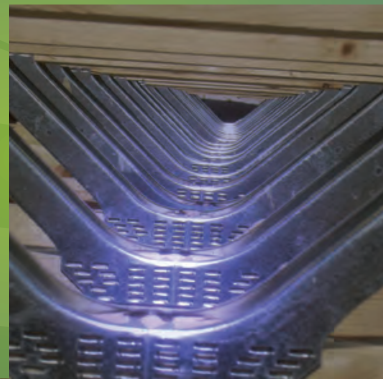






making the difference

closed panel offsite construction, timber engineered systems

design ● supply ● build

Eco Homes Direct
affordable low energy homes

contents

a word to the wise

Tradition and technology - living in harmony

The wisdom of seeking refuge in the crevices and hollows of trees is instinctive behaviour of woodland and forest dwelling creatures throughout the world. And, since Neolithic times, man too has found shelter in dwellings fashioned from timber - the most versatile, durable, abundant and sustainable of all natural building materials.

Scores of successive generations can't be wrong, and timber construction is as relevant today as it's ever been. Wood is strong, light and replenishable. Thanks to advances in building technology and manufacturing processes, timber has earned its place as the mainstay of innovative, affordable and energy-efficient construction techniques designed to reduce heating bills and greenhouse emissions, while helping to create healthier living and working environments.

Fast-track to success

Eco Homes Direct Ltd is at the forefront of pre-engineered timber frame panel construction. Based on methods pioneered and perfected in Canada - where they know a thing or two about challenging climates - Eco Homes is all about off-site construction and supplies fully closed panel systems from its manufacturing bases to facilitate fast on-site construction.

Each timber frame panel comes with insulation, air barrier, service void and pre-cut openings for windows and doors. Our design team optimise every panel to meet the most exacting structural and insulating requirements and eliminate thermal bridges and air gaps. Our engineered I-joists and metal web joists add to structural integrity and help speed on-site erection.

A typical 4 bedroom house can be erected and made watertight in less than a week, ready for external skinning, service connections and internal decoration. The speed and simplicity of construction is challenging the UK building industry to think differently about how new homes and commercial premises are constructed, as well as opening up exciting possibilities for self-builders to achieve the home of their dreams in less time and for less money than they ever thought possible.

Just four days into construction of a new-build home, walls are all in place and ready for roofing.

Closed panel construction methods can create both traditional and contemporary designs.

Meeting new challenges

With our head office located west of London and with manufacturing facilities in the Home Counties and Ireland, we are well placed to supply and service clients throughout the UK and beyond. Eco Homes Direct Ltd is a leader in the design and build of low energy housing and commercial developments, delivering proven solutions in environmentally responsible and innovative technologies for the construction industry.

With ambitious targets being set to provide more affordable housing, and the need to comply with legislation to control greenhouse emissions and reduce energy consumption, house builders, developers, local authorities and architects are under increasing pressure to deliver ever more workable solutions for sustainable living.

Building for a better future

At Eco Homes Direct Ltd we have developed a wide range of panels that are ideal for projects calling for Code for Sustainable Homes levels 4, 5 and even 6. Our SE Passive and Super Eco 4 panels are designed specifically to comply with CSH 4, 5 and 6 and are quite simply some of the best insulated panels on the market.

Because panels are factory assembled and inspected prior to delivery there is no compromise on quality. On-site erection becomes an extension of the production process, making it easier to achieve the high levels of insulation and air tightness essential for meeting all current and projected legislation.

Our in-house team of experienced designers turn drawings and specifications into a kit of bespoke panels and ancillary components that optimise and simplify on-site construction. Computer controlled machines minimise wasteful offcuts and help ensure pin-point accuracy at every stage of assembly to eliminate the possibility of quality issues or component mis-matches.

Quite simply, at Eco Homes Direct Ltd we believe the more that can be done in the factory, the easier things will be on-site. That means fewer delays, greater productivity and significant cost savings on every build.

If you're considering making the switch from site-built brick and block construction to pre-engineered timber frame panels, you should expect some welcome and positive changes to influence your working practices.

It's faster Build times are half or less because much of the work has already been done in the factory. All that remains after the foundations have been poured is to crane the pre-engineered wall panels into place and seal the joints. The time savings means faster turn-around on your investment.

You won't need as many skilled trades Closed timber frame panels come with insulation, air and vapour barriers already installed. Some even have factory-fitted windows. This means much less reliance of expensive trade specialists.

Hitting sustainable targets is easier The first step in hitting high levels of the Code for Sustainable Homes is deciding which panel design you want to order. Building fabric is key to hitting levels 4, 5 and 6, so the heavy engineering is all done at the factory. Panels come in a variety of 'standard' configurations, or we can custom-design the panel, depending on your carbon targets. When considering embodied energy, the carbon sequestered by the wood in a timber panel can be added to the equation.

Fewer on-site delays Building with closed panel timber systems means year-round construction is possible. Buildings can be made weather-tight much more quickly since the wall assembly has already been done. Work can usually progress during bad weather that might otherwise delay traditional construction methods.

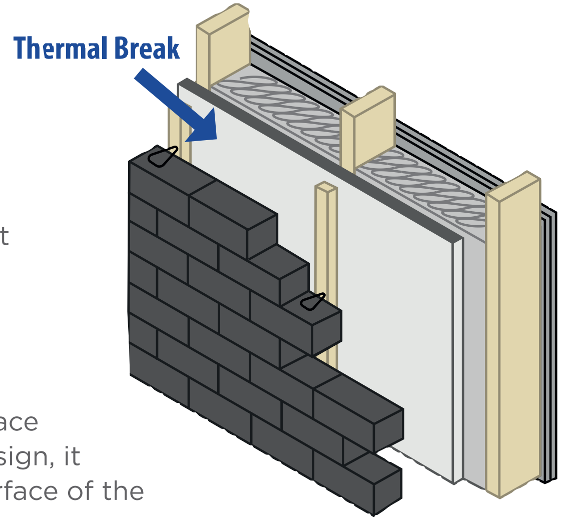
Benefit from cost savings Timber frame panels are much lighter than brick or block. This means potential savings may be made by reducing the strength of the foundation slab. The highly-insulated, factory-sealed timber frame panels hold the heat very well, so you should be able to downsize mechanical systems as a result. And energy modelling software can help to identify a host of other savings in our standard house models.

Less on-site clean-up Factory pre-engineered timber panels significantly reduce the amount of construction waste and keeps sites cleaner - and safer.

To fully appreciate the many benefits of timer frame panel construction it helps to understand what will happen to the panel once it is in place. Wall panels are subjected to a number of pressures they need to withstand, and proper design is key to their success.

Thermal resistance

Walls act as a thermal barrier. At various times they are called upon to keep heat in or keep heat out. Insulation plays a key role. The strength of insulation is measured in thermal transmittance, or U-Value. The lower the U-Value the better the insulation. Timber frame panels are easy to insulate because they create a cavity into which insulation can be placed. It is important to understand that the insulation has a lower U-Value than the timber studs that surround it. In real life conditions, the timber can act as a thermal bridge, where heat can move more quickly through the timber than through the insulation surrounding it.

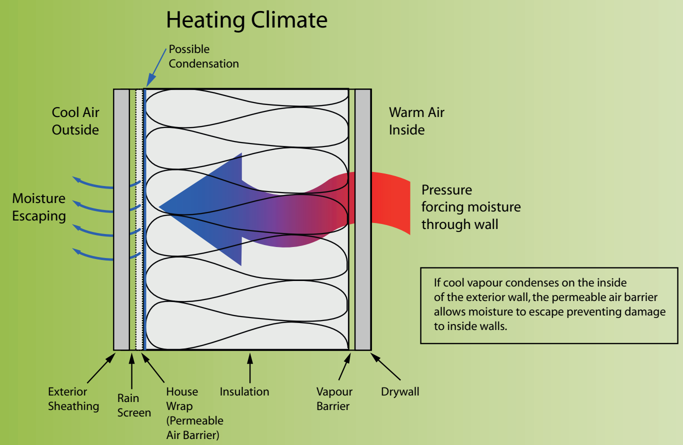


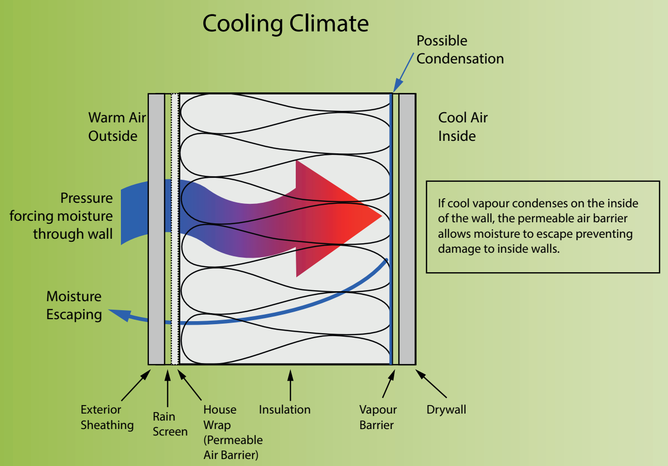
Thermal bridges create temperature differences on the surface of the wall that can lead to condensation. In a wall panel design, it is important that continuous insulation be applied to the surface of the wall to create a “thermal break".

Condensation in walls

Dewpoint is a vital concept in wall design. It is the temperature at which moisture in air of a specific relative humidity will condense into water. So, if the indoor temperature is 23°C and the relative humidity is 70%, the dewpoint is about 16°C.

Warm air holds more moisture than cold air and, as warm air cools down, moisture will drop out of it. The inside of a wall is at room temperature, say 23°C, but outside, it might be just 5°C so the surface temperature of the outside wall will also be 5°C. There is a thermal gradient inside the wall because temperatures inside the wall will drop 18 degrees from the inside to the outside. If there is an air leak in the wall, the warm moist air inside will leak out, dropping 18°C in temperature as it makes its way outside. Moisture will drop from this air inside the wall and one reason why air tightness is very important.





Vapour diffusion

There doesn't have to be a leak for moisture to get into a wall. A pressure difference can cause moisture to move into walls. Because warm air holds more moisture than cooler air, there is a higher concentration of water vapour in the warm inside air than the cooler outside air. Particles in an area of high concentration will move to an area of lower concentration, and will move right through vapour permeable materials, including building materials.

To prevent this, a vapour impermeable membrane, called a vapour barrier is installed. Cold surfaces are condensing surfaces and, if cold, a vapour barrier will actually capture moisture. So, in the UK vapour barriers are installed on the inside of the wall. If the vapour barrier is warm, no condensation will form on it, and water vapour cannot penetrate through it. In the summer, with air conditioning, the situation is reversed (the inside walls are cool), and water can condense on the outside of the vapour barrier (inside the wall), but this moisture will dry to the outside because a vapour permeable barrier has been placed there.

Air barriers

Air barriers are often misleadingly called "breather membranes." In fact, they are more properly described as "vapour permeable air barriers". While air cannot move through an air barrier, water vapour can. No matter how carefully a wall panel is constructed, there is a chance that some moisture will penetrate into the wall. To ensure there is an opportunity to dry, a vapour permeable membrane is installed on the outside wall. The water can then evaporate through the membrane to the outside, keeping the wall dry.

Wind washing

Factory engineered closed timber frame panels prevent wind washing. Wind washing is the movement of heat through an insulated wall, even one that is air tight, caused by improper insulation installation. If fibre insulation is badly installed in the wall cavity, it loses its insulation properties. This allows cold air from outside to cool down the interior of the wall and, though convection, the cold air is transferred to the inside.

Factory pre-engineering provides the highest quality of insulation installation to prevent wind washing and other forms of heat loss from within the building.

The environmental legacy we leave our children and grandchildren depends on what we do today. Not changing our attitudes and behaviour towards our planet isn't an option. We have to use resources more sparingly and be more aware of how we live from day to day.

Tougher Building Regulations are forcing each and every one of us to think more about conserving energy, but building new homes by traditional brick and block methods - even to the latest standards - can seldom achieve the energy saving potential of closed panel timber construction.

At Eco Homes Direct Ltd we acknowledge that not all new build homes can achieve fully passive status. Cost and space limitations are just two of the factors that may prevent or deter one from this option. However, **all** of the standard panel designs in our range are capable of delivering built-in thermal performance that can exceed that of traditional construction methods by up to 80 per cent!

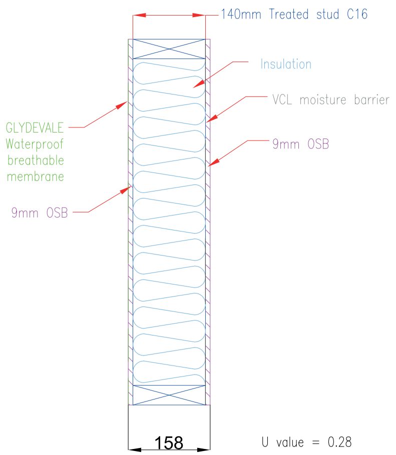
Affordability

Of course, the Passivehaus approach to house building is nothing new. But it's adoption has been slow largely due to its premium price tag and the fact that most exponents of this construction method are located outside the UK. Our unique "HOUSE as a WHOLE" approach and UK-centric sales, manufacturing and installation base, has enabled us to develop a product that competes favourably in the market, with huge value-added benefits that are inherent in the closed panel concept.

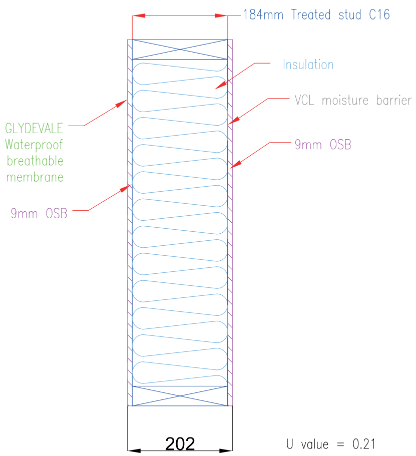
Put simply, the more airtight your home is, the cheaper it is to run. The fewer places there are for air to escape the better, which is why we can manufacture panels up to 12 metres in length as single piece units. And it doesn't stop there. Panels are designed to be fully sealed at every intersection and joint, be highly insulated and moisture proofed and with integral service voids to minimise breaching air tightness and create draughts or cold bridges.

SUPER-Ehomes

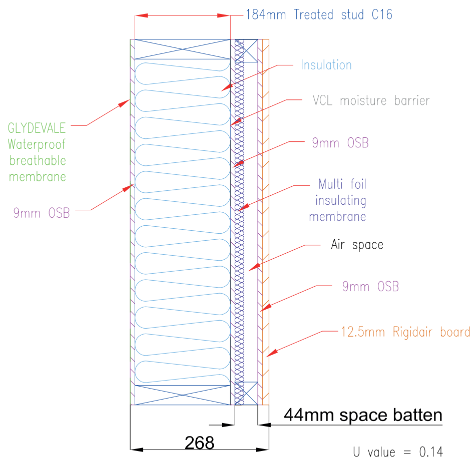
Our Super-Ehomes concept is based on distributed mechanical ventilation with heat recovery (MVHR) *see page 11 for more information*. The system draws in fresh air from outside that is thoroughly filtered to remove airborne contaminants such as pollen and industrial/traffic pollutants, while recovering heat from stale air before it is exhausted outside. That means you can heat your entire home at an even temperature while constantly breathing clean fresh air. Essential for allergy sufferers, but invaluable to the well-being of your entire family!



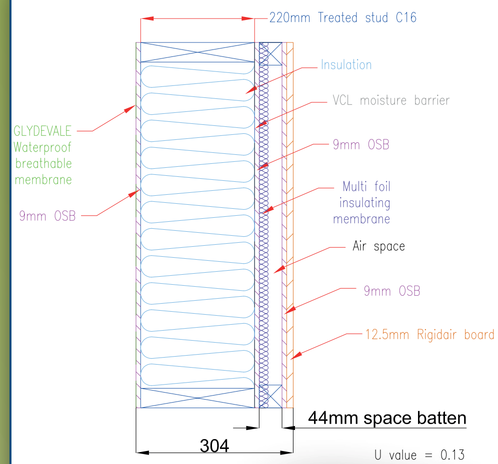
Eco 1



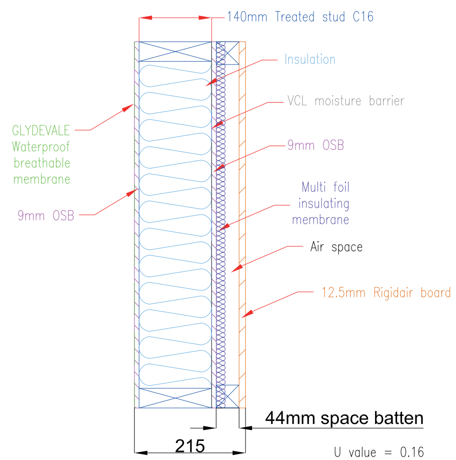
Eco 2



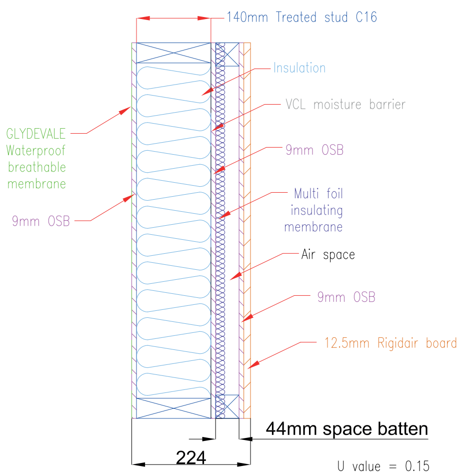
SE Passive



SE Passive Plus

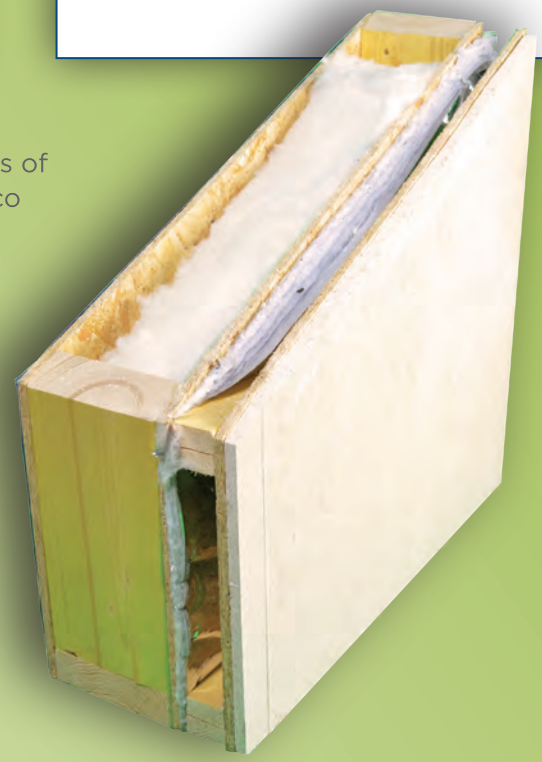


Super Eco 4



Super Plus Eco 4

Shown here are section drawings of the six standard panels in the Eco Homes range together with a cut-through section of a Super Eco Plus 4 panel. Inside surfaces are faced with 12.5mm Rigidair board. This material is four times stronger than conventional gypsum board and is made from recycled paper. With high pull-out resistance and a ultra-smooth surface it does not require plastering and is ready to receive all forms of decoration with minimal preparation.



The transition to zero carbon housing is relatively new and, as with all emerging technologies, it spawns a lexicon terminology some of which is difficult to understand. One such term being widely used is "embodied energy."

Carbon -v- energy

Higher energy use almost always translates to higher carbon emissions. But you can't generalise about the energy and carbon relationship, because different fuels emit different amounts of carbon. Hydro electric energy is very carbon efficient; burning natural gas is not. When engineers calculate the carbon emissions in houses, they always consider the "energy mix," or how energy is generated in the geographic area where the house is located. Energy is generated in a variety of ways almost everywhere, and it is common in the UK to have a mix of nuclear (low carbon), natural gas (high carbon) and an increasing amount of renewable (low carbon).

Embodied energy

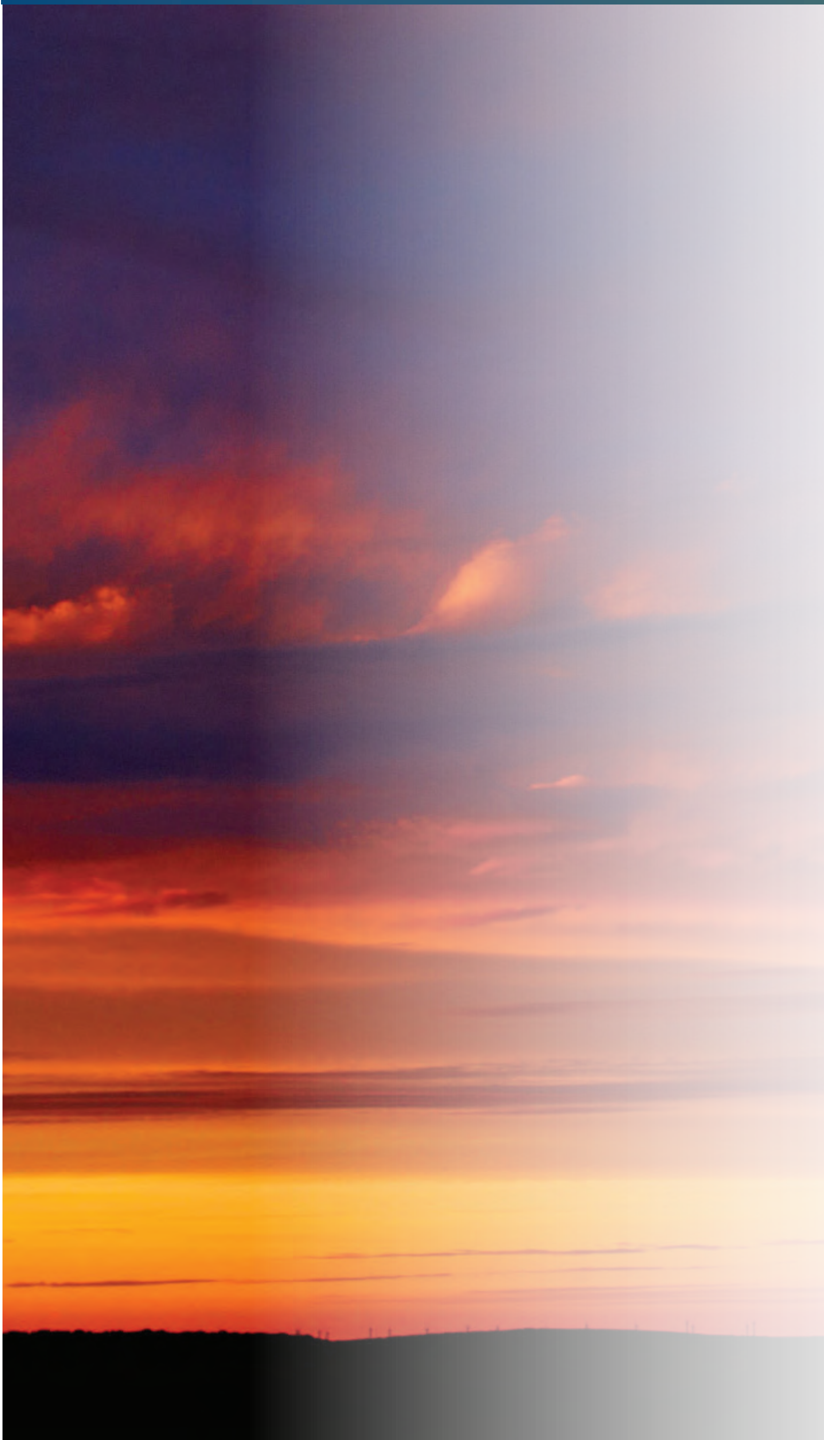
In the timber frame industry we talk about "embodied carbon". which converts the embodied energy into carbon by determining the energy mix at every step of the process. Timber does extremely well in embodied carbon calculations because it is an organic material. It holds, or sequesters carbon. As long as the carbon is in the wood that is inside your walls, it is not in the atmosphere. Since wood used in the UK comes from sustainable forests, there is another tree growing where the one used to make the wall was cut down, so the wood in your wall is keeping carbon out of the atmosphere, and the new one growing in its place is taking up even more carbon. It really is that simple!

Life-cycle assessment

Steel panel manufacturers like to talk about "life cycle assessment." This is either embodied energy or embodied carbon plus the amount of energy required to dispose of the construction material after the building has lived its useful life. Steel panels score very well here, the argument goes, because 90 percent of steel panels are recycled and a further 9 percent are re-used. However, this does not account for the energy (and carbon) required to melt the steel and roll it for re-use.

So, which is best?

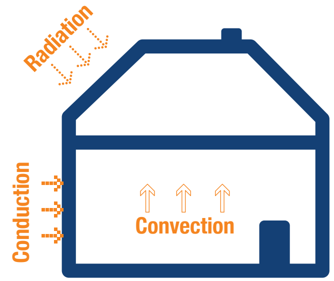
Because of the complexity of the calculations, and trying to take everything into account, most low-carbon programmes are currently considering only embodied energy. However, even these programmes realise embodied energy is not the whole story. Eventually, as numbers for embodied energy and embodied carbon become widely accepted, there will be an attempt to do more life cycle assessments.



Precise, predictable performance - engineered to exceed Building Regulations

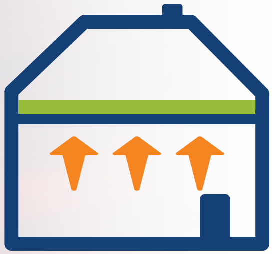
Building science is all about understanding how various elements of a building are impacted by the movement of heat, moisture and air within. An appreciation of the fundamental principles of this very complex subject is usually enough to demonstrate how closed timber panel construction overcomes many of the environmental and structural issues inherent in other forms of building.

Conduction, convection and radiation



Heat moves via **conduction** (through materials), **convection** (warm air rising, replaced by cool air), and **radiation** (by heat-producing sunshine).

The rate of heat lost in a house is determined by the temperature difference from the outside, the surface area of the building, air leakage and thermal resistance (insulation).



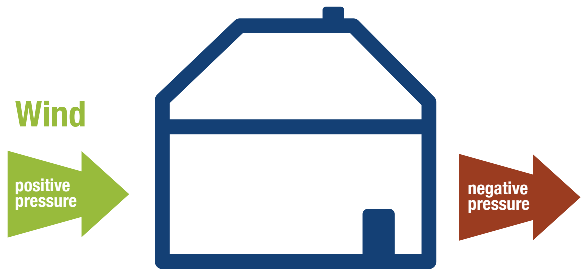
Warm air is buoyant, and warm air will rise, meaning extra insulation should be placed at the ceiling or roof.

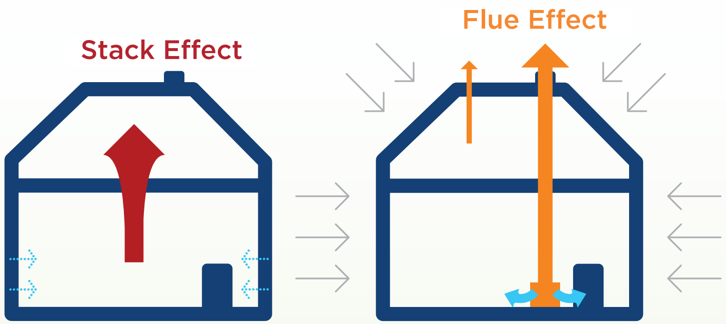
Also, warm air holds more moisture than cooler air. There is more moisture in a warm house than the cool outside, which means water vapour will try to move to the outside unless a vapour barrier is installed. When warm air contacts a cool surface, there will be condensation.

There doesn't have to be a leak for moisture to get into a wall. A pressure difference can cause moisture to move into walls. Because warm air holds more moisture than cooler air, there is a higher concentration of water vapour in the warm inside air than the cooler outside air. Particles in an area of high concentration will move to an area of lower concentration, and will move right through vapour permeable materials, including building materials.

Air movement

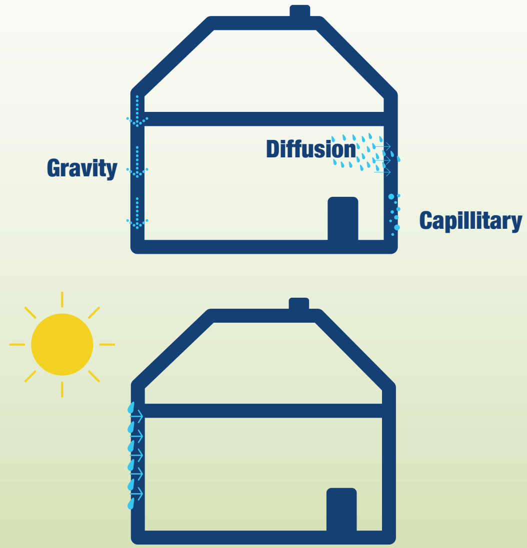
Wind is simply moving air, and wind blowing on a building's surface will create a positive pressure. There will be an equal negative pressure on the leeward side of the house.





Air moves inside your house by the **stack effect**. This is the movement of warm air upwards, being replaced by cool air at the bottom of the house. This cool air could be drawn into the house through cracks and holes, gaps in floorboards or poorly fitting seals around windows and doors.

Air can also be moved via **flue effect**, i.e. exhaust fans. If the ventilation is not balanced, an exhaust fan will depressurise the house, encouraging cool air to enter through leaks, and possibly causing back draught in open hearth fireplaces and other non-sealed combustion appliances.



Moisture

Moisture is moved by **gravity** (leaks in the roof), **capillarity** (the tendency of water to fill small spaces in porous materials such as brick and concrete), and **diffusion** (moisture moving from an area of high concentration to an area of lower concentration).

Capillarity is controlled by erecting a barrier that either has very large holes (so the surface tension cannot support the weight of the water) or no holes at all (such as a damp proof course).

Water can move into walls by the sun creating **vapour drive** inwards after a rain. Wind-driven rain will often penetrate the exterior finish of a wall, so ensuring the wall can dry to the outside and can drain any accumulating water is very important.

MVHR unit

Mechanical Ventilation and Heat Recovery (MVHR)

An air tight house, with balanced mechanical ventilation, properly placed air and vapour barriers and plenty of insulation will be **very** energy efficient, provide a healthy indoor environment and run almost silently.

Mechanical systems should be considered when the building envelope is built to high standards and will provide heat, cooling, water heating and ventilation. The efficiencies of a mechanical systems should be considered with a view to low energy consumption and creating healthy indoor environments. They allow regulation of relative humidity, to discourage mould growth. In an air tight house, the MVHR system provides all the air in the house, so the addition of a high-performance filter will enhance indoor air quality.

In traditional British housing, uncontrolled air leakage accounts for up to 50 percent of heat loss. This keeps your energy bills high and undermines the long-term performance of your house.

Where to reduce air leakage

As we become more energy conscious about how we construct new housing, priority must be given to ways of reducing air leakage. This means better windows, better sealing around wall penetrations such as wires, pipes and vents, and better wall construction. Using modern methods of construction like factory pre-engineered closed timber frame panels goes a long way to cutting air leakage. The factory product is almost completely air tight, and the only thing required of the on-site construction team is to crane the panels into place, and seal the areas between the panels.

Testing for air leakage

We can actually test the air leakage in the houses we build. By using an air depressurisation – or blower door – test, we can determine the rate of air leakage in the building. For good energy efficiency, an air leakage rate of under 4 air changes per hour at test pressure is recommended. Lower than that is even better. Energy-efficient house programmes like Canada's Super E® require air leakage of 1.5 air changes per hour. PassivHaus requires air leakage even lower.

Reduced air leakage saves energy, reduces the admission of outside noise and, when combined with proper ventilation, provides the house with healthy, low-dust indoor air. Proper ventilation includes the installation of mechanical ventilation with heat recovery (MVHR).

How MVHRs work

An MVHR unit continually exhausts stale air and replenishes it with fresh air from outside. The outgoing stale air is usually warmer than the incoming fresh air, so the two streams are passed over each other, without touching, and the outgoing air warms up the incoming air, preserving the heat and lowering your energy bills.

Lower indoor humidity

Warm air holds more moisture than cold air, so the stale air you are exhausting is also carrying a lot of moisture. The fresh air coming in has less moisture in it (even if it's raining outside), so the MVHR also controls indoor humidity. Low- and zero-carbon buildings the world over have demonstrated a very air tight house with an MVHR system is the best way to achieve superior energy performance and maintain a healthy, comfortable indoor climate.

The air tightness of a house is one of the most critical elements in its energy performance. Low-energy and low-carbon schemes such as PassivHaus, Super E®, Energy Star in North America and Minergie in France, all require an air leakage test to be done on houses before they are certified. In more and more countries in the EU, air leakage tests will be required for all new homes. Air leakage is measured using an air depressurisation test, also called a blower door test.

Elements of a blower door

A blower door has three main parts: a calibrated fan capable of inducing a range of air flows; a pressure measurement instrument called a manometer; and, some kind of mounting unit that can connect the instrument to a door in an air tight fashion. The unit is connected to a computer which takes the manometer's readings and calibrates them.
Blower doors can be used to test air leakage in ducts, between different parts of a building, and overall air leakage to the outside of a building. The most common use is to test the overall air leakage of a whole building.

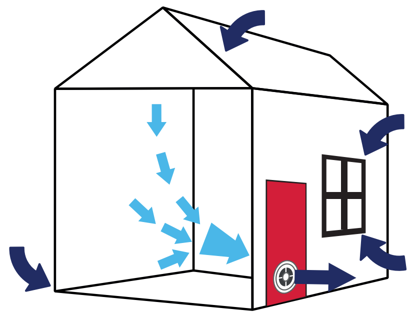
How the test is conducted

The machine is connected temporarily to an exterior door, then all exterior doors and windows are closed, interior doors opened and all vents and dampers closed. Ventilation fans are turned off. The fan is used to exhaust air from the building, putting it under negative pressure. The more air-tight the building (i.e. fewer holes), the less air will be required to depressurise the house to a preset measure. Usually, the measure is 50 Pascals of pressure. This is a relatively high pressure, approximately the equivalent of a 40 kmh wind blowing on all exterior surfaces of the house, but a high pressure is preferred to minimise the effect of wind. Blower door tests will provide inaccurate results if conducted on a particularly windy day.

Once the computer makes its air flow calculation, it is compared to the volume of the house. The most common measurement unit for air leakage is Air Changes per Hour. In other words, if the entire air volume of the house is required to hit test pressure in an hour, that would be 1.0 air changes per hour (ACH).

What is the right air tightness?

Various eco housing schemes set air tightness targets – generally ranging from 0.6 ACH (PassivHaus) to 3.0 ACH (Energy Star). There is no agreement as to what the "ideal" air leakage rate should be, although anything under 3 ACH signifies a potentially energy efficient house. Air tightness testing is also used as a measure of quality assurance. The depressurisation test identifies any unwanted leaks or cracks in the house, and if a test is run before the interior finish is applied, they can be fixed. The test can also determine the air tightness of windows and how well the window has been installed. Air tightness testing is becoming common in Europe, where the EU has set out a standard, EN 13829, which is based on the internationally recognised ISO 9972.



Types of sound

Researchers in sound transmission use three definitions to describe how sound travels in a building.

- **Airborne transmission:** sound in a room generates pressure waves which induce vibration in a wall.
- **Impact transmission:** sound created by an object striking the dividing wall – shoes on a hardwood or ceramic floor would be an example of this.
- **Flanking transmission:** the resulting vibrations of a noise are transmitted by a building component.

General rules

Air tightness in a building will significantly reduce airborne transmission. This is why energy efficient homes are quieter. A Code for Sustainable Homes Level 3 home with less than 3 air changes per hour air leakage should be very quiet. Sound must have a medium to move through and, if the building is airtight, air can't be that medium.

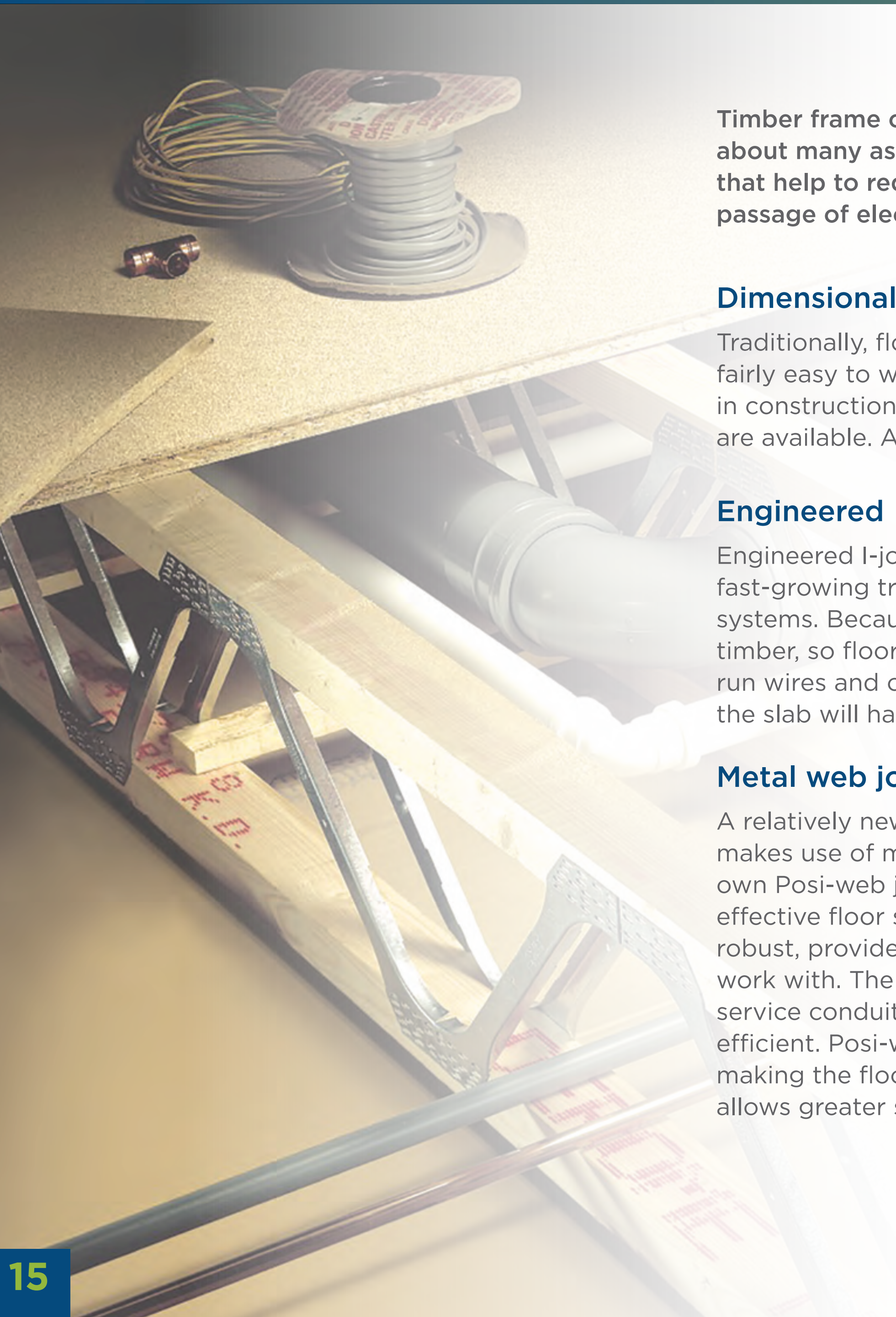
Generally speaking, added mass will also reduce the transmission of outside noise. This is why there is sometimes concern about timber frame houses being noisier. However, this simply isn't true. The additional cavity insulation in a timber frame wall will actually reduce outside noise considerably.

Preventing impact transmission

As with fire safety, the reduction of sound transmission has more to do with how you design the house rather than what the house is made of. The best strategy is isolation - finding a way to decouple the two sides of walls or floors from each other. Resilient metal channels can be used to attach wallboard to timber frame assemblies. These absorb sound. A double layer of gypsum board adds considerable mass and is very effective in most cases. Sound absorbing insulation will also reduce impact transmission.

Flanking transmission

Flanking transmission is especially a problem in multi-unit residential buildings where sound can travel via ceilings, floors, structural joints and service voids. In some cases shared components, such as floorboards, concrete block walls or concrete floors can make flanking problems worse. The key to preventing flanking transmission is isolation. There should be an air gap in a partition wall, so the wall is not shared between units. Remember that flanking transmission is not sound passing through the wall, it is sound that causes the wall to vibrate, and it becomes a sound transmitter.



Timber frame construction provides opportunities for builders and specifiers to think differently about many aspects of construction. This includes the humble floor joist, with options available that help to reduce sound transmission, reduce weight and provide easy underfloor access for the passage of electrical and plumbing services.

Dimensional timber

Traditionally, floor joist systems have used dimensional timber. Solid timber beams are quite strong and fairly easy to work with. However, they have inherent disadvantages. As we emphasise sustainability in construction more and more, it becomes less defensible to use large solid timber where alternatives are available. Also, over time, solid joists can dry and shrink, leading to creaky floors.

Engineered I-joists

Engineered I-joists can be stronger than dimensional timber, and they are made of smaller, usually fast-growing trees. For this reason, they are considered far more sustainable that dimensional timber systems. Because I-joists are engineered to very tight tolerances they don't shrink over time like timber, so floor systems are very much quieter. However, holes may still need to be cut in the joists to run wires and other services and, if there have been problems with pouring an uneven foundation slab, the slab will have to be corrected before I-joists can be installed.

Metal web joists

A relatively new and very efficient flooring system makes use of metal web joists. Eco Homes very own Posi-web joists are part of an extremely cost-effective floor system. They are lightweight, yet robust, provide long-term stability and are easy to work with. The open web design makes running service conduits, cables and pipework quick and efficient. Posi-web joists can also absorb sound, making the floor system very quiet. Posi-web also allows greater spans than dimensional timber.

Despite the UK and northern mainland Europe having experienced some severe weather conditions in recent years, they are nothing to those routinely encountered in other parts of the world where timber frame construction is widely used. Thus, there has been much research and development undertaken on the effects of hurricane-force winds and even earthquakes on this type of construction which, although not strictly relevant to Eco Homes Direct Ltd's own domestic market, should assure potential clients as to the structural integrity of the system.

Engineered for strength

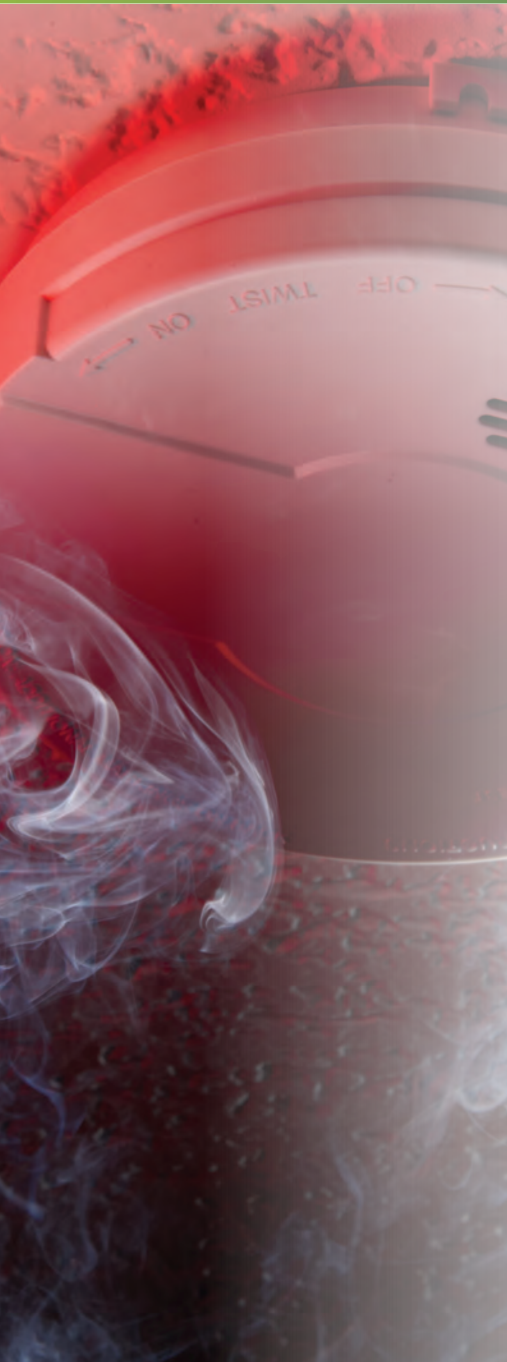
The best type of structure to resist high winds or an earthquake is a frame house. Solid, concrete walls are strong – if you want to stop a bullet – but are inflexible and will crumble in the erratic shaking and twisting liable to occur during an earthquake or hurricane. Frame houses tend to bend and twist slightly and keep their structural integrity. The best earthquake research is happening in Japan, where full-sized houses are built on giant shaker tables to simulate the actions of an earthquake. Research has found that, without question, a frame house – either steel or timber – is the best structure type to resist earthquake damage.

Research on high winds

Unsurprisingly, the best hurricane research centres are in the United States, where hurricanes are relatively common. Researchers put full-sized houses in giant wind tunnels and measure performance. One area of intense research is on roof performance. In high winds, a vortex can form around roof edges creating upward pressure on the roof to lift it. Architectural features like dormers may encourage or discourage vortex formation. Ideal roof lines is one of the areas of intense research.

Building techniques

There are two types of damage that can occur during a hurricane. The roof may be lifted or the walls may collapse, and the building itself must withstand objects being thrown at them at high speeds. For the first type of damage, longer nails and steel nailer plates should be used to connect timber members. Special ties can be installed that tie one floor to the next and the roof to the walls. Doors should open outwards, not in. For the second type of damage, windows are in the biggest danger. Once windows break, the chances of losing the roof increase dramatically. In places like Florida, where hurricanes happen often, impact resistant glass, like that installed in automobiles, is being mandated. This can either be introduced during the manufacturing process, or it may be a film you apply to existing windows.



Research done in North America, where there is a significant proportion of timber frame houses, confirms that fire safety in a house or flat has little to do with the combustibility of the structural materials used. Occupant safety is far more dependent on the occupant's awareness of fire hazards, the contents of the home and fire protection measures taken during the building's construction.

How fire codes work

Fire codes are building standards designed to maximize occupant safety. The main objectives of fire protection codes are:

- to confine the fire to the area of its origin
- to ensure structural integrity of the building is maintained during evacuation
- to ensure measures are in place to allow for the safe exit of occupants

How construction materials are fire-rated

Complete wall assemblies are subjected to fire, then timed to see how long they maintain their integrity. Fire ratings are usually expressed as times. So a **"30 minute fire rated"** wall is less fire resistant than a **"60 minute fire rated"** wall. It is important to note that individual components are not tested, but complete assemblies.

Fire damage to various materials

No material is completely fire proof. At the Canadian National Research Council, studies were undertaken on how various materials react during a fire. Steel will soften at high temperatures, and it will lose its structural integrity. Concrete and brick are prone to "explosive spalling," which means moisture in the pores of the material suddenly boils and "explodes" mortar or concrete. Timber maintains its structural integrity surprisingly well. Once the exterior of the timber has charred, the fire has no fuel left, and simply goes out, leaving the centre of the timber untouched.

Closed panel systems

Even during construction, closed panel systems are very difficult to burn. This is because a fireproof layer, in the form of gypsum board (also called wallboard or plasterboard) is installed at the factory. This highly fire-resistant material forms a coating to protect the panel. When gypsum board is exposed to fire, the release of moisture from the gypsum cools the fire. Specially manufactured fire resistant rated gypsum board is available.

Off gassing and insulation

How much insulation in the wall cavity of a timber frame wall panel off-gases during a fire depends on the insulation material. Urethane foams melt quickly and can give off noxious gases, fiberglass is difficult to ignite, but melts quickly once it does and emits formaldehyde gas. Blown cellulose is generally treated with fire proofing chemicals at the manufacturing stage and does not burn well. Rockwool simply shrinks and also forms added protection to wood joists.

making the difference

We understand that making the switch to closed-frame timber panel construction from more traditional forms of construction raises many questions.

Assessing and rationalising the benefits and equating these to different build projects, client expectations and environmental or planning requirements demands a greater understanding and appreciation of the technology than we could possibly hope to include in a single brochure.

However, for anyone, be they a self-builder, developer, architect or consultant seeking additional information and guidance to make informed choices and fully appreciate the many benefits that benchmark Eco Homes Direct's approach to timber panel construction, our technical support team are always available to guide you through all aspects of this proven, affordable and efficient building method.

Call us on **01628 484 469**
or visit us on line at **ecohomesdirect.co.uk**

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