Thermal Performance of Glass Rooflights

Understanding their thermal performance and contribution to energy efficiency

GLAZINGVISION

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t. 01379 658300
e. info@glazingvision.co.uk

Sawmills Road, Diss,
Norfolk, IP22 4RG

Glazing Vision ltd, registered in England no. 2987024

What is 'thermal performance'?

When thinking about the energy efficiency of buildings, it's easy to focus on heat loss through individual elements and forget the wider picture. It's true that U-values often become the headline figures in a specification, but they are not the sole barometer of performance.

There's a reason for the relevant section of the building regulations in England, Wales and Northern Ireland being titled 'Conservation of fuel and power', and 'Energy' in Scotland. Minimising the leakage of warm air from a building is a fundamental part of its design and specification, but it isn't achieved by low U-values alone.

- Part L 2013 in England, supported by Approved Documents L1A, L1B, L2A, L2B.
- Part L 2014 in Wales, also supported by Approved Documents L1A, L1B, L2A, L2B.
- Section 6 of the Domestic and Non-domestic Technical Handbooks 2015 in Scotland.
- Part F 2012 in Northern Ireland, supported by Technical Booklets F1 and F2.

The regulations for the different parts of the UK aim to achieve broadly the same thing: high levels of energy efficiency and low carbon dioxide emissions, though inevitably the route to compliance varies slightly from country to country.

It used to be possible to specify building fabric that performed relatively poorly, offsetting it through the inclusion of renewable technology. Prominent building physicists describe this as like running a hot bath without putting the plug in first: very inefficient. More recent regulatory updates have effectively moved to put the plug in, shifting the focus toward high performance building fabric.

Putting fabric first

Popularly, this is known as adopting a 'fabric first' approach. Generally speaking, buildings are designed to last - look at the age of some of the properties we occupy, and also consider that 80% of the buildings standing today will still be with us in 2050.

Technology will continue developing, achieving greater efficiency over longer service lives, but highly efficient building fabric delivers for the life of the building. Get the performance wrong and the building will be saddled with it from the outset, unless a high level of retrofit is carried out.

A fabric first approach, on the other hand, makes life easy for a building's owners and occupants - they can continue to reap the benefits of comfortable internal conditions and low energy bills, with minimal maintenance required.

t. 01379 658300
e. info@glazingvision.co.uk

Sawmills Road, Diss,
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Assessing compliance

Good fabric performance therefore relies on low U-values for the main building elements, and minimising heat transfer at junctions where those elements meet (cold bridging). It is also based on reducing uncontrolled ventilation to avoid the excessive loss of heated air while making sure occupants still have a supply of fresh air to breathe.

Renewable technology can still be incorporated to assist with heating or hot water demand, but the key word is 'assist'. Reduce the building's energy demand in the first place and technology doesn't have to work miracles to create a comfortable living or working environment!

For new-build construction projects, building regulations take this inter-connected 'package' of measures into consideration when determining whether a building meets the targets for carbon dioxide emissions and/or energy consumption. There are two calculation methods: the Standard Assessment Procedure (SAP) for new domestic buildings, and the Simplified Building Energy Model (SBEM) for non-domestic buildings.

Under both, the proposed specification is assessed against the 'notional building' - a theoretical identical building that meets a defined level of performance - and must better it to be deemed as compliant. In addition to U-values, linear thermal bridging (the junctions of building elements), airtightness and any renewables, the calculations take into account:

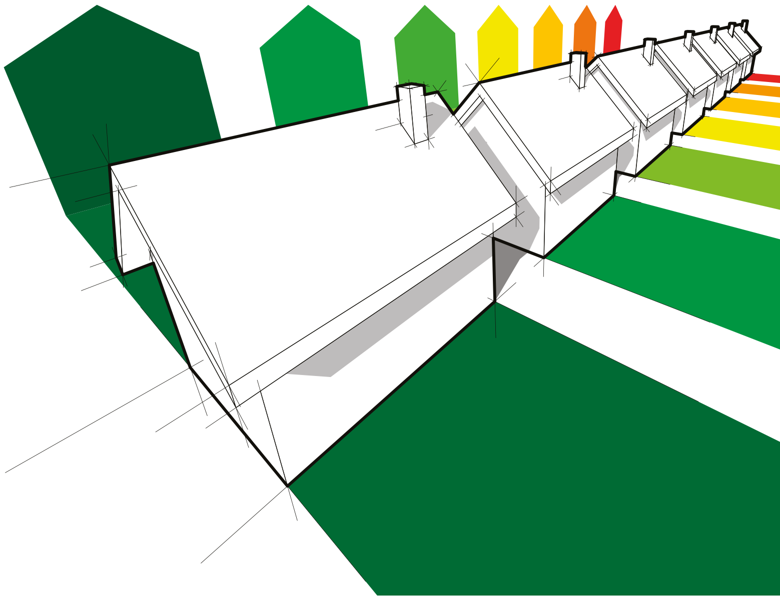
- The type of dwelling (semi-detached, detached etc.).
- The primary space heating system.
- Any secondary heating provision.
- Hot water generation.
- Ventilation systems.
- Efficiency of lighting.
- Size, composition and orientation of doors and glazing.
- Solar gains.

SBEM calculations are understandably more complex than SAP calculations as they have to take into account a broader range of building types and uses, but the underlying principles are similar.

Given the array of design and specification features covered, it's beneficial to undertake some compliance calculations from the early stages of a project to have an idea where the outline specification might be falling short. The process of modelling the building design means values can be tweaked and changed, assessing different iterations as the specification develops.

While the SAP and SBEM methodologies are intended to be a reasonable approximation of how the building will perform, they do not take into account detailed occupant behaviour. The calculation results are a means of establishing compliance and comparing predicted energy efficiency and running costs of buildings.

The actual running costs will vary depending on the way the building is used. For example, a four bedroom house will cost more to run with a family of five living in it than if just one person lived there. No calculation method can predict how a building's occupancy and use will change over time.



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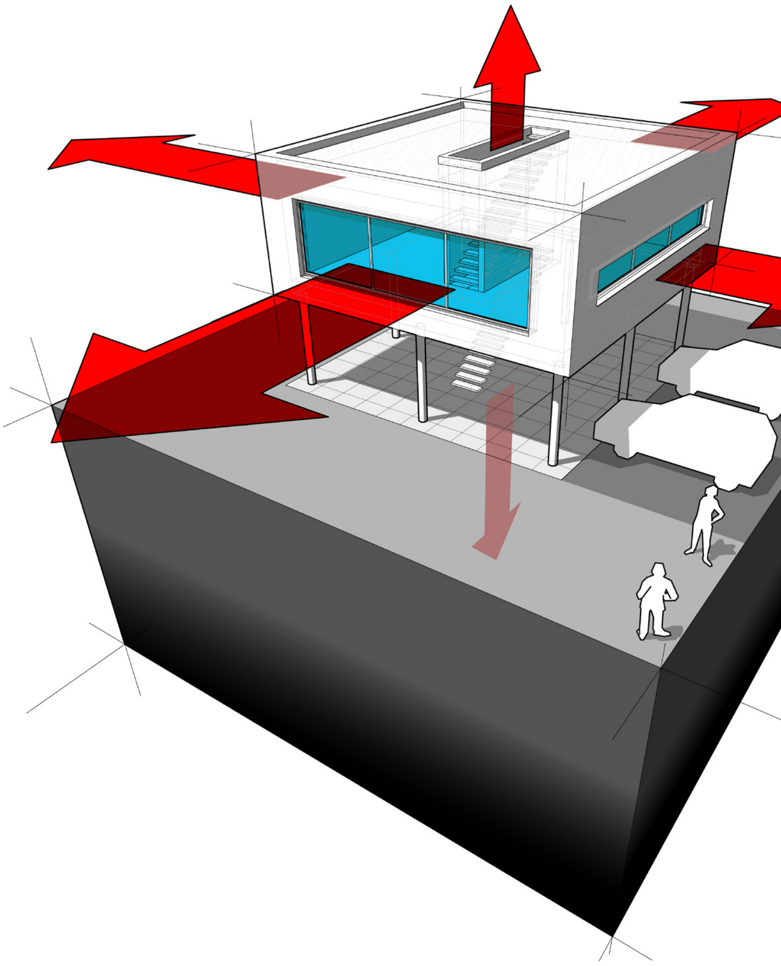
Existing buildings

Because it's rarely possible to accurately determine the construction of existing buildings, a whole-building approach to assessment is much less suitable. Regulations therefore take an elemental approach - i.e. giving specific U-value targets that individual parts of the building should achieve.

Where large amounts of glazing are specified in extensions or refurbishments - usually in domestic projects - the U-value of other elements may have to be improved to compensate. In these situations, SAP calculations may be carried out to assess the whole building including the new construction and glazing.

Solar gain and building orientation



Reduced heat transfer through good building fabric performance works both ways. It provides a comfortable internal environment by keeping the heat in during winter, and by stopping external summer temperatures warming the inside of the building.

Similarly, while glazed elements in a building allow greater heat loss compared to the surrounding construction elements due to their relatively poor U-value, they also permit more heat into the building via solar gains. Unfortunately, many properties - and volume housing in particular - are rarely designed to adequately control solar gains.

Large patio doors opening onto a south facing garden is attractive to potential home buyers, but in the height of summer the room from which they open is subject to large solar gains that create a stifling internal environment. In winter there is some benefit to be had from solar gains helping to warm the building, but if the property cannot retain the heat due to poor insulation and/or airtightness then the benefit is rapidly lost.

The aspect of all glazing in a property should be given due consideration, using design techniques to maximise the usefulness of solar gains - especially in winter - while taking steps, such as employing external shading, to control them in summer.

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Rooflight specification

It is within the context of everything we have talked about so far that rooflights and roof windows must be factored into the design and specified accordingly.

In a high performance building specification, the roof structure might have a U-value as low as 0.15 W/m2K or 0.13 W/m2K. It's not uncommon for a U-value of 1.4 W/m2K to be expected from glazing, and for a U-value of 1.0 W/m2K to be perceived as very low. Given the disparity in performance, the temptation might be to keep the inclusion of roof glazing to a minimum.

Designing a healthy building, however, means not taking U-values at face value.

Natural is best

So far there's been a lot of discussion about getting the balance right in a specification. Natural light is integral to the quality of the indoor environment, creating a pleasing, stimulating and more productive environment, and happier people.

Roof windows or rooflights provide up to three times more light than the same area of vertical glazing, though it has to be done in the right way and controlled.

Allowing too much light into the building is likely to result in glare and, because of solar gains, possible thermal stress for occupants. There are no fixed recommendations as to the amount of natural light that a space should enjoy, but there is plenty of guidance on what sort of roof glazing area might be aimed for, as a percentage of the floor area.

Typically, anything from 10 or 15% to 20% is likely, with 20% giving the highest levels of illuminance.

Pitch perfect

Getting the best out of roof windows means taking into account the pitch of the roof. The higher in a roof they are fitted, the more light from which the room benefits. For a low pitch, roof windows should be positioned higher up the roof to achieve good levels of light and unrestricted views for occupants.

It is worth bearing in mind that other regulatory requirements - such as means of escape requiring a particular distance between the floor and the bottom edge of the rooflight - might dictate the position of roof glazing within the roof structure.

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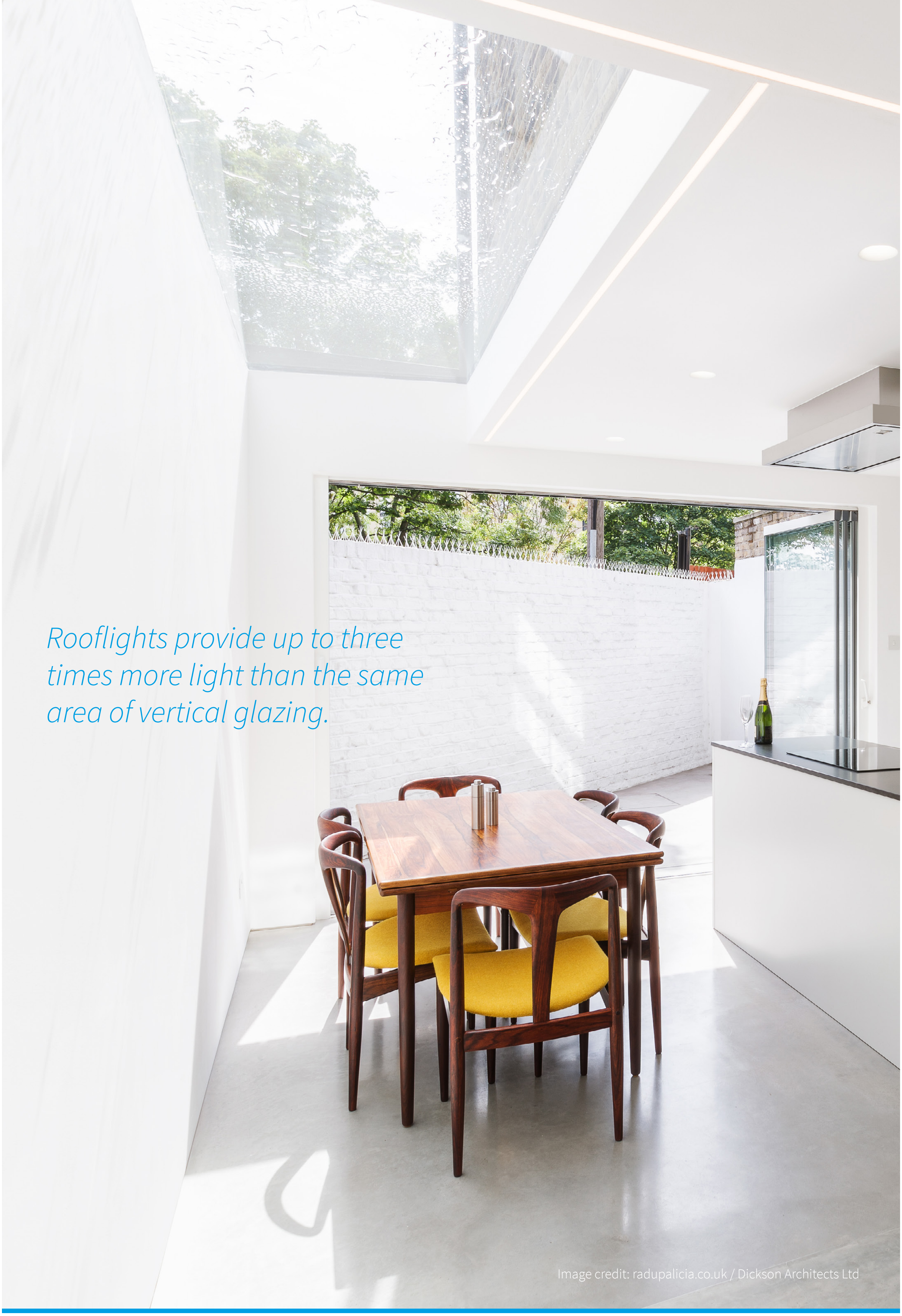


Image credit: radupalicia.co.uk / Dickson Architects Ltd

U-values vs energy use

Introducing the right levels of natural light has other benefits too. Although the U-values for roof construction and glazing quoted before seem quite dramatically different, the relatively small areas of roof glazing mean the minor increase in heating demand is more than offset by the contribution of solar gains and the reduced use of artificial lighting.

The larger the area of roof glazing, the greater the number of hours each year that the building's required illuminance will be provided by natural light, and the less time that artificial lighting will need to be used.

Optimising the area of roof glazing to reduce artificial lighting demand without causing overheating has a massive impact on a building's energy use and carbon dioxide emissions. Compliance calculations penalise electricity used for lighting more than gas used for space heating; the task of the designer is to find the sweet spot of the right amount of glazing. Larger glazed areas can be included to dramatic effect, but may require the use of specialist solar control finishes to reduce solar gain. The performance of the solar control coating will often be a compromise between the amount of heat that it reflects versus the amount of light it allows through (light transmittance) This is where the specifier must weigh up the importance of thermal comfort and natural light.

To help achieve that balance, lighting controls are recommended in both new and existing buildings to make sure that artificial lighting is only on when it is needed.

Considerations for the specifier

Having a clear idea of the likely material specification as early as possible is good for any construction project, but it's particularly helpful for glazing products.

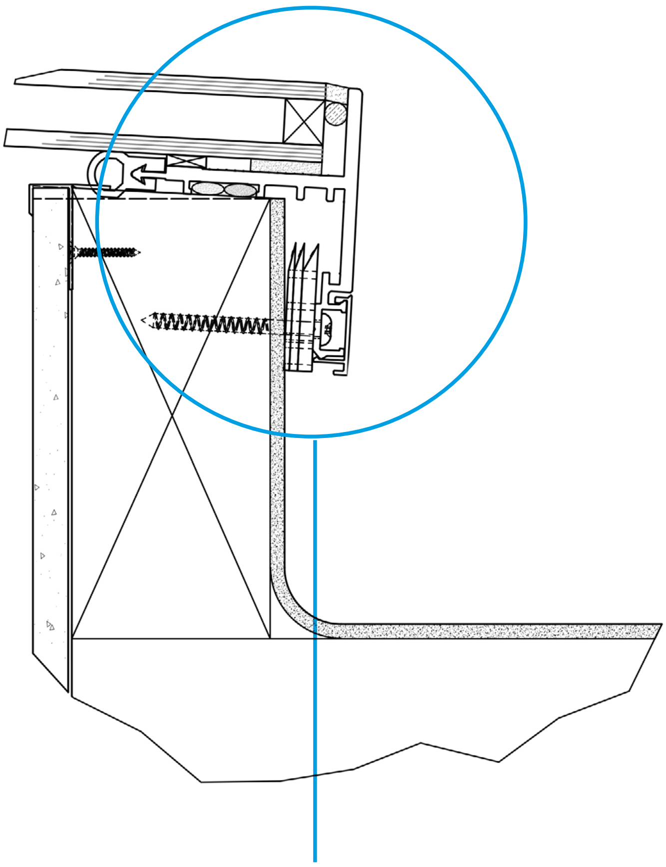
The composition of roof glazing units - including overall size, relative areas of glazing and frame, and the thermal performance of the materials used - varies, so U-values quoted in a specification should be based on an actual product or a detailed calculation model.

Unfortunately, there exists an element of misunderstanding and potential confusion when specifying U-values for rooflights. A performance specification may not be clear about whether a whole-unit or centre pane value is required, and manufacturers themselves may not be clear about the type of U-value they are quoting.

Centre pane U-values address the thermal performance of the glass only. They appear lower because the cold bridging effect of the spacer and edge seal are not accounted for. Centre pane values are useful in conservation projects, where traditional frame designs offer no meaningful thermal performance but where it needs to be shown that the glazed area is helping to achieve regulatory compliance. They are also useful to compare one glass against another, when being used in the same framework.

In most other circumstances U-values should be for the whole unit, including glazing and frame, but too many manufacturers still rely on quoting centre pane U-values. Specifiers can find themselves misled if two similar products are declared in different ways and a centre pane value is mistaken as a better performing product. This method is not in compliance with building regulations.

Explaining their performance claims and being able to back them up is an important role for manufacturers in helping to deliver energy efficient building projects.



U-values should be for the whole unit, including glazing and frame.

Composition of roof glazing units

The appearance of roof windows in terms of the relative areas of frame and glazing has a direct correlation with thermal performance. Currently, the trend in rooflight specification is for less frame and more glass, but the frame has to accommodate the technology and design features that deliver low U-values. Work to improve the performance of rooflights generally has actually resulted in 'chunkier' products.

At face value, choosing one large roof window over two smaller ones is typically better in terms of heat loss. Taking a more holistic approach to the building design, however, a number of smaller units in different parts of the roof can deliver better illumination of the space. If the goal is to maximise the number of natural daylight hours and limit the use of artificial lighting, then the compromise of more frame is acceptable.

Frames are typically manufactured from timber, plastics, aluminium and steel, or are composites of metal and plastic or wood. The choice of materials may be driven by a number of factors including thermal performance requirements, a desire to use more sustainable materials, structural performance or even the visual aesthetic.

Working with a manufacturer who can accurately model the performance of different specifications of rooflight and produce calculations to prove those claims - particularly where bespoke products are desirable or a necessity - is an important step towards having confidence in a design and knowing it can be delivered on site.

Features of modern glazing products

These days, most people understand the benefits of having a glazing unit that is more than just single glazed. Double glazing, triple glazing and even quadruple glazing improve the thermal - and acoustic - performance by introducing sealed layers of gas between the panes.

A well-known feature of products is to fill the sealed space between panes with an inert gas like argon, whose thermal conductivity is some 34% lower than still air. Some manufacturers use krypton and xenon, both of which offer further improvements in thermal efficiency, but which are more expensive.

The U-value of a typical double glazed unit is likely to be around 1.1 W/m2K; a triple glazed unit could be expected to offer a U-value of around 0.60 W/m2K when filled with argon gas and featuring a low emissivity coating.

Low emissivity coatings

A material’s emissivity determines the amount of thermal radiation emitted from its surface, and depends not just on the material itself, but the nature of its surface. A clean and polished metal surface, for example, has a lower emissivity than a dirty, oxidised metal surface.

Low emissivity (low-e) surfaces emit less thermal radiation, and glazing units benefit from this through the application of a microscopic coating of tin, silver or zinc to certain faces of the glass panes in the unit.

Heat energy from the sun, in the form of short wave radiation, passes through the coating to heat the building’s interior. In contrast, the heat energy transferring back through the building fabric, from warm inside to cold outside, is long wave radiation. The glass with the low-e coating emits less of the long wave radiation, effectively keeping more of the heat energy in the building.

There are two types of coating: hard and soft. Hard coat is applied while the glass is still molten, whereas soft coat is applied later in the process. Hard coat is more durable, as its name suggests. Soft coat remains delicate, is only applied to the sides of panes facing into a sealed airspace, and has a lower emissivity than hard coat.

The difference in emissivity between the two means glazing with a hard coat treatment will typically offer a centre pane U-value of 1.4 W/m2K, while a soft coat treatment will see that improved to 1.1 W/m2K. It’s a meaningful distinction, yet some manufacturers will simply claim their glazing to be "low e".

Making a hard coat treatment sound like a similar benefit to soft coat is another reason for specifiers to be aware of the features of the products they’re selecting, and confident in the manufacturer they choose to work with.

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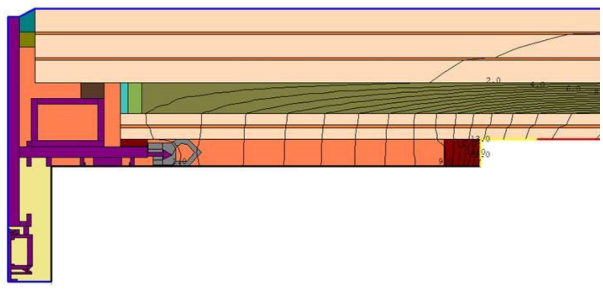
t. 01379 658300
e. info@glazingvision.co.uk
Sawmills Road, Diss,
Norfolk, IP22 4RG

Thermal breaks

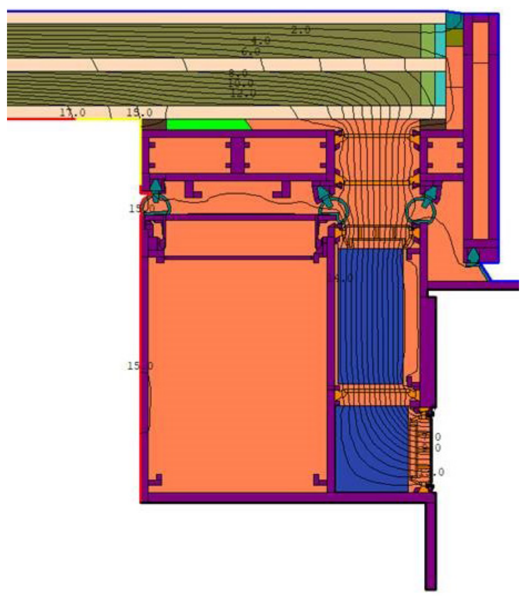
Given the name, it is commonly assumed that the inclusion of a thermal break within the frame design will deliver better performance, particularly where metal frames such as aluminium are used. However, this may not always be the case - in fact, thermal breaks may sometimes result in a worse performance. In order to include a thermal break within a section of framework, the overall size of that section will most likely need to be made larger, thus increasing the amount of exposed surface area of framework, and therefore increasing the risk of condensation forming on the internals of the frame.

There are instances where minimal, low profile frame designs will actually outperform larger, thermally broken ones. The danger is in assuming that thermal breaks are always better and asking for them as a matter of routine, with the result that specifications fail to accurately reflect the best choice of product. The key is to determine how much of the metal frame, if any is actually exposed to the internal warm air environment.



Minimal profile rooflight section does not require thermal breaks due to its small internal surface area and use of internal gasket.

It is also important to understand and correctly follow manufacturers installation details, many documented cases of cold bridging can be traced back to improper installation, notably at the junction of the product and roof fabric. Often rooflights are installed on upstands or kerbs, if these are weathered using lead or aluminium flashing that is lapped over the top of the upstand, it can come into contact with the rooflight framework, forming an effective cold bridge, undoing all of the thermal efficiency in the design of the frame itself.



Larger box section rooflight frame is required to house motor and drive system for opening unit. Frame is thermally broken isolating the cold exterior frame from the warm interior.

Roof windows vs dormer windows

Energy efficiency and occupant comfort are achieved in part through installing the right amount of insulation - and installing it well. Making sure of the continuity of insulation and airtightness layers is necessary to eliminate weak spots where heat loss and air leakage would otherwise occur.

It stands to reason, then, that the easier it is to install insulation and airtightness measures, the better the end result is likely to be. And that in turn means keeping design simple, minimising complicated details and changes of geometry.

Installing rooflights and roof windows within a flat or pitched roof is a means of providing light to the internal space without compromising simplicity. As a single unit, they offer a reliable declared performance, easier installation, and relatively straightforward detailing in terms of getting the best out of the building envelope.

Dormer windows, by contrast, are inherently complicated. They require more improvisation and far more attention to detail during installation, and their relatively thin structural build-up makes it hard to install the necessary thickness of insulation to achieve low U-values to match the rest of the building.

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The performance gap

The system of compliance described in Section 1 of this document can work. But that doesn't really answer the question.

Unfortunately, it often doesn't work. It rarely delivers buildings that, once constructed, meet their designed performance levels. Studies show that carbon emissions and energy use are routinely two to three times greater than predicted - a disparity between design intent and constructed reality, known as the performance gap.

Despite being widely discussed in certain sectors of the construction industry, the performance gap is a phenomenon that continues to escape mainstream attention. There are many and varied reasons for that being the case, and it is beyond the scope of this document to examine them all in explicit detail.

Attention to detail

Awareness of the issue, and good communication that addresses potential problems before they occur, are excellent places to start, however. Clients have to want more efficient buildings (or be guided as to the benefits of aiming for them); architects and design professionals have to plan, design and specify to achieve better performance; and contractors have to be able to deliver it - and not be afraid to ask if they don't know how.

We've already touched on a couple of issues:

- Large areas of glazing will usually require the involvement of a specialist supplier or manufacturer who can confidently specify glass that will deliver the desired performance. A poor understanding of solar gains can create extremes of temperature and uncomfortable living conditions throughout the year.

- In the UK there is a fondness for features such as bay windows and dormer windows. While there's nothing inherently wrong with either, such features introduce complexity into designs where retaining simplicity would be easier to both detail and construct - thereby avoiding potential contributors to the performance gap.

At the end of a project, as-built SAP or SBEM calculations are carried out to reflect what was built. One thing they cannot do is account for the quality of installation.

An accurate picture?

It may appear as if the design and specification has been followed to the letter, but if insulation is badly installed, or doors and windows poorly fitted, or thermal bridging and airtightness not properly addressed, then the finished building will leak heat, feel draughty, fail to achieve what the calculation results suggest, and risk damp and condensation.

While we said it's beneficial to undertake some early compliance calculations to test initial specification ideas, in truth SAP and SBEM calculations are rarely carried out early enough in the process. That can lead to all kinds of issues on site, such as having to improvise to include extra insulation or products with better performance.

On projects where too little understanding of compliance or too little attention to the specification has forced compensatory measures to be introduced, contractors are often faced with sourcing glazed elements, including rooflights and roof windows, with very low U-values. Those products may be available, but even if they could be well installed they are unlikely to have been budgeted for.

A risk inherent in all construction projects, and which can occur with almost any material or product, is product substitution. Uninformed or unauthorised specification changes - perhaps for reasons of cost or availability - are a consistent source of performance gap issues, especially when those supplying or purchasing the materials do not fully understand the implications of differences in performance, such as centre pane versus overall U-values referred to earlier.

Ultimately, the only fix for these issues might be to accommodate some, or more, renewable technology, moving the project away from a fabric first approach and still incurring significant extra cost. While renewable technology is not inherently bad, projects risk being defined by compromises rather than having a coherent, holistic vision implemented from the outset.

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t. 01379 658300
e. info@glazingvision.co.uk

Sawmills Road, Diss,
Norfolk, IP22 4RG

Independent research

Although rooflights and roof windows make up only a fraction of the market compared to doors and 'conventional' windows, they nevertheless make a significant contribution to the overall performance of a building.

Standards for assessing the performance of products, however, don't acknowledge that contribution. The methods described within thermal elements in building standards concentrate on doors and windows, meaning assumptions and estimates have to be made when applying the principles to roof glazing products.

Recognising the future direction of building regulations in terms of fabric performance and the intention (since abandoned) to achieve a 'zero carbon' standard, Glazing Vision sought to undertake independent research with the aim of better understanding the performance of roof glazing products and reducing their potential to contribute to the performance gap.

Anglia Ruskin University used the open source computer program THERM to analyse rooflight frames and their interaction with the glass edge. From that modelling, a methodology was developed to establish the frame performance and, in conjunction with the centre pane U-value of the glass, produce a whole unit U-value.

This methodology effectively allows Glazing Vision to calculate accurate whole-unit U-values for any product, whether part of the existing range, conceived during new product development, or bespoke designs for individual projects. As well as ideas for brand new products, potential alterations to existing products can be analysed through modelling, resulting in more efficient decision making - and roof glazing units that do what the manufacturer claims.

Glazing Vision sought to undertake independent research with the aim of better understanding the performance of roof glazing products.

Vertical or horizontal?

Further illustration of the flaws in current standards can be found in the limiting U-values published in Approved Document L - the worst case values that any element of the building fabric can achieve. As the regulations stand, the value for rooflights is based on the performance as if installed in the vertical - like conventional windows.

In developing the revised Part L for 2013, the Department for Communities and Local Government (DCLG, now MHCLG) agreed with arguments put forward by Glazing Vision and NARM (National Association for Rooflight Manufacturers) that declarations for roof glazing products should be based on their performance in the horizontal plane. Unfortunately, there was too little time to consult on the proposed change and the document was published without the amendment.

Declaring performance as if installed horizontally makes for a better comparison between products. As things stand, those values have to be converted to represent vertical installation (with appropriate surface resistances) in order to check compliance. Furthermore, the notional building ignores the geometry of the product and simply uses the size of the opening - making it even more important to be confident in the performance of the complete unit specified. Some rooflight products will include glazing in more than one orientation, for example, roof lanterns combine both sloped and vertical glass elements.

Adding further complication, BRE Report BR 443 (which deals with conventions for U-value calculations) includes a conversion table for declared 'vertical U-values' depending on angle of installation. For a rooflight installed 'horizontal' (at a pitch of 20 degrees or lower), the table suggests a U-value adjustment of +0.5 W/m2K.

Glazing Vision's calculations show the adjustment should be +0.7 W/m2K for high performance double glazing (the adjustment for triple glazing is different), and they are working to see this reflected in a future revision of the document.

Inclination of roof	U-value adjustment (W/m^{2}K)	
	Twin skin or double glazed	Triple skin or triple glazed
70° or more (treated as vertical)	0.0	0.0
<70° and > 60°	+ 0.2	+ 0.1
≤ 60° and > 40°	+ 0.3	+ 0.2
≤ 40° and > 20°	+ 0.4	+ 0.2
≤ 20° (treated as horizontal)	+ 0.5	+ 0.3

BRE Report BR443 conversion table for declared vertical U-values.

t. 01379 658300
e. info@glazingvision.co.uk

Sawmills Road, Diss, Norfolk, IP22 4RG

Achieving required U-values

Quoting a certain U-value for a roof window as a performance specification, and then expecting a contractor to source a window of the correct size that meets the specification, risks compromising the compliance calculations if they don't know where to look for one.

Where glazing products are concerned, widespread understanding of U-value declarations is not what it could be. If that leads to mistaken performance claims and the installation of roof windows that do not match the original specification, then compliance simply may not be achieved.

When a rooflight meets the needs of a project, every effort should be made to stick with the choice. Unlike other building materials, it is difficult to simply swap to a like-for-like alternative that costs less or is more readily available. If in doubt, contact the rooflight/roof window manufacturer for advice.

Better still, specify the right quality products from a reliable manufacturer at the start and set a tone for the project where quality and the end result is prioritised over short term gains. Ideally, choose to work with a manufacturer who is a member of the National Association of Rooflight Manufacturers (NARM).

The National Association of Rooflight Manufacturers represents a complete cross section of the rooflight design and material type manufacturers in the UK.

The association has been formed to promote co-operation between member companies, in order to develop and maintain standards and codes of practice. It is an active member of the CPA (Construction Products Association) advising Government on future Building Regulations.

t. 01379 658300
e. info@glazingvision.co.uk

Sawmills Road, Diss,
Norfolk, IP22 4RG

How things might develop

One of the benefits of a 'whole building' approach to energy efficiency is the ability to compensate for poorer performing areas or elements by 'beefing up' others. There are limits to that (regulations tend to stipulate worst-case U-values, for example), so a level of common sense is still necessary. Section 4 of Approved Document L1B provides guidance on this, offering optional approaches such as area weighted U values which factor all individual elements of an extension, provided they comply with fabric standards and opening area standards referred to elsewhere in the document.

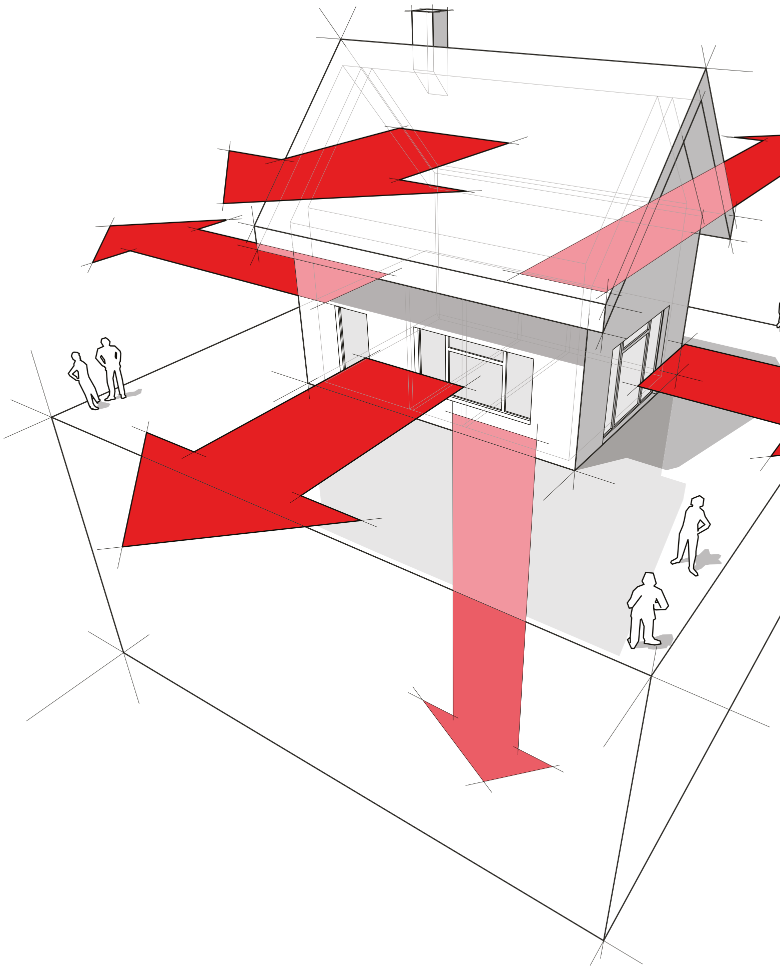
For example, specifying lower building fabric U-values is all very well, but there is going to be a point at which they become economically and practically infeasible. The addition of more and more insulation generates diminishing returns, so really low U-values in the order of 0.12 W/m2K or even 0.10 W/m2K require a thickness of construction that may not have been planned for.

As it is with insulation, so too with windows and doors - and, because of the theme of this document, roof glazing products specifically. Manufacturers are always looking to improve the performance of their products, and technology currently available can produce roof windows with U-values of around 0.80 W/m2K.

Just because they exist, though, doesn't mean they are right for every project - or available! A window with that sort of performance is a highly engineered, triple or quadruple glazed unit - something that may be beyond the budget of many projects.

Eventually, maybe all roof windows, and glazing generally, will offer U-values this low - or even lower - but for now specifiers, installers and clients need to be aware of what is appropriate to their project and not get caught out by having to over-specify in one area to compensate for lower performance elsewhere.

It comes back to taking a balanced approach, that offers flexibility without going to extremes.



The Passivhaus standard

Although it remains a relatively niche area of interest, awareness of the Passivhaus standard is growing. Becoming mainstream can only be a good thing, not just because the standard delivers comfortable, energy efficient buildings, but because there tend to be a lot of misconceptions around it.

Passivhaus was developed by a German physicist, Dr. Wolfgang Feist, who had no interest in construction, but wanted to understand why buildings continued to perform poorly despite the addition of more and more insulation. He recognised that something must be failing in the way buildings were designed and constructed, and set out to find some answers.

The standard Dr. Feist developed is a comfort standard and an energy efficiency standard. By constructing a highly insulated, airtight building with carefully controlled mechanical ventilation that features heat recovery, the aim is to deliver surface temperatures throughout the building that are always at least 17 deg.C.

Because of the airtightness and controlled ventilation, there are no draughts to cause occupants discomfort. Windows can be opened if desired - a popular misconception! - but building users generally find they don't need to, because the internal environment is a healthy, comfortable and pleasant one.

Passivhaus-standard roof glazing

Because of the performance levels required, there are only a limited range of Passivhaus-certified roof windows on the market. As well as exceptionally low U-values, they feature airtightness and windtightness skirts and insulated flashings to make sure they contribute to the overall quality of the building fabric - but there is an issue to be aware of.

Doors and windows generally, having a declared thermal performance, form part of a building's insulation envelope. To maintain continuity of that envelope and aid thermal bridging detailing, it is recommended to install them along the line of the insulation. It is essential that the insulation line is correctly installed around a roof window.

In a pitched roof, the frame of a roof window is installed to the outside of the roof - and, in many cases, outside the line of the insulation. From a thermal bridging point of view, the linear bridging heat losses (psi values) for a roof window can be up to ten times greater than a standard window installation in a wall. From a Passivhaus point of view, that makes roof windows a thermal weak point, but one that can be accommodated with the right planning and modelling of the proposed construction.

Future regulations

Passivhaus advocates would like to see the standard form the basis of building regulations; it not only addresses issues of thermal comfort, but acoustic comfort as well, for example. If that were to happen it would be a massive step change in construction practice in the UK, albeit one that is arguably long overdue.

The benefits of Passivhaus have already been recognised by social housing providers, who see longer term, reliable tenancies as a result of the much-reduced energy bills and the comfortable internal conditions.

Evaluation studies of Passivhaus projects - including the first one ever constructed several decades ago - show they achieve their designed levels of performance, and continue to do so. The standard is the ultimate example of a fabric first approach, with a demonstrable ability to eliminate identified performance gap issues.

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t. 01379 658300
e. info@glazingvision.co.uk

Sawmills Road, Diss,
Norfolk, IP22 4RG

Glazing Vision ltd, registered in England no. 2987024

U-value calculations

Glazing Vision are passionate advocates for quoted performance figures accurately representing what roof glazing products will actually deliver. Without confidence that that is the case, performance gap issues can never be tackled thoroughly.

Product standards dedicated to rooflights and roof windows do not currently exist, leading us to work with independent academics to better understand for ourselves the performance of the products we make. The calculation methodology - a spreadsheet-based mathematical model - developed with Anglia Ruskin University can be applied to all of our products.

As part of our market-leading service, quotes from Glazing Vision include an accurate whole-unit U-value calculation for the specific size and type of product requested. Where 'better than building regulations' is required, we can analyse how an existing product design might have to be altered to achieve the U-value required.

This process allows us to work with you to determine the correct product specification for your project - rather than simply quoting our best centre pane U-value to try and secure your business.

Continuous Professional Development

To support the thoroughness and accuracy of our technical calculation service, Glazing Vision offers a selection of RIBA-approved CPD material for architects and specifiers. Working to RIBA CPD guidelines demonstrates our commitment to providing informative, education-led presentations to improve the general understanding of roof glazing products and how they perform.

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Anglia Ruskin University

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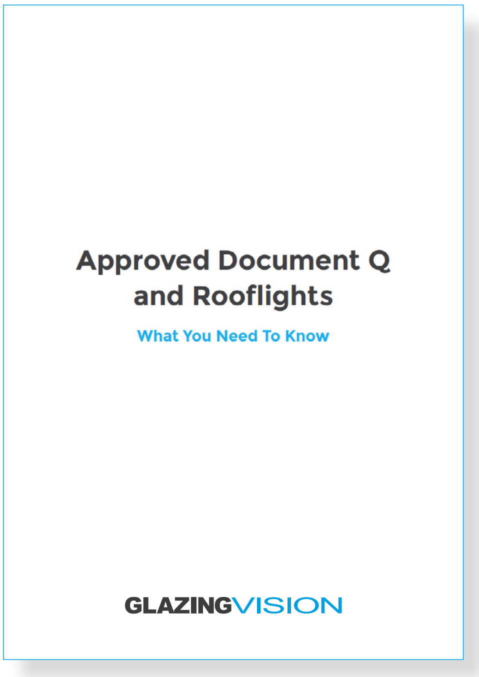
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t. 01379 658300
e. info@glazingvision.co.uk

Sawmills Road, Diss,
Norfolk, IP22 4RG

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