ZERO CARBON HUB

SAP UNTANGLED

An introductory guide to SAP for new homes

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NHBC
citb
LABC
HBF HOME BUILDERS FEDERATION
ideal
SIG INSULATION SIG360 TECHNICAL CENTRE
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Further copies of this guide are available as a PDF download from **www.zerocarbonhub.org**

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ACKNOWLEDGEMENTS

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INTRODUCTION

SAP Untangled is aimed at the SME Builder and gives an overview of the Building Regulations Part L1A compliance process with respect to the SAP calculation.

This Guide is intended as a basic introduction to the SAP assessment process and the information required by the assessor and Building Control in order to achieve compliance with certain aspects of Building Regulations Part L1A and the successful production of an Energy Performance Certificate for the home.

The Guide starts by giving an overview of the SAP assessment process, and pointers on how to choose your SAP assessor.

It then goes on to detail the information required by the SAP assessor at Design Stage in order to produce a prediction of the energy use and carbon emissions of the dwelling. Simple cost effective ways of meeting fabric energy efficiency and carbon targets are explored.

The importance of the SAP calculation result for compliance and the effects of product substitution or alterations to the design at construction stage is highlighted. The information required by the assessor to complete the As Built SAP assessment and produce the EPC for the dwelling is outlined.

The aim of the Guide is to make the SAP assessment process more transparent to those who may not be fully aware of its significance in achieving Building Regulations Part L1A compliance.

The information in this Guide is based on the current versions; Part L1A 2013, and SAP 2012. However most will also be applicable to dwellings being built to Part L1A 2010. Note that the information is only applicable to properties in England. Scotland and Wales have different regulations and are not covered by this Guide.

This Guide is one of a series of good practice guides that are aimed at addressing the performance gap and improving the design, procurement and construction quality of new homes. All publications in the series are available from the Zero Carbon Hub website.

Acronyms

BFRC
British Fenestration Rating Council

CPD
Continuing Professional Development

DER
Dwelling Emission Rate

DFEE
Dwelling Fabric Energy Efficiency

DOCEA
Domestic On Construction Energy Assessor

EPC
Energy Performance Certificate

FGHRS
Flue Gas Heat Recovery System

HETAS
Heating Equipment Testing & Approval Scheme

MCS
Microgeneration Certification Scheme

OCDEA
On Construction Domestic Energy Assessor

OCEA
On Construction Energy Assessor

TER
Target Emission Rate

TFEE
Target Fabric Energy Efficiency

WWHR
Waste Water Heat Recovery

SUMMARY – POTENTIAL ISSUES LEADING TO NON COMPLIANCE

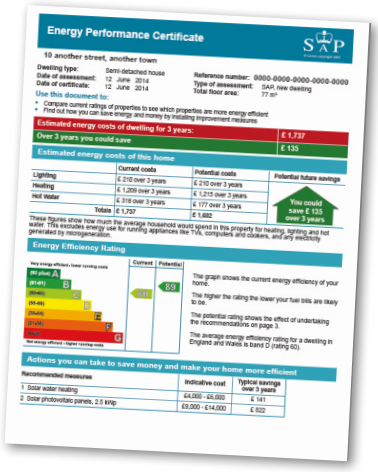
DESIGN STAGE

- Poor drawings and lack of information or specification.
- The ventilation strategy is not defined.
- “Minimum” U-values specified, without proof.
- Heating details are not specified meaning assumptions need to be made, potentially making the result poorer than if correctly specified heating and controls are used.
- Realistic air leakage figures are not assumed. These should be set according to the ventilation strategy, Building Regulations and past experience of air pressure test results achieved.
- SAP conventions not adhered to, meaning incorrect DER calculation is produced.

AS BUILT STAGE

- Poor drawings and lack of information or specification.
- The ventilation strategy is not defined.
- “Minimum” U-values specified, without proof.
- Heating system and controls not installed as per the Design Stage calculation inputs.
- Specified junction details not built to meaning PSI-value inputs need to be adjusted.
- The air pressure test result is higher than assumed in the Design Stage calculation.
- Changes made to the dwelling design and/or product substitution (if not communicated to assessor during build.
- Window specifications do not match design, in terms of U-value, frame factor and g-value; or BFRC figures specified, but different windows installed.
- Secondary heating installed when not in original design.
- SAP conventions not adhered to, meaning incorrect DER calculation is produced, and EPC audit failure.

WHAT IS THE SAP CALCULATION, AND WHAT IS IT USED FOR?



The Government Standard Assessment Procedure (SAP)

SAP is the Government's Standard Assessment Procedure for the calculation of predicted energy use and resulting carbon dioxide emissions from a dwelling. It is used as the main compliance tool for Building Regulations Part L1A, to satisfy Criterion 1 and provides information to satisfy Criterion 2 and Criterion 3. It is also used to produce the Energy Performance Certificate (EPC) for the completed dwelling.

The SAP calculation is based on the energy balance of the dwelling over the course of a year taking into account a range of factors that contribute to energy efficiency, and is based on a standardised occupancy profile.

The SAP calculation is undertaken via approved software packages and is used to provide the following information for a new dwelling:

- The Target Emissions Rate (TER)
- The Target Fabric Energy Efficiency (TFEE)
- The Dwelling Emissions Rate (DER)
- The Dwelling Fabric Energy Efficiency (DFEE)
- The SAP rating
- The Environmental Impact Rating

Building Regulations Approved Document Part L1A gives guidance as to how to reasonably demonstrate to Building Control that a building has been designed and constructed in compliance with the appropriate energy efficiency requirements of for new-build dwellings. Additional industry produced guidance is available, for example NHBC Foundation 'Part L 2013–Where to Start' guides, NF58 and NF59.

Building Regulations Part L1A Compliance Criteria

Criterion 1: Achieving the Target Emissions Rate (TER) and Target Fabric Energy Efficiency (TFEE) – i.e. That DFEE ≤ TFEE and DER ≤ TER

Criterion 2: Limits on design flexibility - the thermal performance of building elements and efficiencies of services should not fall below minimum values

Criterion 3: Limiting the effects of heat gains in summer

Criterion 4: Building performance consistent with the Dwelling Emission Rate (DER) and Dwelling Fabric Energy Efficiency (DFEE)

Criterion 5: Provisions for energy efficient operation of the dwelling

A SAP assessment is carried out at two stages in the design and construction of a new dwelling:

- At Design Stage, with a submission to Building Control before work starts on site
- At As Built Stage, with a final submission on completion of the dwelling

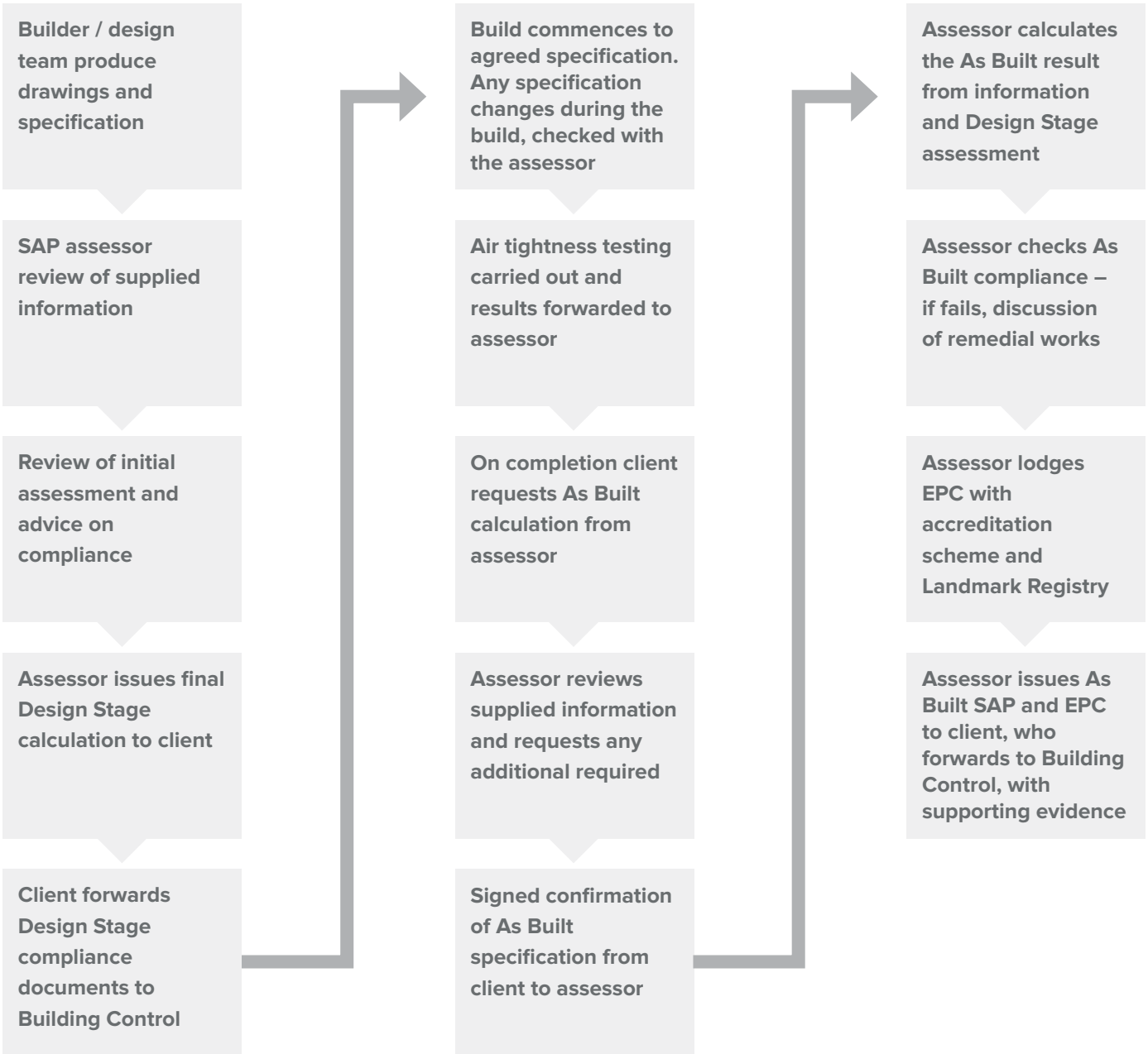
The two submissions can be used by Building Control to check compliance with required targets. A clear connection must be evident between product specifications and the data inputs into the SAP software. The As Built submission is required to produce the EPC for the completed dwelling.

SAP PROCESS

The Process in Stages

A sign of a good assessment is where information can clearly be seen to have flowed between the developer and the assessor, and that this matches what has actually been built / installed.

Note: 'Client' here could be the Builder or another member of the design / development team.



COMMUNICATION IS KEY TO PART L COMPLIANCE

Communication with your SAP assessor, across all aspects of the design and construction process, is vital to ensure the SAP calculation accurately represents the design and subsequent construction of the dwelling; and that in both cases compliance is achieved. Commercial pressures can sometimes negatively impact the quality and accuracy of assessments and information provided, so involving an assessor throughout the process can have significant benefits.

Do not be afraid to ask the SAP assessor for references. If you are working on a development that requires particular product knowledge, e.g. renewables, then ask the assessor to relay their experience in this area, such as the percentage of their work that involves renewable or low carbon technology.

It is easy to feel that energy assessments are an obstacle or tick box exercise with assessors often instructed too late in the design process. Remember that SAP is a compliance tool. Interaction with the assessor, early in the design process, will allow a dialogue should your design initially fail to comply.

A clear path to follow in terms of achieving compliance would be a fabric first approach, followed by fit and forget technology and then renewables or other low carbon technology. However, bear in mind that the SAP assessor may not be a trained designer, so be aware of the extent of the assessors' knowledge, particularly on product specification and application, when trying to get a dwelling to achieve Design Stage compliance.

During the build process, communication back to the assessor, when making any changes that could affect the energy efficiency of the dwelling, is paramount. Ideally, check that the revised assessment will pass, before implementing any changes. Do not be tempted to tell the assessor whatever is needed in order to get the As-built assessment and EPC produced. This will create issues with Audits (which are carried out by the assessor's accreditation body) and subsequently issues with the accuracy of the EPC.

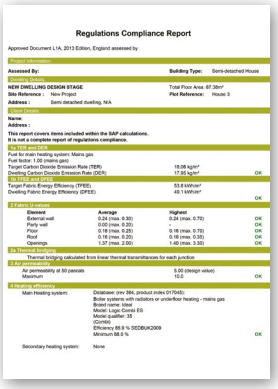
Quick fact

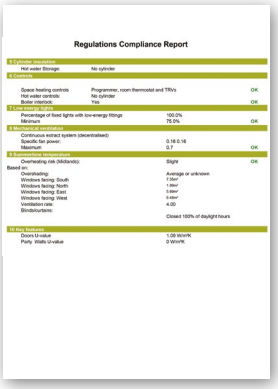
A common cause of issues with compliance at As Built stage is product substitution. For example, changing a high efficiency product for a poorer performing product.

Quick fact

For a building that contains more than one dwelling, such as a terrace of houses or an apartment block, compliance can be calculated based on the floor-area-weighted average of the TER/DER and TFEE/DFEE for all the dwellings in the building.

WHAT SHOULD I KNOW BEFORE APPOINTING A SAP ASSESSOR?


Regulations Compliance Report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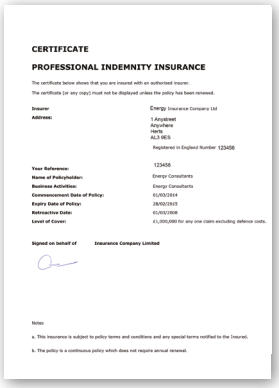

CERTIFICATE

PROFESSIONAL INDEMNITY INSURANCE


ABBE Quality Accredited

Certificate of Achievement

(Full Award)

This is to certify that

has been assessed as meeting the required level of competence for all the units necessary to achieve the full award

ABBE Level 3 Certificate in Domestic On Construction Energy Assessment (QCF)

Ofqual

Example building regulation compliance report

Is the SAP assessor qualified and do they have Professional Indemnity insurance?

Your SAP assessor needs to be OCEA / OCDEA / DOCEA accredited, (depending on scheme) to produce an EPC from an As Built SAP assessment. It is recommended to use an accredited assessor throughout the process and the status of the assessor can be checked on the Landmark website: https://www.epcregister.com/searchassessor.html

Accredited professionals will also require at least £50,000 in ongoing Professional Indemnity insurance, in order to remain a registered assessor.

What is the extent of the service being offered and what are the fees?

The fee will depend on the service being offered. A basic service would be for the assessor to enter the information you provide into the SAP software to tell you whether the design complies or not, and then, based on the information you provide, to produce an As Built version and EPC on completion of the dwelling (if the dwelling is compliant).

An elevated level of service may be beneficial to you. For example, engaging a knowledgeable assessor as a consultant early in the design stage, could often save money on the build cost, but may be subject to additional fees.

HOWEVER, bear in mind that not all assessors will be energy efficiency experts and they may not be sufficiently knowledgeable to identify appropriate solutions, or might even suggest options that would assist compliance without investigating their appropriateness or practicality. It is therefore important to ascertain the competency and knowledge of the assessor before engagement.

Quick fact

A SAP assessor must complete a minimum of 10 hours of CPD per year to remain certified.

INFORMATION REQUIRED – OVERVIEW

What information should the drawings show?

Ideally fully dimensioned design stage drawings showing the following:

- The building's form – plans, elevations, sections
- Linear thermal bridging details, if available
- Opening sizes, type and orientation
- The amount of low energy lighting
- Dwelling orientation – site plan with North point shown
- Site address
- The drawings need to be sufficient for an assessor to accurately take-off dimensions.

What additional information might be required?

- Any Planning conditions relating to renewable or low carbon technologies, or a stated percentage improvement over Building Regulations Part L1A.
- Any procurement deals that are in place, that dictate the choice of materials or products to be used.

What information should the specification show?

- The thermal insulation of the building fabric, including material build ups sufficient to allow U-values to be calculated.
- If available, U-value calculations produced by competent persons in accordance with BR443
- Proposed heating and hot water system, controls and the fuels used to provide heating and hot water.
- Materials to be used in the construction
- Proposed level of air tightness of the dwelling
- Proposed ventilation system
- Any additional technologies that influence the outcome for example, waste water heat recovery, flue gas heat recovery, photovoltaic cells etc.

DRAWINGS AND TECHNICAL SPECIFICATION

Questions to Address

Below is a list of areas to address to ensure the assessor has sufficient information on the drawings and specification in order to carry out the Design Stage SAP assessment.

Is there a key to the wall types used in the construction?
Usually on the plan

Are all the openings labelled?
Can be on plan or elevation

Does opening information include sufficient information regarding U-values, g-values, frame type, glazing emissivity, air gap size; whether argon or air filled
Usually in the specification

Are doors opaque or glazed?
Openings are treated differently for solar gains depending on the percentage glazing – is this information adequately transferred to the assessor?

Are the room types labelled?
e.g. Utility room

Are the wet-rooms detailed, showing shower or bath?
e.g. Electric Shower

Are the openings dimensioned?
Window schedule could be provided

Are the heating and hot water systems detailed?
Usually in the specification

Is there a lighting plan?
Percentage of low energy lights

Is the ventilation position and type shown?
See Building Regulations Part F for information and advice

Are the corridors heated, in apartment blocks?
If so, then an SBEM calculation is required for the corridor areas

Is there a site plan showing orientation?
North point can be shown on dwelling plans instead

Are the controls detailed?
Usually in the specification along with the heating. Or separate heating design.

Is there any secondary heating noted?
e.g. Log burner

Are there working chimneys?
Sometimes dummy chimneys are included to the roof only, for aesthetic reasons

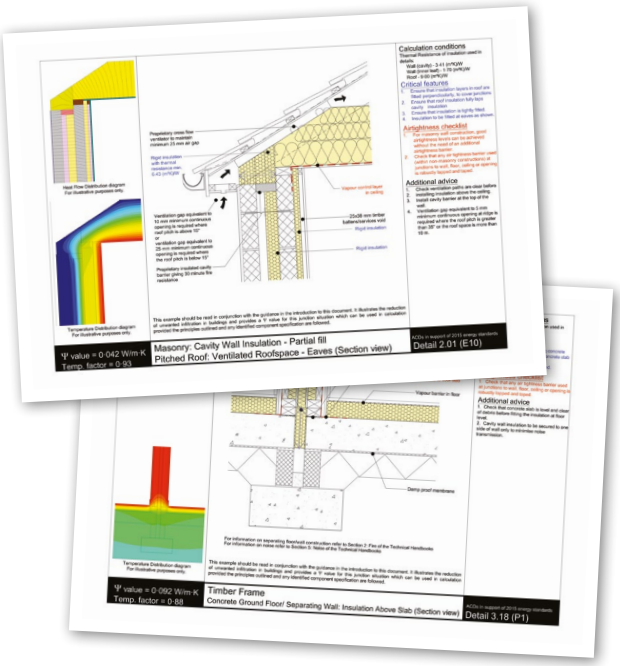
Are chimney and flue sizes obvious?
Any additional open flues need to be accounted for

Are there section Drawings?
Required to ascertain ceiling heights

Quick fact

There is no British Standard applied to architects drawings, in the same way that there is for engineering drawings, so drawings will often differ in information and layout.

INFORMATION REQUIRED – LINEAR THERMAL BRIDGING



Example of Junction Detail and associated PSI-value

Images © Scottish Government

A thermal bridge (sometimes called a cold bridge) is a localised weakness or discontinuity in the thermal envelope of a building. They generally occur when the insulation layer is interrupted by a more conductive material. Improving junction details to reduce linear thermal bridging will help achieve Building Regulations compliance and is one component in achieving healthy low energy homes.

There are two types of thermal bridges in buildings – repeating and non-repeating. Repeating thermal bridges are taken account of in the U-value calculations for the building elements.

The remaining non-repeating or linear thermal bridges are dealt with by PSI-values. These occur at junctions between elements, such as a wall and a floor or a window and a wall. At these locations heat is more able to transfer through the construction, resulting in greater heat loss from the dwelling and localised 'cold spots' in the building envelope. The energy lost through linear thermal bridging is described by the PSI-value of the junction detail multiplied by the length of the junction.

Various sources exist to obtain PSI-values for the building junctions of interest, for input into the SAP calculation (and aid design of the junctions themselves);

- Generic industry sponsored libraries covering the common building types e.g. LABC Registered Construction details or Scottish standards Accredited Construction Details.
- Individual product or building system manufacturer sponsored libraries, covering specific building products/systems.
- Bespoke PSI-values calculated by 'competent persons' for specific developments.

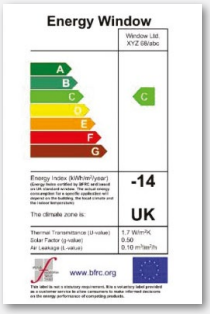
For more information see the Zero Carbon Hub Thermal Bridging Guide and NHBC Foundation Part L 2013 How to Start Guides.

Quick fact

Thermal bridges can account for 20-30% of the heat loss in a typical new build home. As homes become better insulated thermal bridges become even more significant.

INFORMATION REQUIRED – GLAZING

It is important that the correct information regarding the glazing is provided to the SAP assessor. The information your assessor will require will be based on three routes:

Manufacturer is appointed and has supplied:	Manufacturer is appointed and has supplied:	SAP tables, if the manufacturer is not appointed:
BFRC certified U-value and g-value	Glazing type – is it double / triple glazed, argon filled, low E glass?	Glazing type – is it double / triple glazed, argon filled, low E glass?
	g-value (solar transmittance)	What is the frame material?
	Frame Factor	What is the overall U-value?
	Overall U-value	

Quick fact

The British Fenestration Rating Council (BFRC) provides independent verification of the energy efficiency of windows.

Note: it is common for window manufacturers to promote the 'centre-pane' U-value of a window rather than the more realistic 'overall' U-value, and this can cause issues with the accuracy of the information presented to the assessor

Common Pitfalls

- Changes in frame type, during construction, can cause compliance issues. For example, changing from uPVC to aluminium or composite windows, will alter the U-value and frame factor.
- Changing from a BFRC rated glazing, to a 'Manufacturers' specified rating will change the assessment.
- Changing the overall U-value or g-value of the glazing, will affect the assessment result.

There may be confusion over the U-value supplied by the manufacturer, as this can take three forms:

- The U-value measured through the centre of a glazing unit alone – 'centre-pane'
- The U-value of the window frame alone.
- The overall U-value of the window including glazing unit and frame – 'overall'

The overall U-value is the value required by the assessor, so care needs to be taken to make sure the correct value is provided.

I HAVE PROVIDED ALL THE INFORMATION, WHAT HAPPENS NEXT?

I have the desired specification and correct design stage drawings, now what?

The assessor will enter the data into the approved software. At this stage the assessor will be able to indicate if the dwelling meets compliance. A sign of a good assessment is where information can clearly be seen to have flowed between the developer and the assessor.

Over the course of a build, any assumptions should be replaced with known parameters, and it is essential that any changes from assumptions to proposed are checked before implementing, to avoid costly mistakes that can result in the dwelling failing to comply. For example, switching heating systems during build but not consulting the SAP assessor until the dwelling is completed – and finding it now fails.

There are currently six approved software providers for SAP calculations, but not all provide EPC lodgement in house.

These are (program name in brackets)**:**

- **Bryter Digital** (Energy Design Tools SAP 2012 Calculator)
- **Elmhurst Energy Systems** (EES Design SAP 2012)
- **JPA TL Ltd** (JPA Designer)
- **National Energy Services Ltd** (NHER Plan Assessor)
- **RUSFA** (SAPPER)
- **Stroma Certification** (FSAP 2012)

In addition to the approved software providers above, there are a number of accreditation schemes for the assessor.

Does Part F of the Building Regulations (ventilation) affect my Part L strategy?

The ventilation strategy does affect the SAP calculation. The type of system (e.g. background ventilators and intermittent extract fans; passive stack ventilation; continuous mechanical extract (MEV); continuous mechanical supply and extract with heat recovery (MVHR)), the airtightness target of the dwelling, and the presence of any chimneys or flues are the main aspects which influence the result.

Quick fact

Air pressure tests of completed dwellings are required in accordance with the specific requirements set out in Part L. If no more than 2 dwellings are being erected on a site it is possible to avoid the need for pressure testing if an airtightness value of 15 is used in the SAP calculations. However, this will make compliance considerably harder to achieve.

FACTORS THAT AFFECT THE ASSESSMENT

The SAP calculation is based on the energy balance of the dwelling over the course of a year taking into account a range of factors that contribute to energy efficiency:

- Materials used for construction of the dwelling
- Thermal insulation of the building fabric
- Airtightness and ventilation characteristics of the dwelling, and ventilation equipment installed
- Efficiency and control of the heating system(s)
- Solar gains through openings
- The fuel used to provide space and water heating, ventilation and lighting
- Energy for space cooling, if applicable
- Renewable energy technologies

The calculation is independent of factors related to the individual characteristics of the household occupying the dwelling, for example:

- Household size and composition;
- Ownership and efficiency of particular domestic electrical appliances;
- Individual heating patterns and temperatures.

It is able to do this by using standardised occupancy, heating patterns and internal temperatures.

Can the choice of boiler influence the DER?

Yes – the type, make and model of the boiler will influence the resulting efficiencies calculated in SAP. So if the boiler has been chosen at Design Stage, this needs to be conveyed to the assessor.

Note that two combination boilers with the same overall SEDBUK efficiency may lead to different DER outcomes due to potential differences in "summer" and "winter" seasonal efficiencies of those boilers.

At As Built stage and for the EPC production, there is a requirement to confirm the installed boiler, cylinder size and heat loss and all must be evidenced.

FACTORS THAT AFFECT THE ASSESSMENT

What about renewable energy technologies – can they help?

The installation of renewable energy technologies will help reduce the DER of the dwelling. The choice of technology will be partly dictated by the site location and layout. Ideally renewables will be used to complement a good fabric specification and in any case the TFEE will need to be met.

It is advisable to take expert advice on the options and specific design of any system.

Technologies to consider include:

- Photovoltaic cells (PV)
- Solar thermal (solar hot water)
- Air source heat pump (ASHP)
- Ground source heat pump (GSHP)

and rarely:

- Small scale wind turbines
- Small scale hydro-electric power

The critical inputs into the SAP calculation varies depending on technology, but your assessor will be able to advise what information needs to be provided to them.

Does installing a secondary heat source cause problems with compliance?

Unless a particular make and model is specified, the SAP default tables must be used. Specifying a make and model will often show a higher efficiency than the default but the efficiency and test standard of the specified heating is required. Aside from the efficiency of the secondary heat source, the presence of a chimney or flue for the appliance will also affect the SAP result.

Unless you have a room sealed log burner, a secondary heat source is likely to make the SAP result worse.

There is a lot of conflicting information regarding claims of efficiency (both gross and net efficiencies might be quoted by salesmen), which can be misleading. As stated above, make and model of specified heating, together with efficiency and test standard are needed. For example, HETAS is the official body recognised by Government to approve biomass and solid fuel heating appliances, fuels and services.

Note that if there is a chimney or flue provided but no appliance actually installed, for the purposes of the SAP calculation it is assumed that if there is an unconnected gas point then a gas fire with efficiency of 20% is present, and if no gas point then a solid mineral fire with an efficiency of 37% is present.

FACTORS THAT AFFECT THE ASSESSMENT

Can boiler controls influence the outcome?

Using a delayed start thermostat, weather or load compensator will improve the DER. The specific product needs to be in the SAP Product Characteristics Database to be applied to the calculation, so check this with your assessor before specifying.

These products can typically improve the DER by around 1.5%

What about heating controls?

Time and temperature zone control on the heating system can also improve the DER. This could take the form of:

- Separate plumbing circuits, either with their own programmer, or separate channels in the same programmer, or
- Programmable TRVs or communicating TRVs that are able to provide time and temperature zone control (conventional TRVs without a timing function provide only independent temperature control). In this case the device must be located in the SAP Product Characteristics Database.

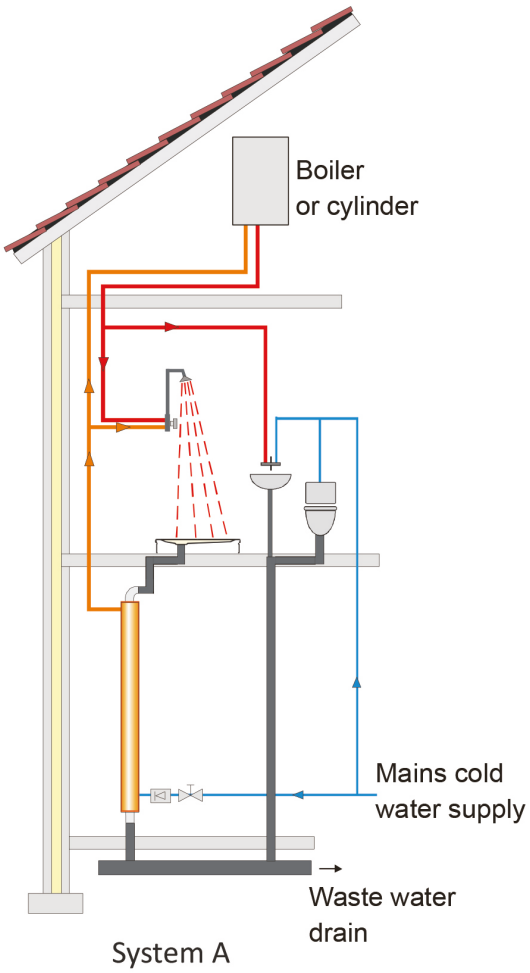
Both cases are subject to the conditions in the SAP Technical Document and apply if there are at least two zones in which heating times and temperatures can be controlled independently of each other.

In the case of direct-acting electric systems, including underfloor heating, it can be achieved by providing separate temperature and time controls for different rooms.

POTENTIAL TECHNOLOGY ADDITIONS

Waste Water Heat Recovery (WWHR)

Typically a waste water heat recovery system works by extracting heat from the water that the shower or bath sends down the drain. This heat is used to warm the incoming mains water, reducing the energy required by the boiler to heat the water up to temperature. WWHR typically take the form of a long vertical copper pipe, where the warm water runs alongside the colder mains water to exchange the heat. It is a fairly simple device, with no electrical components, no pumps or controllers, and so it requires very little maintenance.



Images © Shower Save

WWHR should be planned in early or wet room layouts may not allow efficient installation and full benefit. Two showers can be connected to the same WWHR system provided that the length of the drain pipe between shower and WWHR is not excessive (generally less than 3 metres). Bear in mind they need to be installed below the shower, and in back to back installations, they may clash with other services. For bungalows or apartments, there is a shower tray option, although this is not as efficient as the pipe version. Note that WWHR systems are not compatible with instantaneous electric showers.

There are three different system configurations, with System A providing the maximum energy saving. In this system the output of the heat exchanger is fed to both the shower and combination boiler or hot water system. Consult a manufacturer for advice.

With Waste Water Heat Recovery, it is important to match the correct type and application to the heating system.

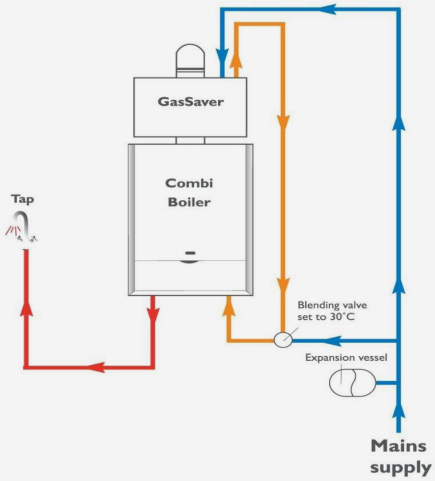
POTENTIAL TECHNOLOGY ADDITIONS

Flue Gas Heat Recovery Systems (FGHRS)

Flue Gas Heat Recovery Systems takes advantage of the heat within the waste flue gasses resulting from the combustion of gas in the boiler. This recovered heat is used to preheat the cold water entering the boiler, thereby lowering the amount of energy needed to warm the water up to the required temperature. It can be applied to mains gas, LPG or oil condensing boilers.

The flue gas heat recovery system requires very little maintenance, with no need for mains electricity. These systems should be planned in early as there are additional space requirements for the FGHRS. Some boilers have the system built in, and in others it takes the form of a “top box”. It is important that the specific boiler and FGHRS are compatible so check this with the manufacturer or seek further advice.

Systems can be either a “wet” or “dry” version



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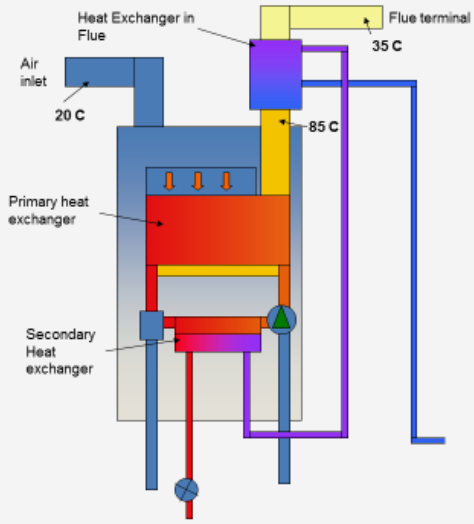


Image © Ideal Boilers

Wet version

Stores the condensate normally expelled into the atmosphere through the boiler flue. Heat from this condensate is recycled to pre-heat water coming into the boiler from the cold mains supply. The energy saved is greater in the wet version than the dry.

Dry version

The device works by using the flue gases which are already hot to pre-heat the incoming cold water as it passes through. This pre-heated water then enters the combination boiler by the standard connection.

THE OVERHEATING CHECK IN SAP

SAP contains a basic "overheating check" at Appendix P. The calculation gives an assessment of whether the building has a low, medium or high risk of overheating during the summer months. However, it is a basic compliance check only and is based on monthly averages so if there is a risk of overheating it will not be able to give information on why, or what might be done to mitigate the risk.

Building Control use the outcome of the assessment as evidence that Criterion 3 of Part L1A has been met – i.e. that reasonable provision has been made to limit heat gains and that the building does not have a "high" risk of overheating.

The home buyer requires air conditioning, can this cause a problem for compliance?

Cooling systems use energy and will therefore negatively effect the DER. The type of system, Energy Efficiency Ratio and area served needs to be entered into SAP in order to get an accurate DER figure. The use of passive cooling measures should be considered first, with mechanical cooling and air-conditioning installed where other measures cannot ensure acceptable indoor temperatures are maintained.

I have a large area of south facing glazing, how can I reduce the overheating risk?

- If possible reduce the amount of south facing glazing in the design.
- Include external shading such as window overhangs.
- Include external shutters, preferably light in colour.
- Use glazing with a lower BFRC g-value (solar transmittance). However, bear in mind that it will worsen the DER, so it is a fine balance.
- Increasing the thermal mass can help to smooth out internal temperature changes over the course of a day, but stored heat will need to be removed, for example by night time ventilation.
- Add blinds to the windows – but there is no guarantee that these will actually be fitted by an occupant, so should not be used in the calculation unless specified.

Note that these measures (apart from blinds) will affect the DER and DFEE.

Note: overheating should be considered at design stage, with buildings at higher risk potentially undergoing a more rigorous overheating assessment, for example by the use of dynamic thermal modelling.

WHAT IS REQUIRED TO PRODUCE THE AS BUILT COMPLIANCE CERTIFICATE AND EPC?

Quick fact

U-value calculations should be submitted to Building Control with the SAP calculation. They should be carried out by persons competent to do so, and in accordance with BR443.

Quick fact

To complete an As Built assessment, it is essential that a Client advises the assessor when changes have been made from the information given at Design Stage.

What is required to produce the As Built compliance certificate and EPC?

The assessor will require the following information in order to produce an As Built compliance document and EPC. This information must then be made available should an audit be carried out on the assessment by the SAP assessor's scheme provider.

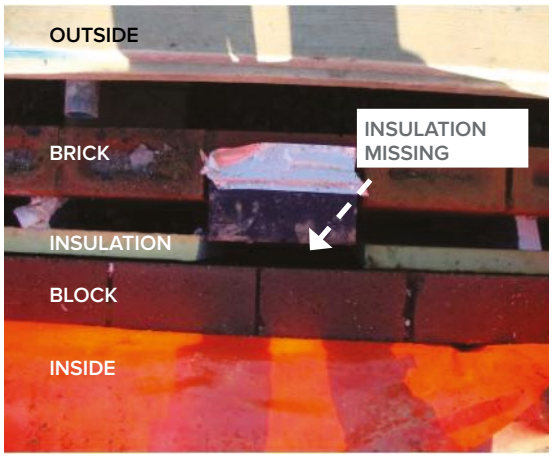
- If available, or if there have been changes since the Design Stage – As Built drawings (plans, sections, elevations).
- OR a statement from the developer or equivalent person that the dwelling has been constructed in accordance with the design specification provided to the assessor and where applicable, written confirmation to the assessor that the specific products have been used in the dwelling concerned.
- As Built specification, if different from the Design Stage specification – Detailed construction information describing all the materials used in the building fabric. All services including space/water heating, ventilation, lighting renewables and any other technologies, including MCS certificates
- U-value calculations (likely to be produced by your assessor) – U-value calculation data sheet including construction layers (materials,thickness and thermal properties) and U-value corrections
- Statement from developer or equivalent person confirming the window properties as built or a certificate based on BFRC methodology
- A copy of the air leakage pressure test certificate. For a dwelling that was tested, test certificate for that dwelling. For a dwelling not tested, test certificates for dwellings of the same type that were used to derive the average. Testing must be conducted by a suitably qualified person. (Or confirmation that testing was not required).
- Confirmation of linear thermal bridging construction details and PSI-values or own calculated values
- Waste Water Heat Recovery Systems – Suitable evidence of correct installation, e.g. Installation checklist and certificate

EXAMPLE IMPLICATIONS OF CHANGES DURING CONSTRUCTION

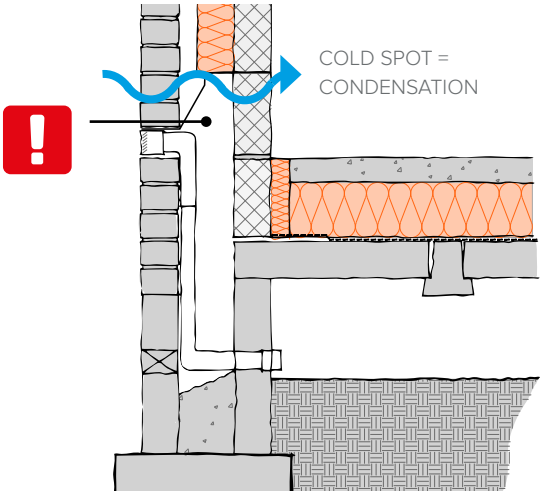
Below are examples of potential compliance issues created during construction.

Not building to the construction details for linear thermal bridging claimed in the SAP calculation at Design Stage will likely lead to increased heat loss and issues with achieving DER and DFEE compliance at As Built stage if PSI-values have to be amended in the calculation.

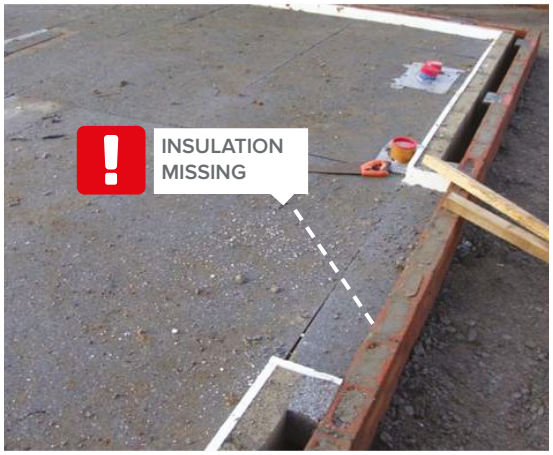
PROBLEM TO AVOID — INSULATION MISSING BELOW DPC



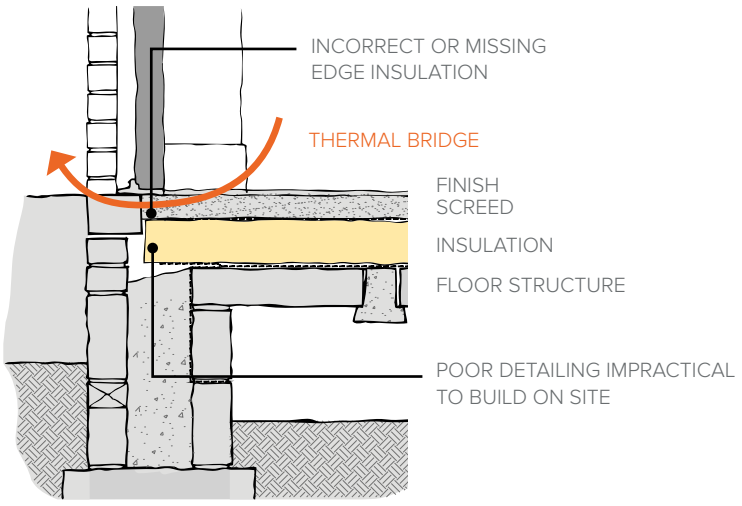
PLAN OF SUB FLOOR VENT BLOCKING INSULATION



PROBLEM TO AVOID — MISSING EDGE INSULATION



SCREED BRIDGING THRESHOLD



Refer to the 'Builders' Book' published by the Zero Carbon Hub for further information and tips on how to avoid these problems.

EXAMPLE IMPLICATIONS OF CHANGES DURING CONSTRUCTION

PROBLEM TO AVOID

HEAT LOSS THROUGH UNINSULATED PIPES

PRIMARY PIPEWORK NOT INSULATED

Not insulating the primary pipework could have over a 2% negative effect on the DER and would mean that the installation does not meet the recommended minimum standards set out in the Building Services Compliance Guide. In addition, the uninsulated pipework could contribute to a summertime overheating problem.

Running uninsulated pipework in internal corridors in apartment blocks can cause an overheating issue, and not just in the summer months.

PROBLEM TO AVOID

SUBSTITUTING THE BOILER ON SITE

Changing the boiler, without re-running the SAP calculation can cause issues with compliance, even if the overall SEDBUK figures are the same. This is particularly evident in combination boilers where the efficiency of hot water production can differ, meaning the DER could be affected.

Not installing full zonal controls, weather compensation or delayed start thermostat, when these have been assumed in the Design Stage calculation, will have a negative effect on the DER.

Swapping fuel types will have huge implications – e.g. installing an electric boiler where the Design Stage calculation was based on gas

Always check with the SAP assessor before changing the specification between Design Stage and As Built Stage, especially when substituting products.

USEFUL LINKS

Accredited Assessor List
https://www.epcregister.com/searchassessor.html

Zero Carbon Hub Builders Book
http://www.zerocarbonhub.org/full-lib

Zero Carbon Hub Services Guide
http://www.zerocarbonhub.org/full-lib

Zero Carbon Hub Thermal Bridging Guide
http://www.zerocarbonhub.org/full-lib

Building Regulations Part L (2013): Conservation of Fuel and Power
http://www.planningportal.gov.uk/buildingregulations/approveddocuments/partl/approved

Building Regulations Part F (2010): Ventilation
http://www.planningportal.gov.uk/buildingregulations/approveddocuments/partf

Domestic Building Services Compliance Guide
http://www.planningportal.gov.uk/buildingregulations/approveddocuments/partl/compliance

Domestic Ventilation Compliance Guide
http://www.planningportal.gov.uk/buildingregulations/approveddocuments/partf/associated

NHBC Foundation 'Part L 2013 – Where to Start' guides, NF58 and NF59
http://www.nhbcfoundation.org/Publications/Guide/Part-L

LABC Registered Construction Details
https://www.labc.co.uk/registration-schemes/construction-details

Scottish Standards – Accredited Construction Details:
http://www.gov.scot/Topics/Built-Environment/Building/Building-standards/publications/pubtech

British Fenestration Rating Council
http://www.bfrc.org/

NOTES

NOTES

NOTE: This Guide is not a legal document and does not form part of a Building Regulations approved specification. It is for information and good practice purposes only. Consult your Building Control Officer for details on approved specification's and policy.

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