INDUSTRY VIEWFINDER

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EXPLORING CURRENT THINKING ON PASSIVHAUS

PRODUCED IN ASSOCIATION WITH

idealcombi Internorm KTS SCHÖCK

Photo courtesy of LAMILUX

Innovative daylighting at Harris Academy, Sutton. See page 13.

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GET IN TOUCH
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executive summary

The concept of ultra high-efficiency Passivhaus design is now well-established among the UK design community, and generally speaking architects have embraced the idea. The question is, with our looming climate targets as a nation, are clients and the wider construction industry ready and willing to deliver this 'gold standard' of low carbon buildings across the board?

Passivhaus has been in existence since 1990, when the first houses were built in Darmstadt, Germany. In 1996, the Passivhaus Institut was formed in the city, and began certifying a range of building types – extending from homes to schools and factories – against its rigorous and thoroughly policed standard. Initial homes achieved around a 90 per cent reduction in space heating needs thanks to a combination of high insulation and air-tightness levels, and 'passive' design – compact buildings orientated to maximise solar gain.

As the UK moves towards the Government's statutory goal of 'net zero carbon' (a 100 per cent emissions reduction against 1990 levels), clients and contractors are increasingly more focused on employing recognised, effective strategies to reduce buildings' carbon emissions. According to the Technology Strategy Board, buildings (including their operational phase) produce 45 per cent of the country's total carbon emissions. That breaks down into 27 per cent from domestic buildings, and 18 per cent from non-residential buildings.

The Government has recently committed to an earlier target of 2035 for a reduction of 78 per cent (against 1990 carbon emissions), to help move us along the road to zero in 2050. It has nailed its colours to the mast by enshrining both the 2035 and 2050 goals in law, claiming to have gone the furthest of any Government in terms of the legal requirements on carbon.

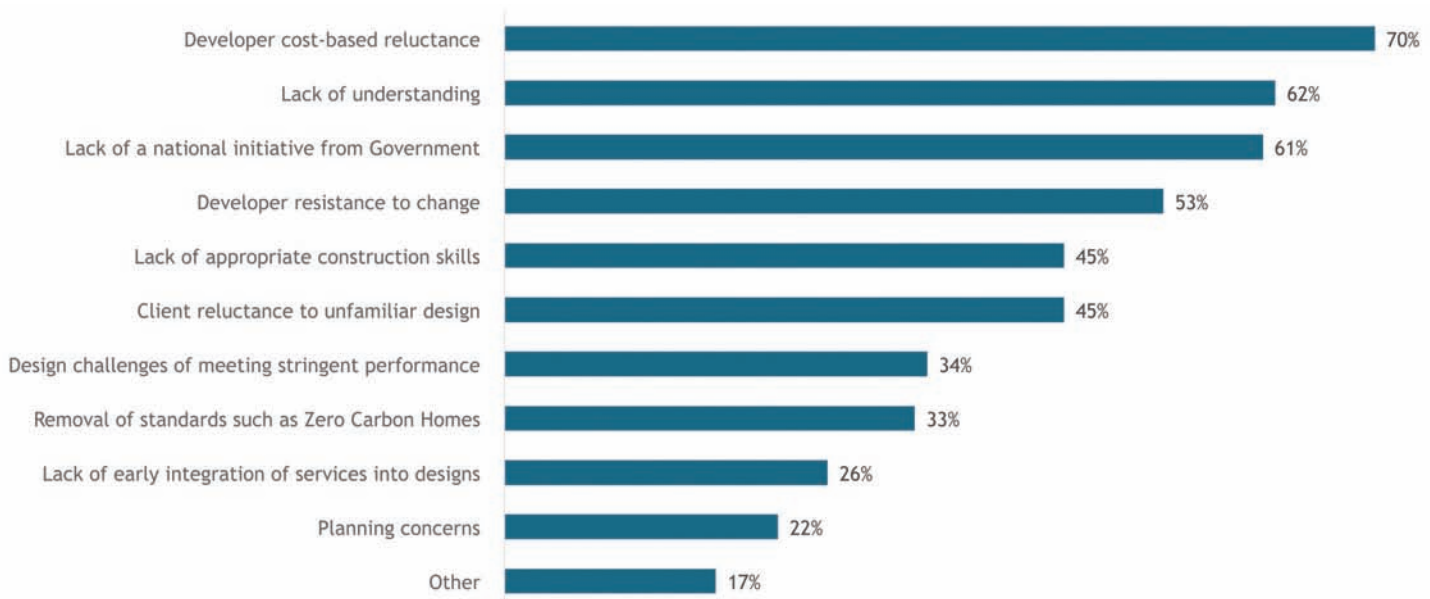
The real issue, however, is what are the 'deliverables' when it comes to progressing towards these goals? Despite its claims to be leading on the low carbon agenda, Government is hesitant to propose solutions. The industry has begun to provide the answers, including by showing that Passivhaus is certainly one of the key demonstrable – and widely applicable – ways forward, as our survey results show.

Clients and contractors drive procurement, and if we are to meet our carbon goals as a nation and internationally, the whole industry and its clients need to embrace the comprehensive approach offered by Passivhaus. Having it as part of their arsenal will make achieving the drastic emissions reductions – which will make the difference beyond 2035 – much more possible.

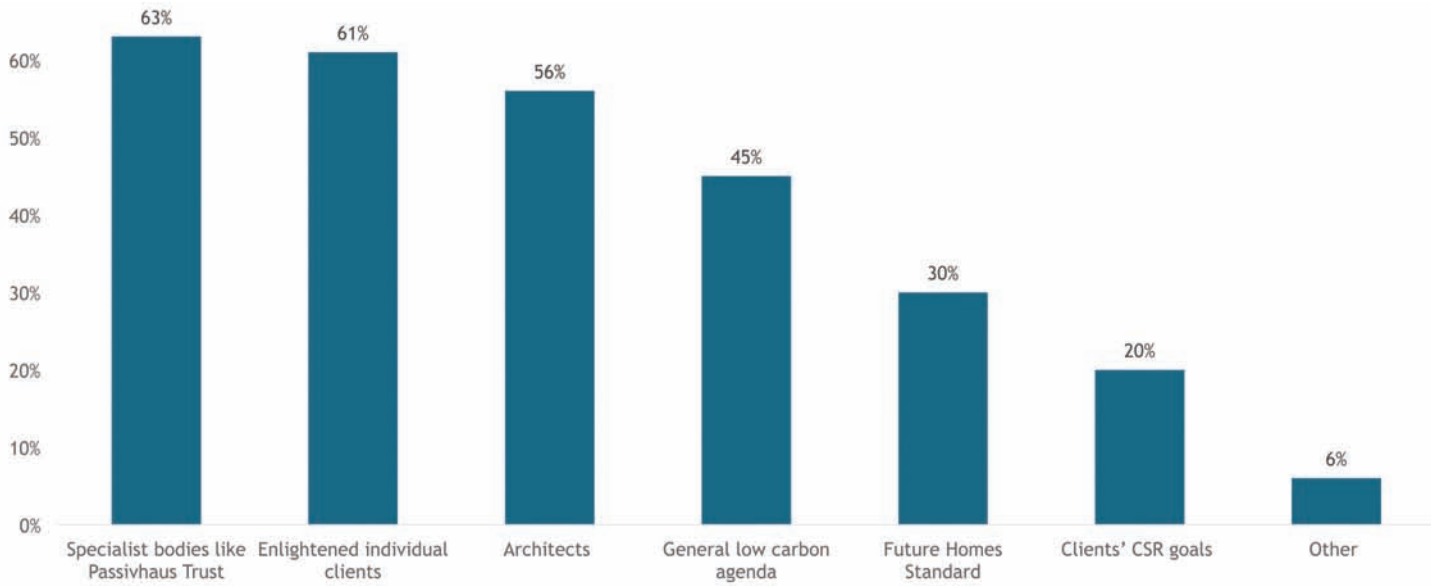
ADF, working with Edge Insight, asked our audience of architects to provide some insights into the current takeup and ongoing design challenges of Passivhaus. The key aspect of our survey was not to look at the overall carbon ambition, or whether or not Passivhaus was a worthy standard, but to take that as a given and to analyse current takeup, and obstacles to Passivhaus that need removing.

Some of those obstacles are about misconceptions over what Passivhaus does, and does not require, and the resulting changes it means for building design. Conversely, there are benefits that engaging in Passivhaus can bring about professionally for architects beyond the end goal of highly efficient buildings – which our survey bears out.

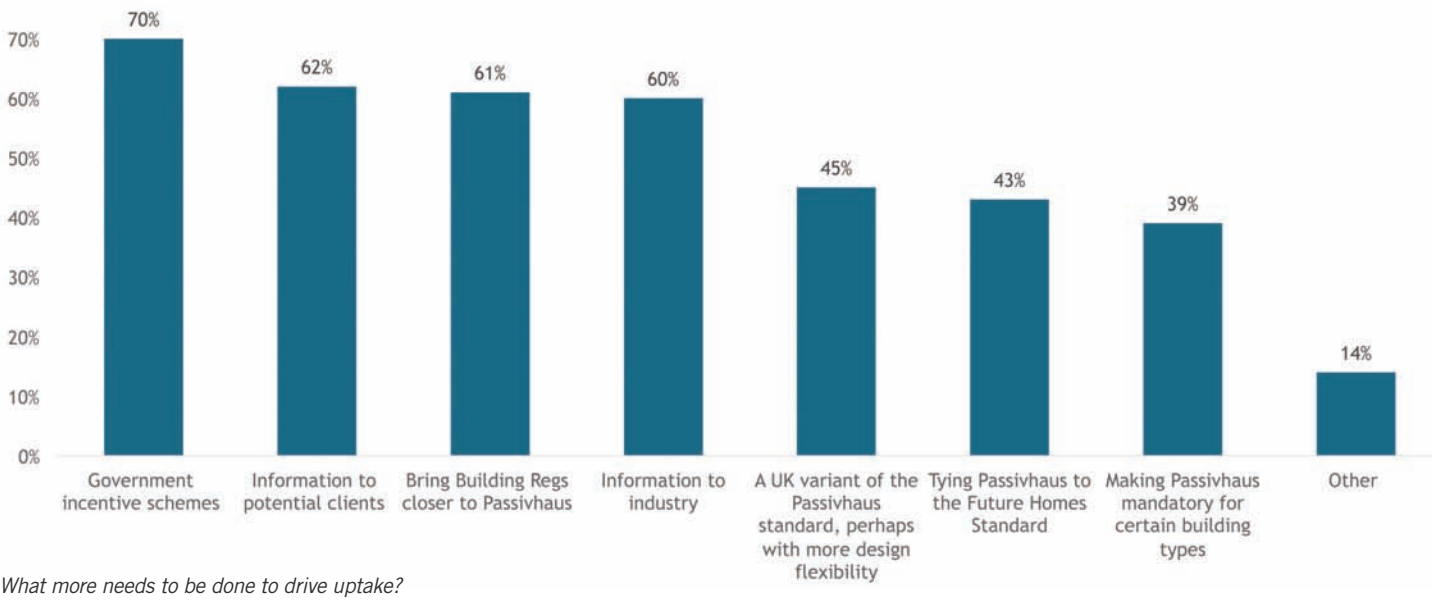
The survey also corroborates the fact it is a tough standard; although that is of course the whole point – unlike some Building Regulations,



What do you see as the main reasons for slow Passivhaus adoption in the UK?



Who/what is driving Passivhaus uptake in the UK?



What more needs to be done to drive uptake?

Passivhaus isn't characterised by ambiguity or flexibility, and requires clients and designers to test their skills and engage collaboratively to make sure that future buildings perform dramatically better. 'No pain, no gain' might be one way of putting it!

Our survey does however provide some revealing snapshots of whether that pain is just proving too much for some at present. Passivhaus converts like sustainability advocate Tory Peer Lord Deben might be challenging developers to produce all dwellings to Passivhaus standards, but that is a long way from deliverable reality at the moment in the UK.

Because the retrofit agenda is also a huge challenge, Passivhaus has spawned EnerPhit, a refurbishment version of the standard, and Passivhaus Plus, for those saving enough carbon to export to the grid, and finally Passivhaus Premium – certifying an even higher level of efficiency. The status quo, or at least the elite level, has been raised several notches. The Future Homes Standard 2025 (which requires carbon to be cut by 31 per cent), still does not compete with such performance.

Our survey reveals however why undertaking Passivhaus could be an appropriate, and more realistic solution than many might assume, for a range of sectors.

It also shows why it's a powerful weapon for designers to use to take the lead in the built environment, and make the huge cuts urgently needed in our national carbon emissions.

introduction

By 2008, there were estimated to be up to 20,000 completed Passivhaus-designed buildings worldwide. The first UK Passivhaus wasn't completed until 2009 however – Y Foel, a self-build house in Wales which saw the private owners commissioning JPW Construction to produce a timber-framed, highly energy efficient building.

The house has an external I-beam timber frame and an internal core of earth walls on the ground floor, plus slate floor slabs. The timber wall panels and A-frame roof trusses were built on site, and the number of individual panels was minimised to reduce thermal bridging. This gives a flavour of the type of construction which can support the Passivhaus approach.

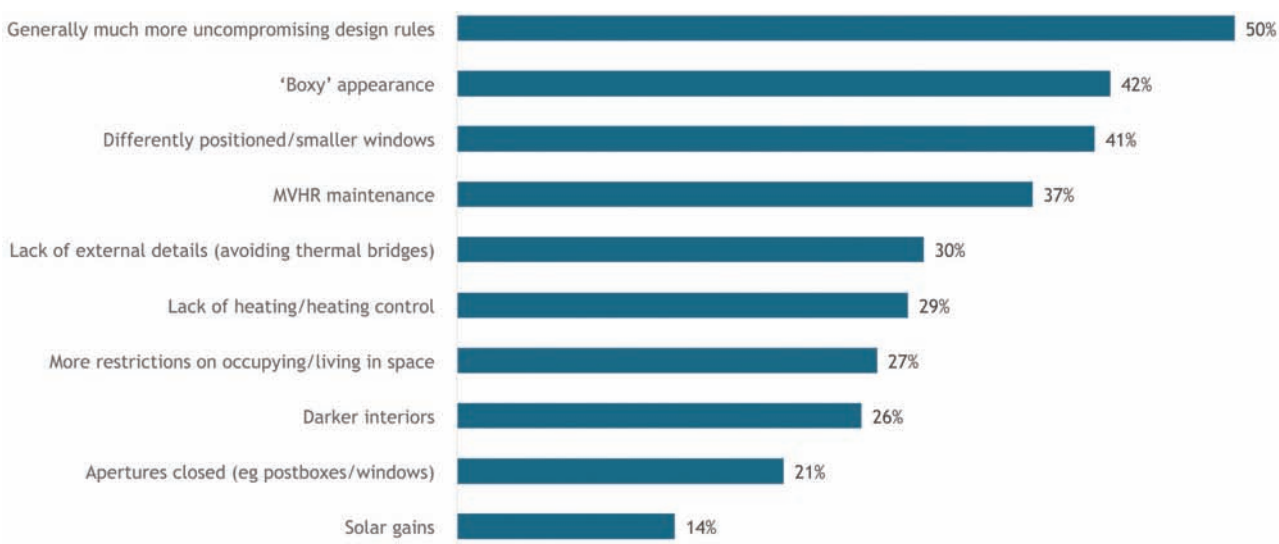
According to the Passivhaus Trust, architects in the UK need to adapt their approach to deliver Passivhaus buildings. The Passivhaus Planning Package – a specialist design tool produced by the Passivhaus Institut for calculating energy specs to create a certifiable building, requires specific design modelling. And, in addition to "very high" levels of insulation, and "extremely high performance" windows, the building fabric will need to be free of thermal bridges, air-tight, and have efficient ventilation with heat recovery. This hefty shopping list, with commensurate extra investment, means that some architects and clients may have been put off, and only the more evangelistic 'eco-warriors' will have been early adopters.

While our survey of architects picked up on some of the reasons for slow take-up in the UK, according to respondents the approach may not be as demanding, or architecturally different, as the common stigma might suggest. Just as importantly, it may not mean such drastic changes for building users.

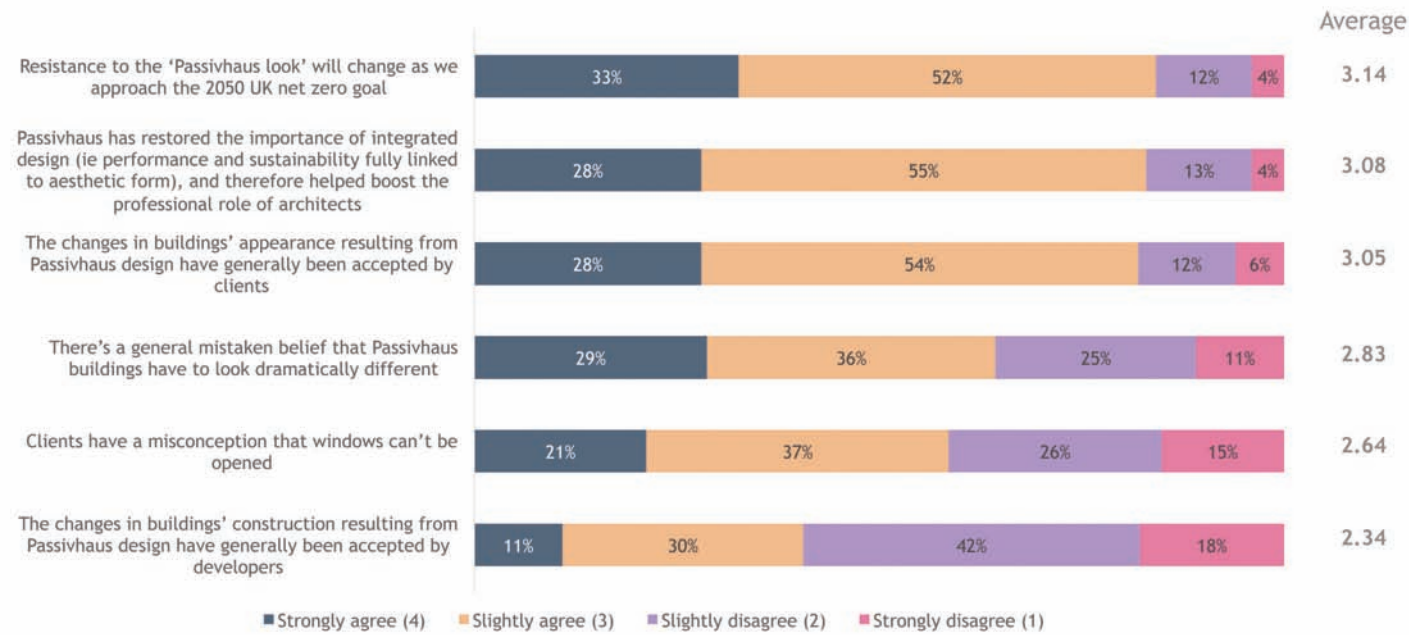
client objections

The survey we carried out covered many of the common objections to Passivhaus design, as well as the well-publicised positives. It looked at what architects saw as the main reasons for slow Passivhaus adoption in the UK. It also looked at perceptions around clients' acceptance of Passivhaus buildings, and contractors' acceptance of the learning curve they need to navigate to achieve the construction.

The research study also looked at whether there was a general belief that Passivhaus buildings will necessarily look very different, and whether that belief was mistaken. Another well-known stigma is that windows cannot be opened in Passivhaus buildings, due to the goal of ensuring air-tightness, however we also assessed this in the survey in terms of how common this belief is among clients (21 per cent of



What are the biggest Passivhaus design stigmas for clients currently?



How much do you agree with the following statements?

architects responding said that clients believed this). One commenter (to an early question regarding appropriateness in different sectors), said that they had been disappointed to find there was 'zero demand' in their local area for Passivhaus.

Our survey also confirmed that there remain other stubborn design stigmas around Passivhaus for clients. The most often cited was 'generally much more uncompromising design rules,' with 50 per cent of respondents picking this objection. Not too far behind were 'boxy appearance' (42 per cent), the unusual positioning or sizing of windows (41 per cent), and the need to maintain the necessary Mechanical Ventilation and Heat Recovery (MVHR) equipment required to provide fresh air in an air-tight structure (37 per cent).

Despite the perceived risks of overheating being an issue across construction, unwanted solar gain was the least commonly selected stigma among clients, (8 per cent), as Passivhaus design embraces solar gain. Other more common concerns were lack of heating, greater restriction on lifestyle, darker interiors, and apertures needing to be closed.

A common stigma cited when it comes to client objections, was cost – and a more nuanced aspect was elucidated by one commenter, saying there was "unknown cost, and no incentive," pointing to a lack of central support reported elsewhere in the responses. Reduction of floor space, and an aspiration for large windows, which can lead to overheating, were other factors which led to client reluctance, but "lack of understanding" was another, potentially key macro factor pointed out by one commenter.

architects' engagement

A reassuring 85 per cent of respondents thought that resistance to the different aesthetics of Passivhaus buildings will moderate, as we approach the net zero deadline of 2050. Also, 28 per cent "strongly agreed" (and 54 per cent "slightly agreed") that clients had already accepted those changes in appearance. Despite this, said 29 per cent of our respondents, the belief that Passivhaus buildings have to look "dramatically" different, is a mistaken one. While there was good news on clients' acceptance, unfortunately only 11 per cent of those surveyed strongly agreed that developers had accepted the necessary changes to construction practice to achieve such high levels of efficiency.

With architects' role arguably being steadily reduced in project teams over recent decades, could an increase in the commissioning of Passivhaus schemes potentially lead to a consolidation and extension of architects' remit – due to aligning form closely with function – to the benefit of their profession? Some believe that Passivhaus, which requires a close integration of the services design with overall structural aspects and

therefore the aesthetic aspects, means that architects cannot be relegated to adding mere 'decoration' to such projects, and their work is once again integral both to the function as well as form of a building.

Our survey discovered strong support for this idea, with 83 per cent of respondents agreeing that Passivhaus "has restored the importance of integrated design (ie linking of performance and sustainability to delivery of the aesthetic form), and will therefore help boost the professional role of architects."

Some commentators expressed a view that the 2025 Future Homes Standard (FSH), which ups the ante considerably on domestic new build energy efficiency (by 31 per cent via a combination of fabric improvements and bolt-on renewables), could take the place of Passivhaus in the UK.

However, we asked our survey audience whether they believed that there was room in the market for both the FSH and Passivhaus, and a convincing 90 per cent of respondents believed there was, some offering the caveat that we need to wait until it becomes clear what the standard actually is.

By contrast, only 9 per cent believe that the FSH would render Passivhaus obsolete, with 33 per cent "disagreeing strongly." Some commenters criticised the FSH, for example for being "not as comprehensive, and relying too heavily on tech that can fail." One commenter was vehemently pro-Passivhaus, over the FSH, saying "just make Passivhaus the standard – it demonstrably delivers!"

sector appropriateness

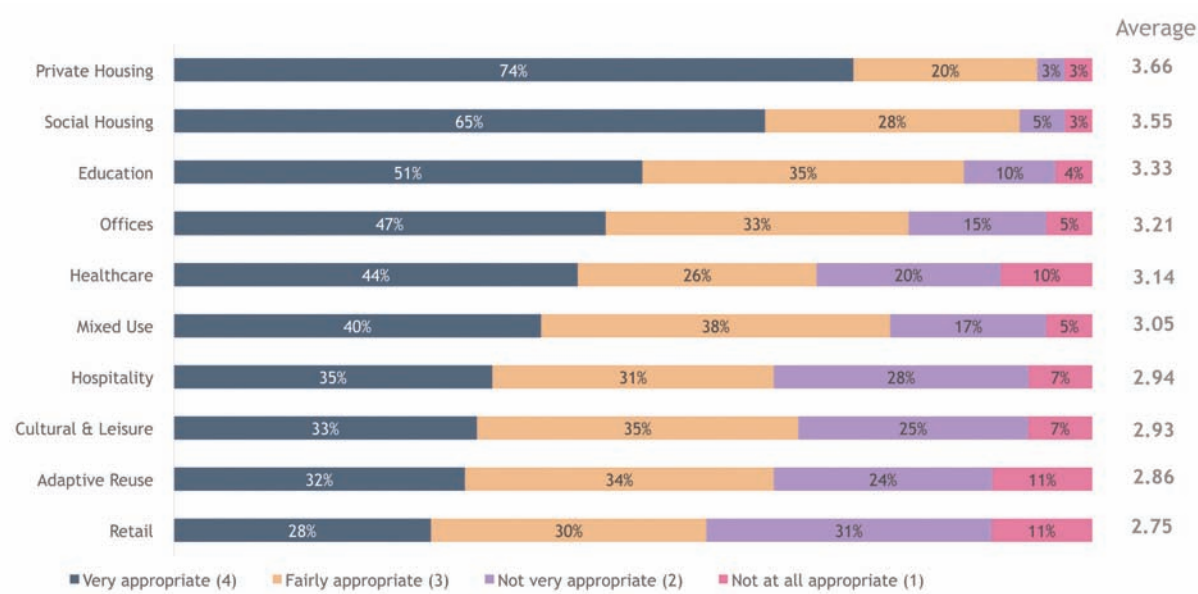
In total, 19 per cent of our architect respondents to the survey were currently working on a Passivhaus project, and 16 per cent had previously completed one. The vast majority were in the private housing sector, with a handful in social housing, education and student accommodation.

They believed that certain sectors were more appropriate than others for the design approach, with private housing predictably coming out on top; 74 per cent saying it was 'very appropriate.' Social housing was next, with 65 per cent saying it was 'very appropriate' for Passivhaus.

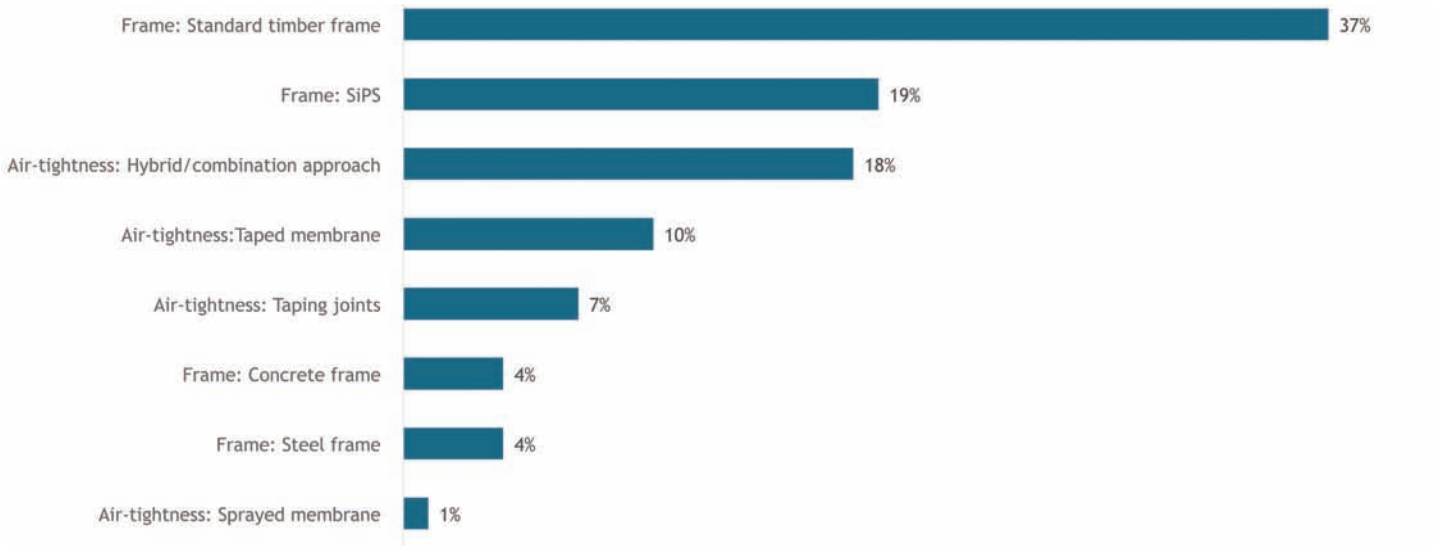
Only half of the respondents (51 per cent) thought that education projects were 'very appropriate,' but a relatively high 35 per cent said they were 'fairly appropriate, meaning that a total of 86 per cent believed that Passivhaus was suited to new UK education buildings.

Next in line was offices, with 47 per cent 'very appropriate' and 33 per cent 'fairly appropriate.' The rest of the list consisted of healthcare (44 per cent 'very appropriate'), mixed use (40 per cent), hospitality (35 per cent), and cultural and leisure (33 per cent).

Then there was a slightly anomalous category of 'adaptive reuse' (which goes across many potential sectors). Perhaps for this reason, or that it has inherent complexities, the respondents thought that it was less ideal than many other build types for Passivhaus (32 per cent said it was 'very appropriate'). Bringing up the rear was the retail sector, with just 28 per cent saying it was 'very appropriate,' no doubt reflecting the necessary 'openness' of such facilities.



For each of the following sectors, to what extent do you feel that Passivhaus is appropriate?



Design approaches – which do you favour for Passivhaus currently?

The comments section on the 'appropriate sectors' question was very revealing, with one commenter saying that while Passivhaus is "clearly desirable," it may have to be rated as "not very appropriate" for all building or occupation types, its suitability depending more on "exact structure, and details." They continued that difficulties were presented in existing buildings such as multi-occupancies, "especially where the onus is on leaseholders of apartment blocks, offices etc." And with budgets "especially tight" in retail and hospitality, payback was a "crucial determinant." This commenter doubted whether government grants would "adequately cover the gaps between desire and realism."

Mixed views exist within the design community as to the pros as well as the cons of Passivhaus, according to our survey. While costs are one issue, one commenter said they found Passivhaus "a little confusing as to its overall effectiveness." While one respondent said Passivhaus "should be a legal requirement," another believed that it was "a waste of resource."

Another commenter said that Passivhaus buildings were hampered by a lack of adaptability, and suffered where users don't have a substantial amount of "control on the building envelope." They said: "Passivhaus works best when the users are invested in the technology, and there is a high degree of control."

Item	Overall Rank	Rank Distribution	Score	No. of Rankings
MVHR	1		1,034	126
Solar PV	2		969	120
Air source heat pumps	3		948	121
Ground source heat pumps	4		931	120
Solar thermal	5		863	118
Wind turbines	6		651	119
Rainwater harvesting	7		627	118
Green roof	8		600	118
Biomass heating	9		534	117
Microhydropower systems	10		422	118
Water borehole	11		418	118

Lowest Rank — Highest Rank

Please rank these renewable technologies in order of importance for achieving Passivhaus-compliant designs

progress & takeup

While respondents were generally in favour of Passivhaus, they agreed that takeup had been slow in the UK. The most common reason given for this was "cost-based resistance from developers" with 70 per cent, followed by "lack of understanding" (62 per cent) and "lack of a national initiative from Government" just behind it at 61 per cent. Other reasons given were:

- developers' resistance to change (53 per cent)
- lack of appropriate construction skills (45 per cent)
- client reluctance to unfamiliar design (45 per cent)
- Design challenges of meeting stringent performance (34 per cent)
- Removal of standards such as Zero Carbon Homes (33 per cent)
- Lack of early integration of services into designs (26 per cent).

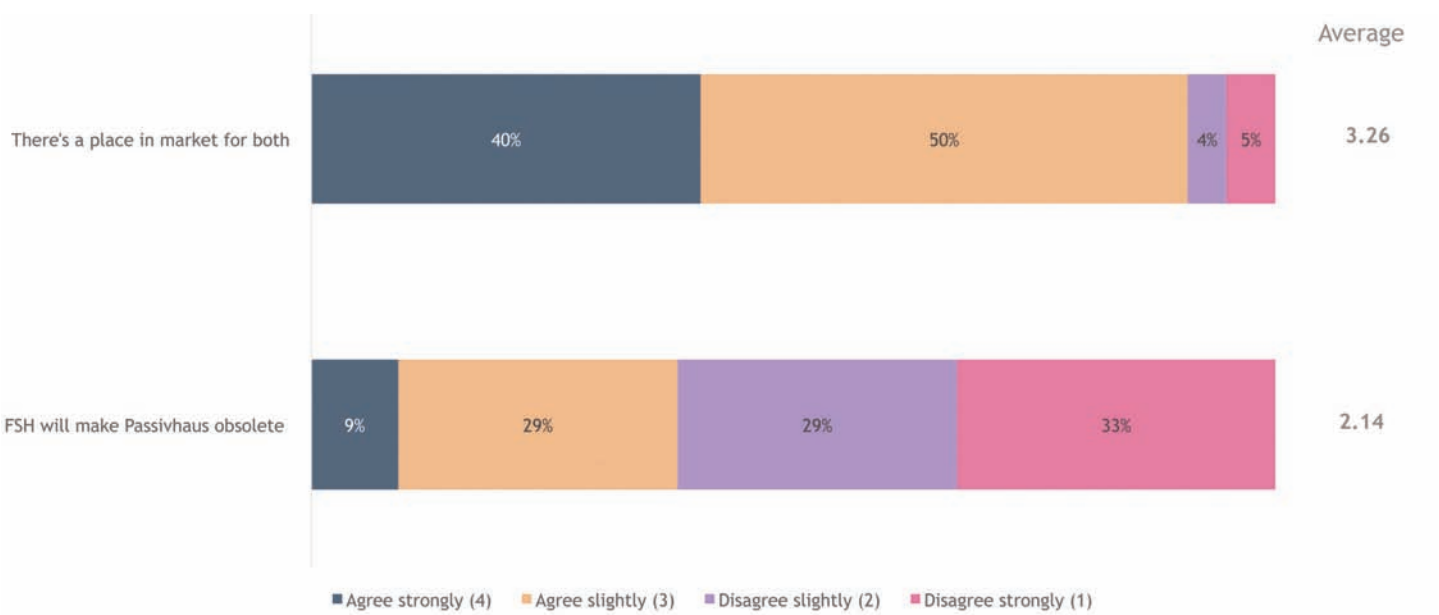
In terms of who's driving the uptake, the top answer from respondents was the specialist bodies in the field, such as the Passivhaus Trust (63 per cent). But very close behind were "enlightened individual clients" (61 per cent), and architects themselves (56 per cent). The overall low carbon agenda was also a big driver, according to the survey, with 45 per cent picking this factor, and the Future Homes Standard due in 2025 was perhaps surprisingly already a key factor too, said 30 per cent of respondents. Lasly, corporate clients' Corporate Social Responsibility goals accounted for 20 per cent of responses.

Respondents said that Government, builders merchants and the wider supply chain, "marketing to enthusiasts," and simply the available skills in each locality, were other factors driving UK takeup of Passivhaus.

When it comes to construction methods, timber frame was way out in front, with 37 per cent of respondents saying it was their preferred route to Passivhaus, compared with 4 per cent for both concrete and steel alternatives. SIPs frames were popular with 19 per cent of respondents.

On air-tightness, respondents favoured a hybrid approach of methods (18 per cent), with solely membrane-based solutions popular with 10 per cent of respondents, taping joints 7 per cent, and sprayed membranes just 1 per cent from our survey sample.

Renewable technologies for Passivhaus were ranked in order of importance by respondents, with MVHR at the top with a score of 1,034. This was followed, in descending order, by solar PV, air source and ground source heat pumps, solar thermal, wind turbines, rainwater harvesting, green roofs, biomass, microhydropower, and water boreholes.



To what extent do you agree with the following statements when considering the 2025 Future Homes Standard?

CASE STUDY 1: IDEALCOMBI

Goldsmith Street, Norwich – Stirling Prize winner 2019

Norwich City Council's Goldsmith Street is the largest Passivhaus social housing scheme in the UK, and was designed by Mikhail Riches with Cathy Hawley. The project was awarded the RIBA Stirling Prize in 2019.

The roughly 100 new low energy homes are split between about 50 flats and 50 individual terraced houses. The socially rented homes should cost in the region of £150 a year to heat.

At Idealcombi we are very proud to have been part of this ground-breaking housing project. The Idealcombi Futura+ windows and Frame IC front doors are an important part of achieving the Passivhaus certification and still maintaining an aesthetically pleasing visual expression. Each home has their own Idealcombi front door in different colours, and triple glazed high performance windows, meeting Passivhaus requirements.

Goldsmith Street was hailed by the Stirling Prize jury as "a ground-breaking project and an outstanding contribution to British architecture"

Goldsmith Street was hailed by the Stirling Prize jury as "a ground-breaking project and an outstanding contribution to British architecture."

The priority was to design a passive solar scheme in order to minimise fuel bills for residents using:

- A design that faces windows and habitable rooms south to make the most of winter solar gains and is shaded in the summer
- Slim 53 mm sightline Futura+ windows, specified for optimal visible glass proportion
- Rooftops positioned at 15 degrees in order to maximise solar gain while ensuring each terrace will not block sunlight from the windows of the row behind
- Every wall is over 600 mm thick, with white window reveals incorporated throughout that insulate the window frames and also serve to splay the reveals – a design that helps improves light into interiors and views out
- Aluminium mesh brise-soleils that provide solar shading.

Overall, Goldsmith Street surpasses a long-held preconception about social housing – that it must be designed and constructed with providing the bare minimum in mind. Mikhail Riches has proved that, with the right approach to planning and no small amount of smart architectural detailing, an affordable housing project can raise the bar for architecture as a whole.

CASE STUDY 2: INTERNORM WINDOWS

High performance, Passivhaus triple glazing for uninterrupted views

Set in a natural amphitheatre overlooking the market town of Bruton in Somerset, Cubis Bruton by award-winning independent developer Acorn Property Group, combines 56 highly contemporary three- and four-bedroom homes, uniquely designed to offer rural living at its best.

This innovative scheme is modern in style, designed to be energy efficient and highly sustainable, featuring beautiful landscaping in-keeping with its surroundings to seamlessly blend nature and architecture. Green and gravel roofs blend the roofscape into the landform like the geological outcrops that inspired them.

Bruton offers more than stunning Somerset countryside – it's a creative, eclectic community which *The Times* declared as 'the most fashionable place to live in the UK'.

Why Internorm windows and doors were chosen

The client and architect were looking to achieve large areas of glass to make the most of views of the stunning countryside and maximise light entering the buildings, as well as underlining the contemporary, open plan design of the development. The specification demanded a high-performance glazing system, which was not only highly thermally efficient but also cost effective.

Internorm has been an industry leader for 90 years and is renowned for manufacturing award-winning premium windows and doors in timber-aluminium, PVCu and PVCu-aluminium that meet the highest specifications, even on large scale glazing.

Following extensive consultation with Internorm, Acorn selected the KF310 and KS 430 PVCu-aluminium composite triple-glazed options for all its tilt and turn windows, balcony doors and rear entrance doors. The stylish external black power coated aluminium cladding added an additional design element to the architecture. The Internorm products installed included SBD/Part Q compliant hardware and glass with Eclaz® premium glass coating, all performing to Passivhaus standards.

The large glass areas with minimal sightlines, suitable for check reveal installation, achieve U-values below 0.8 W/m^{2}K. The robust and high-quality large format KS430 lift and slide doors are simple and straightforward to install and can be manufactured to a width of 6.5 metres.

Luke Burwood, group procurement and sustainability manager at Acorn Property Group, commented: "The whole concept of Acorn's ground-breaking project at Cubis Bruton was centred around a fabric-first approach. Effectively, we wanted to use this as a blueprint to demonstrate how a developer can build the very best performing buildings possible, using high-quality, high performance materials at every step. Of course, this always needs to be balanced with commercial viability, and for us, specifying Internorm triple glazed windows and sliding doors was an easy decision in this regard.

To have a Passivhaus rated product, at a price comparable to much lower performing windows, meant that we could build to Passivhaus principles without the cost and hassle of certification, but with the knowledge that our customers would be able to enjoy the benefits for many years to come. Combining this level of product performance with a standard of service that we feel is unmatched in the commercial glazing industry means that we are now working with Internorm on more developments across the Acorn Group, employing those same principles each and every time."

CASE STUDY 3: KINGSPAN TIMBER SOLUTIONS

The Elsworth Passivhaus – dispelling myths

Kingspan Timber Solutions manufactured the contemporary Elsworth show home at the Potton Show Centre. Built to the Passivhaus Standard, it uses the Kingspan TEK building system, our SIP (structural insulated panel) offering, to ensure it achieves the excellent levels of airtightness and thermal efficiency necessary to qualify for the Passivhaus standard.

When the idea of Passivhaus was first conceived, it was agreed that a box shape was the best option for retaining heat. Whilst this is true, there is a common misconception that a Passivhaus must be 'Brutalist' and functional in design.

We wanted to show that you can create an attractive, contemporary house which, when paired with a highly efficient build system like Kingspan TEK, can still fall within the parameters of the Passivhaus standard. Another motivation for constructing the home was to dispel the myths often associated with Passivhaus builds, such as being unable to open the windows, the inside air being unhealthy, and the ventilation system being noisy and expensive to run.

With innovative features which are visually exciting and technically challenging, the sustainable show home was designed by HTA Design LLP and demonstrates what can be achieved without needing to compromise on style or design. The finished design includes a number of interesting features, in particular the complex angles of the roofs on both the ground and first floors. Such features required a lot of work from an energy-efficiency perspective to make sure heat was not lost, but we felt the double-storey dwelling offered the most flexibility for the family home, and we were confident that the prowess of the Kingspan TEK build system was more than up to the task.

The Kingspan TEK building system was the obvious choice for this project. As a SIP, it already achieves the airtightness levels necessary to achieve the Passivhaus standard. We enhanced its performance further by carefully sealing and taping the external wall junctions, to ensure any thermal bridging within the building envelope was kept at an absolute minimum. The large spans that Kingspan TEK can achieve were a perfect fit for the large open-plan ground-floor area.

The finished building is a testament to both the thoughtful design and the excellent performance of the Kingspan TEK build system. The necessity for window placement to gain as much solar energy as possible has been worked carefully into the design, so that the house appears aesthetic as well as functional. A rooflight was added in the centre of the ground-floor living space to inject the open-plan area with as much light as possible.

Both this and the supporting pillars help to zone the different areas of the main living area, which might otherwise feel cavernous. The complete design is proof that designing to the Passivhaus Standard does not mean a compromise on the quality of design. The finished Elsworth house has nearly double the amount of insulation and is approximately 10 times more airtight than a property which is compliant with current Building Regulations.

CASE STUDY 4: LAMILUX

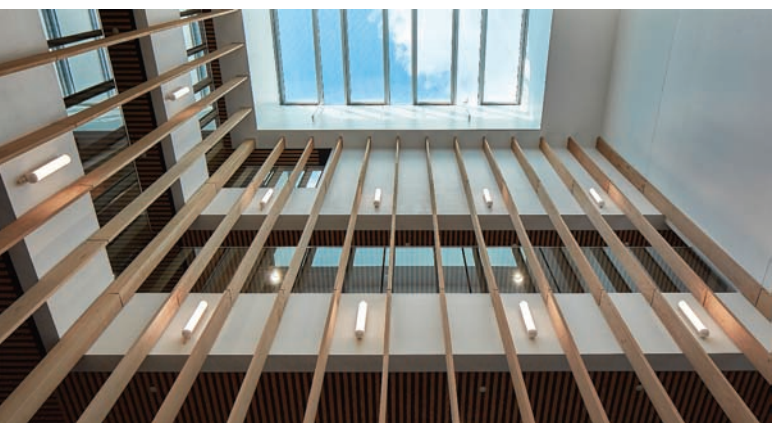
An innovative daylighting solution from LAMILUX – for a landmark in sustainability

Harris Academy Sutton is the first, and largest, Passivhaus secondary school in the UK and has gone on to be recognised for the building's outstanding performance. The well insulated and exceptionally airtight building, designed by Architype, provides a naturally light and inspiring setting to accommodate the 1,275 pupils and 95 members of staff. With the staff and pupils' wellbeing a significant factor in the design, the rigorous Passivhaus requirements of the build result in better air quality, ideal thermal temperature and the right amount of natural light throughout the whole year, consequently providing an optimum building to teach and study in.

LAMILUX designed, supplied and installed 10 Glass Roof PR60 Passivhaus rooflights throughout the corridors, assembly hall and sports hall areas of the school, bringing high levels of daylight to public areas within the four-story building. The triple glazed, Passivhaus certified rooflights were designed with integrated opening vents to further enhance the environment with natural ventilation.

The LAMILUX Glass Roof PR60 Passivhaus sets the benchmark for energy efficiency standards for atrium glazing. It has been independently assessed by the Passivhaus Institute and awarded the highest efficiency rating, the phA Advanced Component classification. The system features a Ucwi value for the complete skylight of <= 0.82 W/m²K, utilising warm edge triple layer glazing with 'Super Spacer,' as standard.

The aluminium extruded mullion/transom glazing bar system allows for designs of almost any shape, inclination and size which meant each of the uniquely sized rooflights were designed with flashings and interfaces to suit the bespoke project requirements, as drawn by the architect. The thermally separated structure, watertight to 1200 Pascals, with RE1200 rating and Class E to EN 12208, was designed for a shallow pitch inclination, and in this case the rooflights were installed on a 3 degree pitch.



LAMILUX worked with main contractor Willmott Dixon to achieve the required light and solar performance. The triple glazed rooflights were specified with a toughened neutral high performance coated outer pane to provide comfort within the building, whilst achieving impact safety to CWCT TN92 Class 2 U-values and air-tightness values, according to the Passivhaus certificate – verified during the detailed design phase of the project.

In addition, two EN12101-2 certified Smoke Lift Skylights and SHEV control panels were supplied and installed by LAMILUX. To achieve the required high energy standards, and because there were no additional daylight requirements, the smoke vents were installed with solid insulated panels to give the best thermal performance possible, contributing to the building's exceptionally low energy use and outstanding user comfort. The smoke Lift Skylights were delivered as fully factory fitted units, pre-assembled to 500 mm high GRP upstands, to simply fix directly to the opening in the roof deck.

The project was completed in July 2019, with the school opening for its first intake in September 2019. This extraordinary Passivhaus building for education sets standards for sustainability and excellence, and is an inspirational example for future schools to follow.

CASE STUDY 4: SCHÖCK

Schöck Isokorb for seafront Passivhaus Plus award winner

Seaton is a traditional Devon seaside resort town, but the eye-catching new development on the seafront is anything but traditional. Seaton Beach Apartments offers innovative, award-winning luxury beachfront apartments, complete with a penthouse – and is the first multi-residential development in the UK to be certified as Passivhaus Plus. The ground floor is concrete, with monolithic clay block construction used from the first to third floors and timber frame for the penthouse. Combined with high-performance external render and internal plaster, the result is an entirely mineral hygroscopic wall build-up, which helps regulate humidity and provide a comfortable internal environment.

90 per cent less energy

Other features of the design include low electromagnetic field wiring and a highly efficient mechanical ventilation with heat recovery (MVHR) system and exhaust air heat pump for hot water supply. There is constant filtered air within the triple glazed, airtight construction and PV roof panels generate more energy than the building uses – which is 90 per cent less energy usage than a typical new build.

Because the Passivhaus standard is easier to achieve with simpler, box-like forms, buildings can be considered aesthetically limited. However, design ingenuity and the use of Schöck Isokorb thermally broken balcony connectors defies that notion. The potentially unexciting building now features large sea-facing balconies with generous curves. The detailing of such balconies is critical though, if thermal bridging is to be minimised and the energy performance not compromised.

A technically advanced solution

Schöck Isokorb thermal breaks are installed where the balconies meet the clay block structure. Ineffectual insulation at these cantilever connectivity points will result in local heat loss, requiring more energy to maintain the building's internal temperature. Low internal surface temperatures around the thermal bridge can also cause condensation, leading to structural integrity problems with absorbent insulation products and the potentially serious occurrence of mould growth.

The Schöck Isokorb is one of the most technically advanced measures to counter thermal bridging. It thermally separates components from one another and also acts in a structural design capacity. The product type used has an innovative HTE Compact compression module and transfers both negative moments and positive shear forces in cantilever balconies.

Enormous freedom of design

As the leading international supplier of structural thermal breaks, Schöck is able to offer planners complete construction dependability and almost limitless freedom of design with the options available. There are solutions for concrete-to-concrete, concrete-to-steel, steel-to-steel, a thermally insulating connection for reinforced concrete walls – and even a maintenance free alternative to wrapped parapets.

The temperature factor used to indicate condensation risk (fRSI) which must be greater than, or equal to, 0.75 for residential buildings, is easily met by incorporating the Isokorb. All products meet full compliance with the relevant UK Building Regulations and the NHBC. They also offer LABC Registration and have independent BBA Certification.

conclusion

The UK may have been relatively slow to embrace Passivhaus widely, but it is fast catching up with the rest of the world. However, we are some way off the level of ambition of true leaders, for example the 333,000 square metre Passivhaus city development in Gaobeidian, China (a country which hosts 73 window companies making Passivhaus-level products). And closer to home, the Bahnstadt district of Heidelberg has been entirely constructed to Passivhaus standards.

These are the kind of quantum leaps which will be needed across the world for us to really use Passivhaus as a major plank towards mitigating climate change. Our survey shows that the industry is really only starting to realise the potential. Of course successfully rolling out Passivhaus across the UK requires client buy-in on a large scale, and possibly one of the most revealing comments from survey respondents was that clients had to be "committed to the scheme" for a Passivhaus project to work. ■

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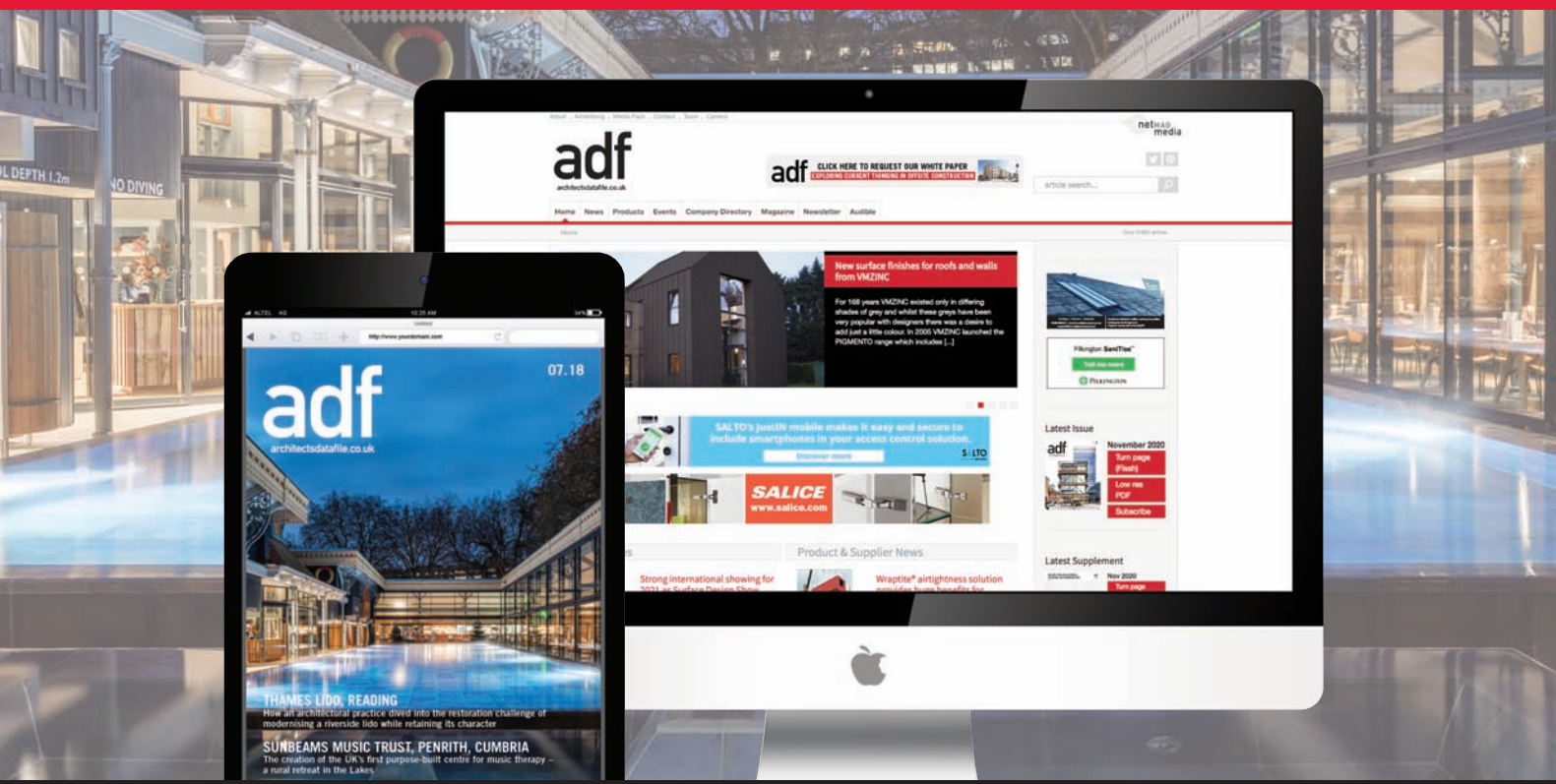

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