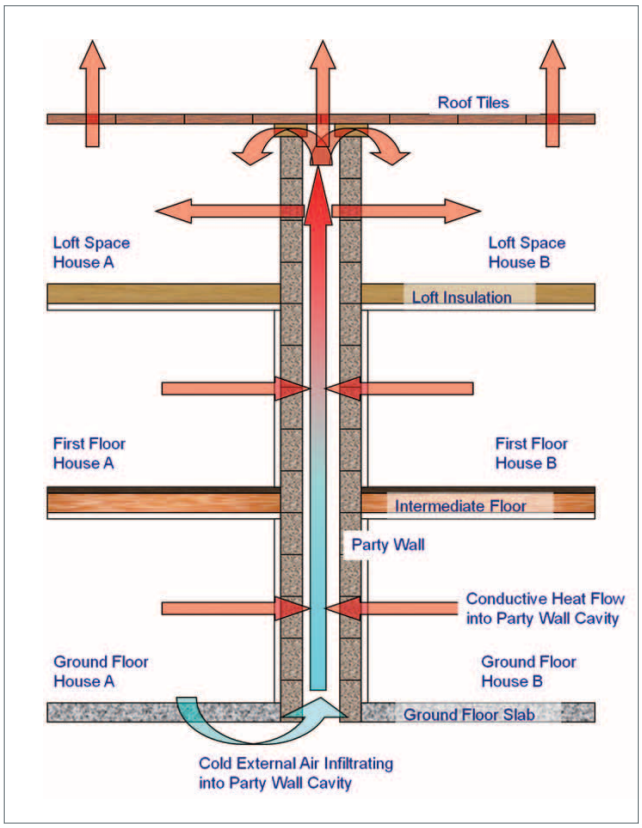


Figure 7: Heat loss paths through cavity party walls

Image courtesy of Centre for the Built Environment, Leeds Metropolitan University

To limit the heat loss through the cavity party wall, air movement within the cavity needs to be restricted. This can be achieved by sealing the edges of the party wall to stop the chimney effect occurring, and optionally by filling the cavity with insulation to prevent air movement within it.

Unlike other heat loss building elements within the DER calculation, the U-value for a party wall is not explicitly calculated; instead, there are four general options to choose from, each with a standard U-value, as shown in Table 3.

Table 3: U-values for cavity party walls

Party wall construction	U-value, W/(m2K)
Solid party wall	0.0
Unfilled cavity with no edge sealing	0.5
Unfilled cavity with edge sealing	0.2
Fully filled cavity with edge sealing	0.0

The limiting U-values specified elsewhere in ADL1A 2010 state that party walls need to achieve a U-value of 0.2 W/(m^{2}K) (see Table 1, page 4), so, according to Table 3, a cavity party wall must, at the very least, be edge sealed. **However, the TER is calculated with an assumed U-value of 0.0 W/(m^{2}K) for the party walls,** so the dwelling will either have to be designed to that same standard or will need to make up the difference elsewhere to achieve the TER.

In order for a cavity party wall to achieve a U-value of 0.0 W/(m^{2}K), in addition to being edge-sealed, the wall will need to be fully filled with insulation so that there is no continuous air path between the top and the bottom of the wall, or between the ends of the wall.

Your BCB will need to be satisfied that the proposed sealing is adequate, and that it will not cause any issues with Approved Document B (Fire Safety) or Approved Document E (Passage of Sound). Robust Details Ltd has confirmed that adequate flexible sealing around all party wall edges is now included within the details in the Robust Details Handbook, and therefore this will not affect compliance with Part E. Robust Details Ltd will also now allow the option of filling the cavities for nine of the details that previously had clear cavities – see the Robust Details Handbook for further details.

Previously, thermal bridging at party wall junctions was not included but, under ADL1A 2010, junctions of building elements with party walls **are** now to be considered in the calculations.

Heat loss through party walls

REQUIREMENTS (CONTINUED)

Thermal bridging has already been discussed in detail on pages 6 to 9.

For further details about heat loss through party walls, see *Technical Extra Issue 1*, February 2011.

YOU NEED TO...

- Review the party wall constructions currently used.
- Identify a suitable solution for sealing and filling any cavity party walls.
- Ensure that your energy assessor takes this into account when calculating the DER.
- Provide details of proposed party walls to the BCB for approval.

Fixed building services

REQUIREMENTS

The Domestic Building Services Compliance Guide 2010, published alongside ADL1A, contains extensive guidance for the specification and installation of all types of fixed building services. Whilst the primary focus of ADL1A compliance is the TER/DER calculation, there is a general presumption that the building's systems should also comply with the Guide (which itself is, formally, an Approved Document).

ADL1A 2010 simply states that each fixed building system must be at least as efficient as the worst acceptable value for that particular type of appliance as listed in the Guide. For gas-fired wet central heating systems, the boiler efficiency (or 'SEDBUK value') listed in HM Government's Boiler Efficiency Database should be at least 88%[4]. The central heating controls should be wired to provide an interlock (where both the boiler and pump are switched off when there is no demand for heat). For dwellings with a floor area of less than 150m^2, the controls should divide the dwelling into at least two space heating zones with independent temperature control, one of which is assigned to the living area.

Separate temperature control of the zones should be provided using a room thermostat in each zone. Individual thermostatic radiator valves are also required on all radiators except those in the 'reference' rooms (i.e. those with a thermostat) and bathrooms. A separate timed hot-water zone should also be provided, unless hot water is produced instantaneously such as with a combination boiler.

Larger dwellings with a floor area greater than 150m^2 should additionally have separate time (as well as temperature) controls in each of the space heating zones.

The Domestic Building Services Compliance Guide also contains minimum performance standards for many other items; for example, specific fan power and heat recovery efficiency of mechanical ventilation systems; seasonal performance factors for heat pump systems; the energy efficiency ratio for comfort cooling systems; circulation pump power for solar water heating.

[4]Note that the values in the database were updated in 2009 for use with ADL1A 2010. Two sets of figures are shown in the database (2005 and 2009); take care to use the 2009 column.

YOU NEED TO...

- Ensure that the minimum efficiency standards in the Domestic Building Services Compliance Guide are met.
- Be prepared to provide evidence of the services specification when requested by the BCB.

For **Building Regulations advice and support**, call **0844 633 1000** and ask for **'Building Control'** or visit **www.nhbc.co.uk/bc**

Lighting

REQUIREMENTS

Under ADL1A 2010, the TER assumes that 30% of a dwelling's fixed internal light fittings contain low-energy lamps; this was the same under ADL1A 2006. However, for the first time, ADL1A 2010 specifies that the DER should be calculated using the **actual** proportion of low-energy lamps fitted, up to a full 100%. This means that low-energy lighting provision is now tradable in the TER/DER calculations, and that anything between 30% and 100% of low-energy lighting will benefit the DER.

However, ADL1A 2010 also specifies that a dwelling must meet the minimum standards for low-energy light fittings specified in Domestic Building Services Compliance Guide 2010; for fixed internal lighting, this means that a minimum of 75% of fittings must in fact be low energy (which has the specific meaning shown in Table 4 below).

So, in effect, a 2010-compliant dwelling will have between 75% and 100% low-energy internal light fittings – and the more low-energy fittings that are installed, the more the DER will improve.

Control gear may be integrated in the lamp or located elsewhere in or near to the fixed light (e.g. within the lampholder). Fittings may now be standard bayonet or Edison screw cap, i.e. they no longer have to be 'dedicated' low-energy fittings as they were under ADL1A 2006. Light fittings with a power consumption of less than 5 circuit Watts[3] are excluded from the count of fittings; this would exclude many light-emitting diode (LED) fittings.

Separate standards apply to external lighting, as shown in Table 4 below.

Fixed lighting and controls	Lighting efficacy requirements (acceptable as 'low energy')
■ Internal light fittings (75% of fittings) with ■ Manual switching	More than 45 lamp lumens per circuit Watt, and a total output greater than 400 lamp lumens.
■ External lighting with ■ Automatic daylight control and occupant detection	Lamp capacity no greater than 100 Watts per light fitting.
■ External lighting with ■ Automatic daylight control but manual switching	More than 45 lumens per circuit Watt.

Table 4: Lighting requirements, taken from the Domestic Building Services Compliance Guide 2010

[3] A circuit Watt is the power consumption of the fitting including the lamp plus any control gear.

YOU NEED TO...

- Ensure that a minimum of 75% of fixed internal light fittings are low energy. (Fittings with GLS tungsten or halogen lamps would not meet the standard. Some light-emitting diode (LED) and compact fluorescent (CFL) lamps meet the requirements, but others may not – see manufacturers' figures for efficacy and output.)
- Consider whether to improve the dwelling's DER by installing anything up to 100% low-energy fittings.
- Ensure that external lighting also meets the separate requirements.
- Where the control gear for internal lighting is integrated with the lamp, fit these lamps on site so that they can be checked by the BCB. This same criteria may be applied to sites built under the 2006 regulations.

For **Building Regulations advice and support**, call **0844 633 1000** and ask for **'Building Control'** or visit **www.nhbc.co.uk/bc**

Commissioning of heating and hot water systems

REQUIREMENTS

ADL1A 2010 requires that fixed building services are commissioned by testing and adjustment as necessary. The commissioning may be carried out by the person who installs the system, a subcontractor or a specialist firm; in all cases, the commissioning must be in accordance with the procedures set out in the Domestic Building Services Compliance Guide 2010 or the Domestic Ventilation Installation and Commissioning Compliance Guide 2010, as appropriate. These procedures refer, in turn, to the commissioning and testing procedures of the manufacturers of the particular systems installed. For gas-fired central heating systems, the 'Benchmark' commissioning checklist can also be used; this is included with all Heating and Hot Water Industry Council (HHIC) members' installation manuals.

Not all fixed building services need to be commissioned: for some systems, commissioning is not appropriate; for example, where controls are simply on/off, such as with a single fixed electric heater. In other cases, commissioning may not be possible, or would not affect the energy efficiency of the system.

A notice of commissioning is required to be given to the BCB within five days of the completion of the commissioning work. However, where carried out by a person registered with an appropriate competent person's scheme, it only needs to be given within 30 days of completion of the commissioning work.

YOU NEED TO...

- Ensure heating and hot water systems are commissioned in accordance with the Domestic Building Services Compliance Guide 2010 or the Domestic Ventilation Installation and Commissioning Compliance Guide 2010, as appropriate.
- Provide evidence of commissioning to the BCB within five days of the completion of the commissioning work (or within 30 days if carried out by a person registered with a competent person's scheme).

REGULATION AND COMPLIANCE

Provision of information to homebuyers

REQUIREMENTS

As with ADL1A 2006, the owner of the dwelling must be given sufficient information about the home, its fixed services and their maintenance requirements, to enable them to operate the home in a fuel- and power-efficient manner. These operating and maintenance instructions should be written in a way that the householder can understand, and should include explanations of (a) how to make adjustments to the time and temperature control settings, and (b) what routine maintenance is needed to enable constant operating efficiency.

New in ADL1A 2010 is the requirement that the instructions should be specific to the systems actually installed in the dwelling, and that they should be provided to the occupier in a durable format, which will last the service lifetime of the system(s).

Also new in ADL1A 2010 is the requirement to include the data which was used to calculate the TER and the DER. The occupier should also be given the recommendations report which is generated in parallel with the on-construction Energy Performance Certificate (EPC).

YOU NEED TO...

- Ensure the operating and maintenance instructions for the building services are handed to the homeowner upon completion.
- Ensure the homeowner is given the EPC with the associated recommendations report, together with the data used to calculate the TER and DER.
- Keep an electronic version of the TER/DER input data file, to help the occupier if they later decide to alter or improve the building.

Swimming pools

REQUIREMENTS

Reasonable provision is now to limit the heat loss of the basin by achieving a U-value of 0.25W/(m^{2}K) in its construction. The pool hall, but not the basin, should be included in the TER/DER calculations.

For **Building Regulations advice and support**, call **0844 633 1000** and ask for **'Building Control'** or visit **www.nhbc.co.uk/bc**

GUIDANCE AND GOOD PRACTICE

NHBC Foundation

Who should read this: Everyone.

INTRODUCTION

The NHBC Foundation supports the industry with free, high-quality research and practical guidance. The following reports will be of interest to builders wishing to comply with ADL1A 2010.

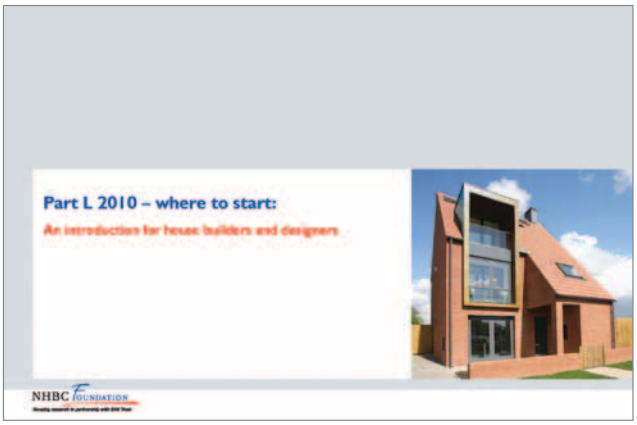
GUIDANCE

Part L 2010 – where to start: An introduction for house builders and designers NF28

This guide simply explains how to comply with the latest version of ADL1A, introduced in October 2010. It takes four types of home and presents four different compliant specifications for each, based on:

- enhanced fabric
- solar thermal panels
- solar photovoltaics
- mechanical ventilation with heat recovery.

Together with illustrations of typical wall, floor and roof constructions reaching various levels of thermal performance, these examples should enable builders and designers to make better-informed choices about how they comply with the new requirements.



A practical guide to building airtight dwellings NF16

This guide, jointly produced with the Zero Carbon Hub, brings together the experiences of those who have already got to grips with airtightness, for the benefit of those who have not. It identifies the common air leakage paths in typical constructions and provides practical advice on how these can be addressed.

YOU NEED TO...

There are no actionable requirements, although readers are advised to note the findings.

Visit the website **www.nhbcfoundation.org** to download a free copy of these and other reports.

For **technical advice and support**, call **01908 747384** or visit **www.nhbc.co.uk**

INFORMATION AND SUPPORT

Complying with Part L 2010

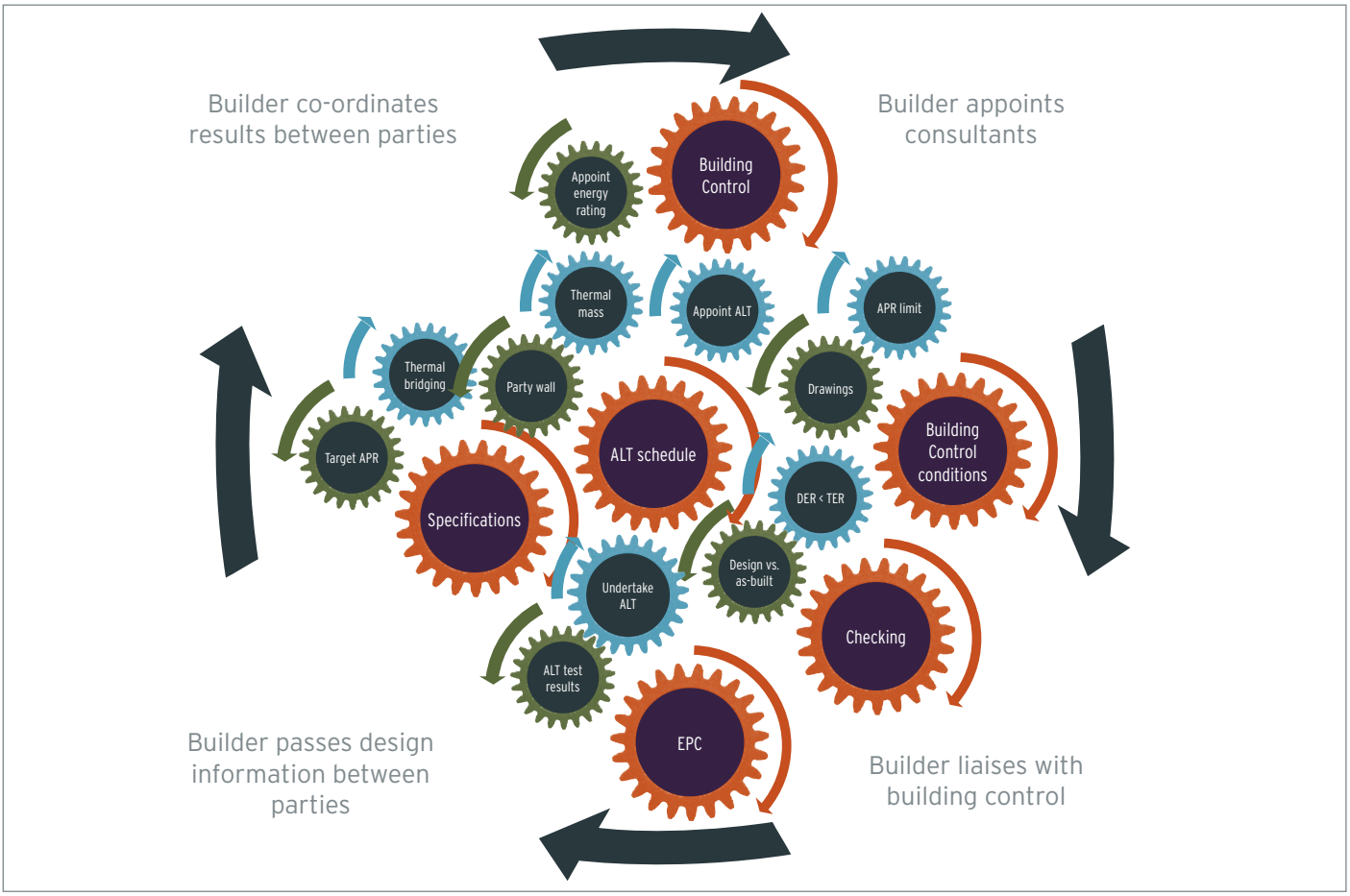
INTRODUCTION

The regulations and compliance pages 1 to 16 of this document detail the technical requirements of specific elements within Approved Document L. To put this into context, Figure 1 below shows the many elements a builder will be required to co-ordinate to achieve compliance, and Figure 2 on the next page sets out how NHBC can assist you in co-ordinating all the complexity that is Part L.

WHAT YOU NEED TO DO

- Manage suppliers for building control, energy rating and air leakage testing.
- Provide all suppliers with drawings and co-ordinate information exchange between them.
- Your DER/TER results will need passing on to building control and your air leakage tester. Air leakage testing schedules will need setting up by your tester, agreed by building control and then passed back to you.
- You will need to arrange for your air leakage tests.
- You will need to pass your air leakage results to your energy assessor and building control.
- You will need to forward your EPC to building control.

Figure 1: The builder co-ordinates many elements for compliance



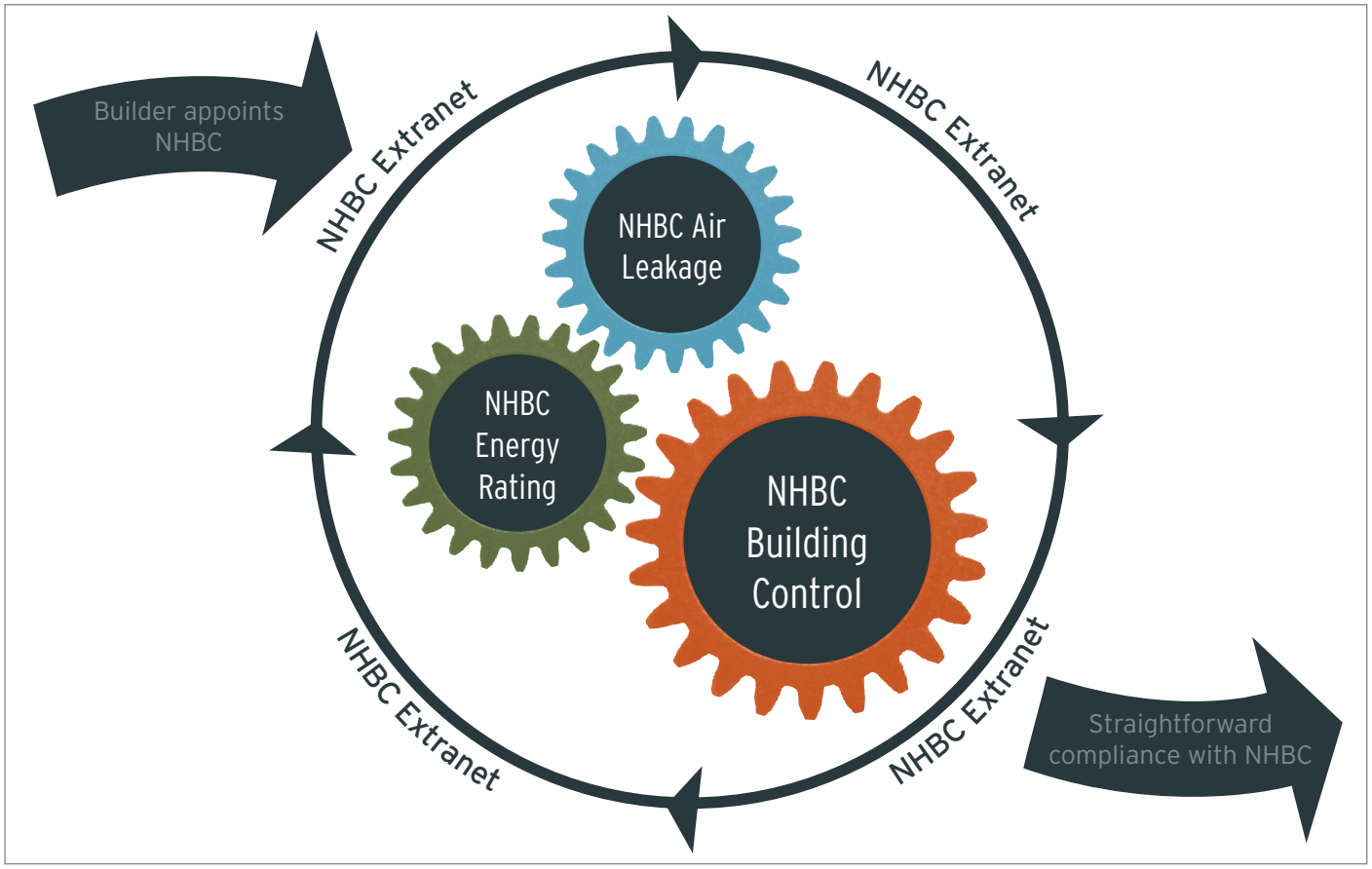
For **technical advice and support**, call **01908 747384** or visit **www.nhbc.co.uk**

WHAT YOU NEED TO DO

Place your SNIN/order for warranty, building control, energy rating and air leakage with NHBC. Submit your drawings and specifications via the NHBC Extranet.

To enquire about our services, please call **0844 633 1000** and ask for **'Sales'**.

Figure 2 : NHBC's solution simplifies compliance



WHAT NHBC WILL DO...

- NHBC Building Control will assess and set conditions.
- NHBC Energy Rating will undertake your SAP, produce your Air Leakage Testing Schedule and pass the results to Building Control for you.
- NHBC Air Leakage will call you as build progresses to schedule your testing and pass the results to you, Energy Rating and Building Control.
- NHBC Energy Rating will produce your EPC and send this to you and to Building Control.
- NHBC Building Control will release your Part L conditions.

For **technical advice and support**, call **01908 747384** or visit **www.nhbc.co.uk**

INFORMATION AND SUPPORT

FREE** PART L BRIEFINGS

As a result of the high demand for the first series, NHBC is running a second series of free, two-hour briefings on Part L. These will provide practical advice on lessons learnt so far, guidance on the new regulations, and key requirements for building control, energy rating and air leakage.

For further details, and to book your free place, please call **0844 633 100** and ask for **'Training'**, or visit **www.nhbc.co.uk/partltraining**.

Places are limited, so book early!

Milton Keynes	20 September 2011
London	22 September 2011
Nottingham	28 September 2011
Manchester	29 September 2011
Leeds	4 October 2011
Bristol	6 October 2011

**Note: places are free to NHBC registered builders, affiliated companies and Housing Associations only.

BUILDING REGULATIONS - VISIT TECHZONE

Keeping up to date with regulatory change is always a challenge, as highlighted by the significant changes to Part L 2010.

NHBC's TechZone is a specialist area on our website containing the latest information on all aspects of building control, including a question and answer section with practical advice and guidance from our in-house experts.

www.nhbc.co.uk/techzone

SUSTAINABILITY AND ENERGY

If you need advice on complying with sustainability or energy targets, NHBC's expert consultants can help you achieve your targets cost-effectively, with solutions appropriate to your scheme.

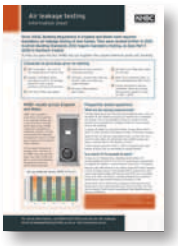
To discuss Part L 2010, and any related issues, please contact the energy team on **0844 633 1000** and ask for **'Energy'**.

As well as SAPs and EPCs, NHBC also offers SBEM, Code for Sustainable Homes and BREEAM services.

AIR LEAKAGE TESTING

To discuss your requirements and/or book a test, please call **0844 633 1000** and ask for **'Air leakage testing'**.

Download the information sheet from **www.nhbc.co.uk/alt**.



ACOUSTICS CONSULTANCY

The party wall bypass issue, i.e. the requirement to fill cavity party walls to minimise heat loss, raises concerns about maintaining adequate acoustic performance. Also, thermally efficient or lightweight blocks can create acoustic difficulties in some circumstances.

For expert advice and practical acoustic solutions to Part E that are compatible with Part L and Part F 2010, please call **0844 633 1000** and ask for **'Acoustics'** to speak to one of NHBC's experienced acoustic consultants.

Download the factsheet from **www.nhbc.co.uk/acs**.

For **technical advice and support**, call **01908 747384** or visit **www.nhbc.co.uk**

NEW SUSTAINABILITY TRAINING COURSES

Building new homes to Building Regulations Part L (2010) and the Code for Sustainable Homes standards demands new construction technologies and methods, and requires a lot more knowledge from site management staff.

NHBC has worked with the Home Builders Federation (HBF) and ConstructionSkills to develop a pilot programme of two new sustainability courses specifically for site managers:

- Management of the installation of low and zero carbon technologies – one day.
- The management of sustainability on site – one day.

They are joint funded by ConstructionSkills and NHBC, and are available for site managers and supervisors of NHBC registered builders and HBF members for only £25+VAT per delegate (open) and £150+VAT (in-company).

For dates and venues, please visit: **www.nhbc.co.uk/sustraining**.

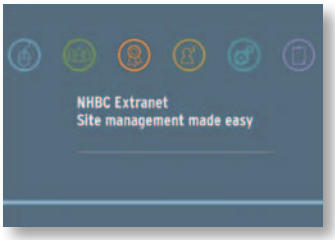
Alternatively, if you would like in-company course dates or have any questions regarding these courses, please email **training@nhbc.co.uk** or call **0844 633 1000** and ask for **'Training Services'**.

NHBC EXTRANET – EFFICIENT MANAGEMENT OF SITE DOCUMENTS AND DATA

The Extranet has been designed to help you efficiently manage the provision of NHBC Warranty, Building Control, and Sustainability and Energy services. Through the Extranet, you can:

- submit appropriate technical information and drawings securely
- submit non-site specific documents
- access sustainability and energy reports
- download sustainability and energy rating certification.

View a demo or sign up now at: **www.nhbc.co.uk/extranet**.



ADDITIONAL NHBC ARTICLES

Thermal bridging – cutting emissions, cutting costs; NHBC Sustainability Extra 8, October 2010

www.nhbc.co.uk/standardsextra

The party wall bypass – how to comply; NHBC Technical Extra Issue 1, February 2011

www.nhbc.co.uk/techextra

RELEVANT DOWNLOADS

There are useful downloads to Approved Document L1A, as well as information on Approved Documents C and F, SAP 2009, cavity party wall details, the Domestic Building Services Compliance Guide and the Domestic Ventilation Compliance Guide, all available via the Government's Planning Portal at:
www.planningportal.gov.uk/buildingregulations/approveddocuments/partl/

For **technical advice and support**, call **01908 747384** or visit **www.nhbc.co.uk**

Useful contacts for technical information and advice

NHBC technical advice and support

Phone: 01908 747384
Email: technical@nhbc.co.uk
Web: www.nhbc.co.uk/builders/technicaladviceandsupport

NHBC Standards

Buy online at:
www.nhbc.co.uk/nhbcshop/technicalstandards

Building Regulations

For guidance on issues relating to Building Regulations, visit NHBC's TechZone at www.nhbc.co.uk/techzone.

Building Control queries

For Building Control queries, please call 0844 633 1000 and ask for 'Building Control', or email buildingcontroladmin@nhbc.co.uk.

Engineering queries

For Engineering queries, please call 0844 633 1000 and ask for 'Engineering'.

NHBC Foundation research

The NHBC Foundation facilitates research and shares relevant guidance and good practice with the house-building industry.

www.nhbcfoundation.org

Zero Carbon Hub

The UK Government has set out an ambitious plan for all new homes to be zero carbon from 2016. The Zero Carbon Hub helps you understand the challenges, issues and opportunities involved in developing, building and marketing your low and zero carbon homes.

www.zerocarbonhub.org

NHBC Clicks & Mortar e-newsletter

NHBC regularly distributes information on a range of industry topics including new products and services, the building industry market, house-building news and house-building statistics. To receive this industry information, please register at:

www.nhbc.co.uk/newsandcomment/registerfore-news

NHBC Housing Developments e-newsletter

Housing Developments is a new, free resource, developed specifically for the affordable housing sector and designed to report on current industry developments and issues, with expert insights into affordable and social housing.

To receive this e-newsletter, please register at:

www.nhbc.co.uk/housingassociations/affordablehousingnewsletter

General enquiries

For all other enquiries, including ordering products and services, please call 0844 633 1000, and ask for 'Sales'.

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HB2891 09/11