

Retrofit Coordinator

Jargon Buster

Industry Key Words

Air changes per hour (ac/h) - (Volumetric), the number of times per hour that the air inside a building is changed. Units $\text{m}^3 \text{ hr} / \text{m}^3 @ 50 \text{ Pascals}$.

Air permeability - Defined in BS EN 13829. Units $\text{m}^3/\text{m}^2\text{hr}$ at 50 Pascals or $\text{m}/\text{h} @ 50 \text{ Pa}$.

Building airtightness (also called envelope airtightness) - Defined as the resistance to inward or outward air leakage through unintentional leakage points or areas in the building envelope. This air leakage is driven by differential pressures across the building envelope due to the combined effects of stack, external wind and mechanical ventilation systems.^[1] A good practice standard for air tightness in retrofit would be less than $3 \text{ m}^3/\text{m}^2\text{h} @ 50 \text{ Pa}$.

Airtightness - The fundamental building property that impacts infiltration (the uncontrolled inward leakage of outdoor air through cracks, interstices or other unintentional openings of a building, caused by pressure effects of the wind and/or stack effect).^[2]

An airtight building has several positive impacts^[3] when combined with an appropriate ventilation system (whether natural, mechanical, or hybrid):

- Lower heating bills due to less heat loss, with potentially smaller requirements for heating and cooling equipment capacities
- Better performing ventilation system
- Reduced chance of mould and rot because moisture is less likely to enter and become trapped in cavities
- Fewer drafts and thus increased thermal comfort

Air leakage index - Per unit thermal envelope area. Units $\text{m}^3/\text{m}^2\text{hr}$ at 50 Pascals or $\text{m}/\text{h} @ 50 \text{ Pa}$.

Delivered energy - The amount of energy which is supplied to final users, e.g., households, office buildings, schools, factories and cars.

Global Warming Potential (GWP) - A measure of how much a given mass of greenhouse gas is estimated to contribute to global warming. It is a relative scale which compares the gas in question to that of the same mass of carbon dioxide (whose GWP is by definition 1). For example, methane, nitrous oxide and sulfur hexafluoride have GWPs many times that of CO₂, although CO₂ is being emitted into the atmosphere in much larger quantities.

Heat Loss - Loss of heat via the fabric of the property usually resulting from air infiltration and ventilation.

Heat Gain - Heat in a property resulting from metabolic (people and animals), hot water, cooking, lights and appliances, solar and heating systems.

Heat Loss Parameter (HLP) - A building's specific heat loss (in units of W/K) divided by the building's floor area (measured internally i.e. within the thermal envelope). Units W/K.m²

Infiltration - Non-deliberate ventilation leading to unwanted air-leakage.

Physical Interfaces – Point at which one material joins to another.

Functional interfaces - Relationship between elements e.g. air permeability and ventilation systems; heat loss and heating output.

Occupant Interfaces - Relationships between building and its occupants e.g. heating controls, smart meters.

Passivhaus - A low energy building standard. Passivhaus Institut (PHI) originator of the Passivhaus movement and of the Passivhaus Standard.

Passivhaus Planning Package (PHPP) - A modelling and accreditation software tool developed and updated by the Passivhaus Institut.

Primary energy - The amount of energy mined or extracted at source; e.g., from coal, oil, natural gas, uranium or wood. Includes losses within processes such as electricity generation and transmission.

Stack effect - In winter, the warm air inside a building is less dense than the cold external air. Consequently, cold air tends to be drawn in through cracks and gaps at the base of the building, with warm air exfiltrating through openings in and near the top of the building.

Thermal Bridge - A thermal bridge, also called a cold bridge or heat bridge, is an area of an object (frequently a building) which has a significantly higher heat transfer than the surrounding materials resulting in an overall reduction in thermal insulation of the object or building. This can also be because of thinning or discontinuous insulation layers.

Repeating thermal bridges - Thermal bridges that occur because of the type of construction (studs in timber frames, rafters, joists etc).

Non-Repeating Thermal Bridge - Other locations of thermal bridges that do not repeat in the structure (window reveals, wall roof junctions, wall floor junctions, corners etc).

Thermal capacity – The ability of the constituent materials in a building to store heat, for a given rise in temperature. Measured in units of J/K (joules per kelvin). Also sometimes referred to as thermal mass.

Thermal envelope - The insulated external fabric of the building.

Useful heat - The heat put into the house by the heating system, which will be less than the heat energy put into the system (through fuel).

Values

ψ (psi) value - The heat loss per unit length of thermal bridge. Units W/mK.

λ (lambda) value - The thermal conductivity of a material. Units W/mK. Sometimes called 'k value'

R-value - The **R-value** is a measure of thermal resistance for materials. It gives an indication of how much they resist the transmission of heat (their thermal resistance). The higher the value of R, the better the thermal performance and heat retention of the material or assembly, and the slower any heat loss. Units are m²W/K (m² x Watts / Kelvin).

U-values - U-values measure how effective a construction is as an insulator. The lower the U-value is, the better insulated the construction is. For example, here are some typical U-values for building materials:

- a cavity wall has a U-value of approx. 1.6 W/m²
- a solid brick wall has a U-value of approx. 2.0 W/m²
- a double-glazed window has a U-value of approx. 2.8 W/m².

In this example, the cavity wall is the best insulator and the double-glazed window is the worst insulator.

U Values are expressed in Units of W/m²K (Watts) / m² per K(elvin)). This means that a U value of 2 indicate a heat loss of 2 watts per m² of the construction per degree k temperature difference between inside and outside.

Pascals - A measure of pressure - Conventionally the air tightness of building envelopes is measured at a pressure difference of 50Pa between inside and outside.

This list is not exhaustive of all the values used in building construction and retrofit.

Funding and Subsidy Schemes

The Energy Company Obligation (ECO) – The Energy Company Obligation (ECO) is a Government subsidy scheme paid for through a levy on UK households' energy bills. It provides grants towards in the installation of energy efficiency measures, such as solid wall, loft and cavity insulation, with a focus on fuel poor and "hard to treat" homes.

The Feed-in Tariff (FiT) – The Feed-in Tariff (FiT) is a Government subsidy scheme that is designed to incentivise the installation of measures that generate renewable electricity, such as solar panels. Under this scheme, households are paid for the each unit of electricity that they generate, as well as being able to sell excess electricity to the grid. This significantly increases the payback of renewable heating measures.

Private Rented Sector Energy Efficiency Regulations – Under the Energy Act 2011, legislation was put in place that will require private landlords to bring their properties up to a minimum energy efficiency standard (an EPC rating E). This is expected to have a significant impact on fuel poverty.

The Renewable Heat Incentive (RHI) – The Renewable Heat Incentive is a Government subsidy scheme that is designed to incentivise the installation of renewable heating measures, such as biomass boilers and ground source heat pumps. Under this scheme, households are paid for each unit of renewable heat that they generate. This significantly increases the payback of renewable heating measures.

Standards

PAS2030 - Publicly Available Specification 2030 is the installer standard for publicly funded retrofit projects in the UK. The latest version is PAS2030:2017, due for publication imminently.

Passivhaus – Passivhaus buildings provide a high level of occupant comfort while using very little energy for heating and cooling. They are built according to principles developed by the Passivhaus Institut in Germany, and can be assured through an exacting quality assurance process. Passivhaus projects apply to new build projects, whilst EnerPHit applies to retrofit.

EnerPHit – ‘Quality-Approved Energy Retrofit with Passive House Components’ Certificate. EnerPHit projects achieve between 75% – 90% energy savings for existing buildings and are certified retrofits with Passivhaus components.

MCS – Microgeneration Certification Scheme - A set of product and Installation Standards for publicly funded renewable energy systems such as solar PV, solar thermal systems and heat pumps.

BBA – British Board of Agrément - A certification scheme for building products for the quality and installation of building products and systems.

Building regulations - National regulations controlling safety and efficiency in buildings (Different in each devolved nation). In England and Wales, retrofit is covered by building regulations Approved Document L1B.

Assessment Tools

BREDEM – The BRE Domestic Energy Model (BREDEM) is a methodology for calculation of the energy use and fuel requirements of dwellings based on their characteristics. It shares some features with the SAP methodology, but allows users to adjust inputs which are fixed in SAP, making it better suited to certain analysis tasks. The current edition is BREDEM 2012.

RdSAP – RdSAP is the method used to produce Energy Performance Certificates (EPCs). Rd stands for Reduced Data, and the method is designed to allow surveys to be completed more quickly and therefore more cheaply than a full SAP survey at some cost of accuracy. RdSAP underpins both Green Deal assessments and the minimum standards regulations. We can offer EPC assessments if required.

SAP – SAP (Standard Assessment Procedure) is a method for assessing the energy performance of houses using a standard methodology specified by the UK government. The current version of SAP is

SAP 2012, and it calculates a 'SAP rating' as well as an estimate of energy bills and CO2 emissions associated with the estimated energy use. The SAP calculations are based on building dimensions, construction (and therefore energy performance) of building elements such as walls and windows, details of the heating and hot water systems and controls, and any installed renewable technologies including solar PV panels.

Fan Pressurisation Test – A useful tool for evaluating air tightness of a retrofit project. A fan is temporarily installed in the building envelope to pressurize the building. Air flow through the fan creates a single static pressure within the building. Generally, the higher the flow rate required to produce a given pressure difference, the less airtight the building, as air is leaking from somewhere. Measured in $\text{m}^3/\text{m}^2\text{h}$ at 50 Pa.

Thermographic Survey – This is a diagnostic technique which enables surveyors to ascertain the amount of heat that is being lost from a building. When viewed through a thermographic lens, areas of poor or thinning insulation, thermal bridges and air leaks will show in warm colours to indicate that heat is being lost in these areas. Thermographic surveys are useful for demonstrating effectiveness of insulation and air tightness systems after installation.

WUFI – (Wärme Und Feuchte Instationär – Heat and Moisture Transiency) A method of ascertaining moisture transport and vapour diffusion within buildings.

Key Retrofit Measures

Insulation

Cavity wall insulation – From around 1920, houses in the UK were typically built with a cavity in between two layers of brick wall. Heat loss through this type of wall can therefore be reduced using cavity wall insulation, which is installed by blowing insulating material into the gap. Where applicable, it is often one of most cost-effective energy saving measures. Some cavities were constructed only partially filled with insulation.

External wall insulation – External wall insulation (EWI) is another solution for solid walls or hard to treat cavities. Although room sizes aren't affected, the outside appearance of the building will be affected and roof eaves may need to be extended. The insulation is applied to the walls and then covered in a suitable material – usually render but brick slips, pebbledash or cladding is also available. EWI can be expensive, but can often attract a grant/subsidy.

Hard to treat cavities – Walls with non-standard cavities (e.g. partially filled, narrower than usual) or walls in difficult locations (particularly those exposed to driving rain, or over three storeys high).

Loft insulation – Loft insulation reduces the heat loss rising from the main heated areas in the house below. The insulation is typically laid over the floor of the loft, with a recommended thickness of 270mm. It is often one of most cost-effective energy saving measures, especially where little or none is currently present.

Internal wall insulation – Older walls, especially solid walls, have relatively low insulation values. As there is no cavity to fill, one option is to apply internal wall insulation (IWI), which is then covered by

plasterboard. A variety of materials can be used and therefore the thicknesses required to reach Building Regulations varies, but will usually be between 40mm and 100mm. Although internal wall insulation will reduce the room size it is worth remembering that it is only applied to external walls. IWI can be expensive, but can often attract a grant/subsidy.

Party Wall – The wall that separates two homes in a terraced or semi-detached house.

Heating systems

Combi boiler – A combi boiler is both a water heater and a central heating boiler, combined (hence the name) within one compact unit. Therefore, no separate hot water cylinder is required.

Compensator – A device for controlling the heating system to compensate for internal load or external weather. Eg. If kitchen gets warm from cooking, load compensator will turn heating down. If outside environment is warm, weather compensator will turn heating down.

Condensing boiler – Condensing boilers use heat from exhaust gases that would normally be released into the atmosphere through the flue. As a result, they tend to be more efficient than non-condensing boilers.

Heating controls – Effective heating controls let you take charge of when, where and at which temperature your heating is operating – including varying these across different zones or rooms in the house. Improving these, or simply just changing the way you use them, could save you money.

Smart Heating Controller – A heating controller which 'learns' occupancy pattern of dwelling and senses occupancy.

Smart Meter – An energy meter which can be read remotely and can provide feedback to occupants about energy use and costs in their home.

Thermostat – A thermostat is a component of a heating control system which ensures the temperature is maintained at a set level. Your bills will typically fall – all other things being equal – for each degree C you drop your thermostat's temperature setting.

Thermostatic radiator valves – A thermostatic radiator valve (TRV) is a self-regulating valve fitted to hot water heating system radiator, to control the temperature of a room by changing the flow of hot water to the radiator.

Underfloor heating – There are two types of underfloor heating; "wet" and electric. Wet underfloor heating can be linked to a gas boiler or heat pump, and can offer savings over a conventional radiator system. Electric underfloor heating is only really appropriate where there is no wall space for radiators, as it is generally very expensive to run.

Zoning – When the heating system of a house is set up or changed such that different areas are heating at different times and to different temperatures it is called zoning. The saving benefits can be large as you are essentially reducing the house volume every time you aren't heating a room.

Renewables

Air source heat pump – Air source heat pumps (ASHPs) takes low-grade heat from the outside air and convert it into heat for use in providing central heating and hot water. They are best suited to “off-gas” properties. They are eligible for the renewable heat incentive (RHI, see above).

Biomass boiler – Biomass boilers take solid fuel such as logs, wood chip, or pellets and burn them to provide central heating and hot water. Their main advantage is in their use of renewable fuel, which results in lower CO₂ emissions. They are best suited to “off-gas” properties. They are eligible for the renewable heat incentive (RHI, see above).

Ground source heat pump – Similar to their air source cousins, ground source heat pumps (GSHPs) takes heat from the ground and uses this to provide central heating and hot water. Below a certain level, the ground stays at a fairly constant temperature all year round, so these pumps can achieve a higher Coefficient of Performance (COP) than air source heat pumps (which work better in milder temperatures). They are eligible for the renewable heat incentive (RHI, see above).

Solar thermal panels – Solar water heating systems use solar panels, called collectors, fitted to your roof to convert heat from the sun into hot water. A boiler or immersion heater is often used as a back-up to heat the water further when the sunshine is insufficient to reach the temperature required. They are eligible for the renewable heat incentive (RHI, see above).

Solar PV (Solar Photovoltaics) – Covers the conversion of light into electricity using semiconducting materials that exhibit the photovoltaic effect. In buildings, this appears most often as roof mounted panels.

Ventilation

Ventilation is the process by which moisture and air are able to move within the house. Ventilation is an essential part of any retrofit design, as it helps alleviate damage resulting from excessive moisture in a dwelling, in conjunction with the insulation and heat gain sources. Standard ventilation in homes usually consists of windows, trickle vents and extractor fans.

Mechanical Ventilation with Heat Recovery (MVHR) - A system of ventilating buildings, in which heat is recovered from the exhaust air stream to preheat the fresh air intake. Normally there are two sets of ductwork, both connected to an air-to-air heat exchanger, with the air flows in the supply and exhaust branches carefully balanced.

Mechanical Extract Ventilation (MEV) – This system extracts air from wet areas of the house and directs it to a central extraction unit.

Passive Stack Ventilation (PSV) - As air in the building is heated it expands and rises. The change in pressure within the house then draws colder air in to replace it. This process is passive.

Miscellaneous Retrofit Terms

Brick Slips - Thin tiles of brick (or plastic sometimes) that are applied as a finish to EWI to mimic the appearance of brickwork.

COP - Coefficient of Performance – the degree to which the heating system used converts energy in the fuel to heat in a dwelling. For example, a GSHP which converts 1 unit of energy in to 3.5 units of heat has a COP of 3.5.

Corners, junctions and edges – Where retrofit often goes wrong

Cost-effect – Cost-effectiveness analysis (CEA) is a form of economic analysis that compares the relative costs and outcomes (effects) of two or more courses of action. The measure that delivers greater benefit (e.g. energy saving or carbon reduction) per unit cost would be described as the more cost effective.

Carbon Saving – this is the amount of carbon emissions that a retrofit measure will prevent, and the value of the savings. For example, a good retrofit measure would have a high carbon saving for a low cost.

Dead Leg – A section of piping which is no longer used or surplus to requirements. If not managed properly, water can stand in the dead leg and stagnate, which can lead to the development of Legionella bacterium. If inhaled, this can be incredibly harmful to humans (Legionnaires disease).

Degree Days - Degree days are a measure of the number of days that an external temperature is below a base temperature calculated for a house This is used in BREDEM to establish the length of the heating season AND the size the heating load over the heating season.

External Thermal Insulation Composite Systems (ETICS) - An EWI system consisting of insulation, adhesive, fixings, fittings and finishes and an installation process which is subject to a guarantee.

Fuel Poverty – There are two well-known definitions of fuel poverty: “10% definition” and the “Hills definition”. The “10% definition” simply states that, a household is said to be in fuel poverty when they have to spend more than 10% of their household income on fuel to keep their home in a ‘satisfactory’ condition. Under the “Hills’ definition”, households are considered to be fuel poor if they have required fuel costs that are above average (the national median level) and were they to spend that amount on fuel, they would be left with a residual income below the official poverty line.

Fuel Efficiency – The relationship between the amount of fuel consumed and the degree to which the energy consumptive systems do their job. The lower the amount of fuel used for the job required, the higher the efficiency. For example, an older dwelling typically uses 60% of its fuel for space heating, making it highly inefficient.

Heating Energy required = [(Fabric loss) + (Ventilation Loss) + (Bridging Loss)] x Degree days

Hydrophobic – A material which repels water (waterproof)

Hygroscopic – A material which absorbs water (porous)

Inhibitor – an element of central heating systems which reduces the amount of sludge that can build up, and therefore reduces corrosion.

Interstitial condensation – Condensation that occurs between the layers of a construction – usually out of sight.

Listed Building – These buildings are listed by Historic England, Cadw (Wales), Historic Scotland and Northern Ireland Environment Agency. They are usually buildings of special historical, conservancy or architectural interest, and are protected to a certain degree depending on their list rating. Buildings are listed in England and Wales as Grade 1, Grade 2* and Grade 2. Each grade will require different planning applications for retrofit.

Off-grid – Off-grid is a term mainly used in terms of not being connected to the main or national gas/electrical grid. The higher costs associated with fuels such as coal and LPG means that these properties often have significant scope for cost effective retrofit.

Microbore – a type of piping that is easy to bend by hand and has fewer joints (fewer possible leakage points). Microbore is usually small in diameter which limits heat loss, and means that less water sits in any dead legs.

Parging – Plastering with a lime render to seal the wall. This provides an air tight layer.

Payback Period – The period of time required for an investment to recover its initial outlay in terms of income and/or savings generated.

Performance Gap - The difference between the energy savings achieved in reality versus those expected in the design of a retrofit project.

Retrofit – Retrofitting refers to the addition of new technology or features to older systems. With regard to home energy retrofit, retrofit refers to the installation of technologies used to improve the performance of existing buildings in terms of their energy efficiency.

Smart meter – As the next generation of gas and electricity meters, smart meters have an accompanying in-home display to help residents keep track of the energy used in their homes, cutting out the need for meter readings.

Stock assessment – In the retrofit industry, stock assessment refers to analysis undertaken to look at the current energy performance of portfolio properties, and the options for improving it.

Surface condensation – Condensation which occurs on a cold surface e.g. a wall or window.

Tool Box Talks – a presentation on a specific site safety issue given to members of the construction workforce. They may be presented as short talks, powerpoint presentations, delivered on site or in the workspace by a senior, experienced and knowledgeable team member. They are intended to provide instructions, information, and continuous training to help prevent accidents, ill-health and environmental damage.

Vapour permeable - Vapour permeable materials allow water vapour, but not air to pass through them. Their moisture content is in dynamic equilibrium with the surroundings.

VOCs – Volatile organic compounds (such as cigarette smoke).

Whole-House Retrofit – the theory of applying all retrofit principles to any single retrofit project on a house. This means considering all elements such as IWI, EWI, Floor Insulation, window replacements, ventilation, services etc. Retrofitting with a whole-house approach will always require more immediate expense, but will also always save money in the long term (via paybacks, maintenance, fuel bills etc).