CLIENT SUSTAINABILITY GUIDE

A brief guide to sustainability and low energy building design for domestic clients

LV ARCHITECTS

why?

The Climate Crisis is the greatest challenge of our time. Rising temperatures are leading to weather extremes, natural disasters, environmental degradation, food and water shortages, economic disruption and political conflict.

Maintaining the ‘status quo’ is no longer an option. Action needs to be taken now, and by all of us. It will be no mean feat; tackling the Climate Crisis will require the collective efforts of everyone to prevent catastrophe.

The construction industry is responsible for 49% of UK carbon emissions, so taking immediate steps to adapt practices and processes within the built environment is crucial in slowing the progress of climate change.

The UK Government requires the UK to end its contribution to global warming by 2050 by bringing all greenhouse gas emissions to net zero, and the Royal Institute of British Architects has set a 2030 Climate Challenge to meet and exceed the Government’s target.

This guide has been produced in order to help our clients understand a bit more about why and how you can reduce your carbon emissions when it comes to constructing or renovating a building.

At Liv Architects, we can help you to make your project more sustainable for the benefit of the planet, and for yourself. With good design, you can make your building not only more environmentally friendly, but also more comfortable to live in, better for your health, and cheaper to run.

Leading scientists say that unless we change things drastically, then within the lifetime of people alive today, we are heading for a world which can only sustain 0.5 to 1 billion people.

what?

These are the key terms to understand in any discussion relating to sustainability or Zero Carbon construction:

Operational Carbon

This is the term used to define the carbon emissions associated with the energy needed to run a building, including heating, cooling, ventilation, hot water, lighting and power. This is all the energy consumed by the building, and includes it’s management and maintenance.

Embodied Carbon

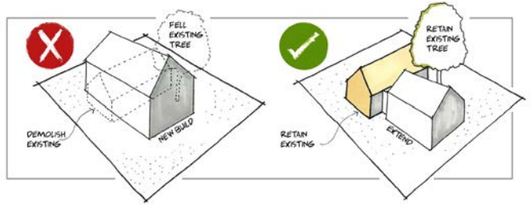
This is the term used to define the carbon emissions of the manufacture of all materials and construction processes incorporated in the construction of a building. This includes any carbon emissions associated with the removal of those materials at the end of their life.

Net Zero Carbon

This is a complex term, but generally speaking is used to confirm that the sum total of the carbon emissions over the life of the building are minimised and, with additional ‘offsets’, equals Zero.

Zero Carbon can relate to Operational Carbon, Embodied Carbon or the total of the two.

how?



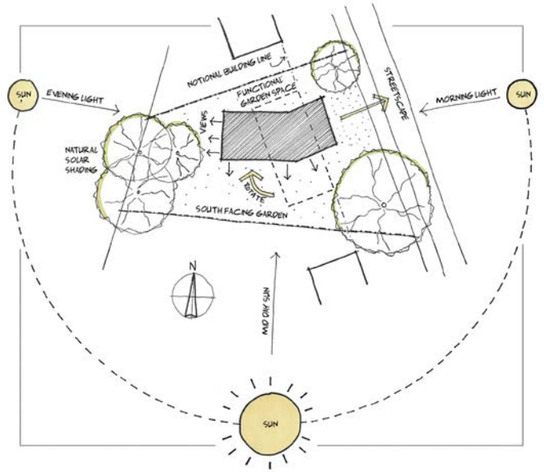
Reuse and Recycle

Only build new where existing buildings cannot be reused, refurbished or extended.

Prioritise materials that are reused, reclaimed, or natural from local areas and sustainable sources, or those which can be recycled at the end of their life.

If neither re-use nor recycling are feasible, always seek to use natural materials or those with a high recycled content to reduce the embodied carbon of the build.

Reduce Embodied Carbon

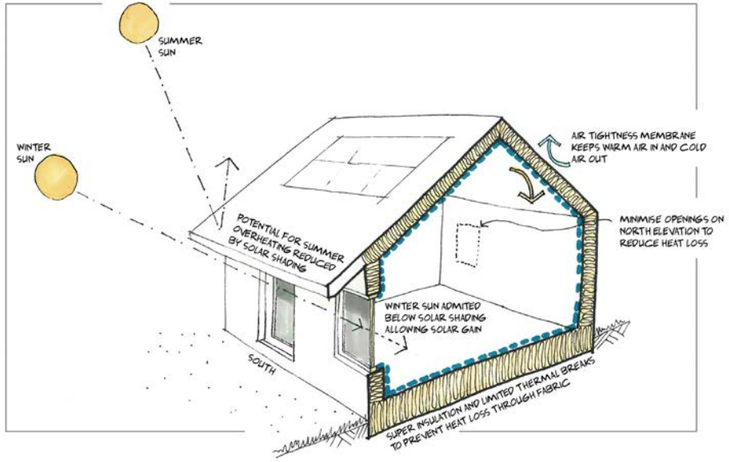


Orientation & Windows

A building's form, orientation and window proportions are all design aspects that do not add extra construction cost but can make a significant difference in the building's efficiency.

Avoiding overheating is critical, both for comfort and to remove the need for cooling, so external shading to South and West facing glazing is often necessary, as well as considerations of glass specification (triple glazing & low -G glass), as well as special coatings to the glass.

Reduce Operational Carbon



"We all know that a knitted jumper will keep you warm, but in strong winds the air will blow right through it, rendering its high insulation levels ineffective. Adding a Gore-Tex jacket on top which is air tight, water resistant and vapour permeable will maximise the effectiveness of the woolly jumper, while preventing sweatiness. The behaviour of a building envelope is no different."

Insulation

This is often referred to as taking a 'Fabric First' approach. This is where the majority of investment is put into the fabric of the building, increasing insulation levels well above the minimum Building Regulations requirements.

This will prevent or reduce heat loss through the building fabric, therefore cutting the amount of energy needed to keep the building warm.

Considering the materials and methods of construction specified is also critical, as using natural and recyclable materials are key considerations in reducing the embodied carbon of the overall project.

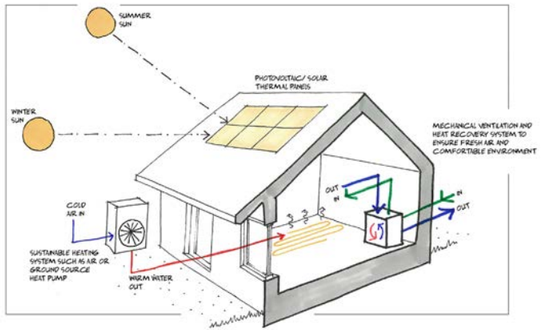
Airtightness & Ventilation

Airtightness is one of the most important factors for improving energy efficiency and comfort, by reducing draughts and heat loss from the building.

Installing a Mechanical Ventilation with Heat Recovery (MVHR) system allows you to have control over the air flow within the building, maintaining good air quality and reducing heat loss within an airtight structure.

And yes, you can still open the windows!

Reduce Embodied Carbon **Reduce Operational Carbon**

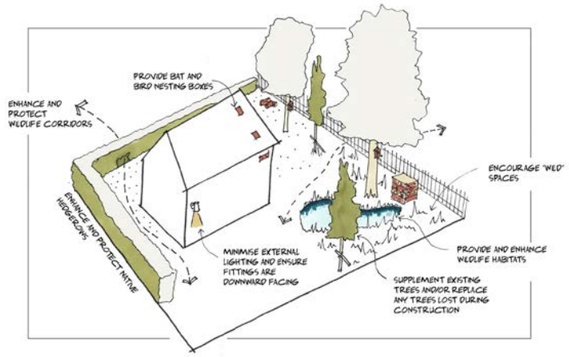


Technology

Once the necessary steps have been taken to minimise the building's energy use requirements, sustainable technologies can be installed to ensure that the energy use which can't be designed out comes from renewable sources.

This can include Air or Ground Source Heat pumps for heating & hot water, and Photovoltaic Panels for electricity generation, coupled with battery storage reduce reliance on the grid.

Reduce Operational Carbon



Environment & Biodiversity

When choosing a site for a new build, it is best to pick somewhere that is already served well by infrastructure and should avoid harming the existing environmental assets of an area.

Retaining existing trees, access to high quality wildlife rich green spaces, effective water management (including rainwater harvesting), consideration of existing protected species, and pollution control all make for a good nature-rich development.

4%
Construction cost uplift to build to the Passivhaus Standard

-30%
Reduction in annual energy costs (compared to Building Regulations standard new build with gas boiler)

£15-50k
Whole Life Cost Benefit range of passivhaus, compared to Building Regulations standard

-1.5%
Potential interest rate saving on mortgages for qualifying energy efficient design

(how much?)

Any uplift in upfront construction costs for improving the performance of the building must be weighed up against the reduction in ongoing running costs and increase in property value. The figures shown on this page are averages, and in all cases will be specific to the design of the building.

Benefits

Alongside the financial benefits of low energy construction, other less tangible benefits must be considered:

- Reduced maintenance costs due to use of higher quality materials and improved workmanship.
- Exceptional levels of user comfort; no draughts, cold spots or overheating, with a constant supply of fresh, clean air.
- Reduced likelihood of allergies and other health problems.
- Reduced noise pollution, with high performance building envelopes keeping the indoor environment quiet.

[figures courtesy of Passivhaus Trust]

which? for new build

There are a number of different standards available for new build projects. Deciding which is best for you will depend on the project, your priorities and your budget. The options are shown on this page, and all are over and above the minimum Building Regulations standard.

LETI Building Standard

The London Energy Transformation Initiative was established in 2017 to guide the industry towards net Zero carbon. Their Design Guide proposes standards for new build houses and retrofit projects well in excess of the minimum standards of the Building Regulations.

This is not a certified scheme, but a set of targets which designers and homeowners should strive to achieve.

Requirements

Air Tightness:	<1 air changes/hr
Space Heating/ Cooling Demand:	<15 kWh/m^2
Renewable Energy:	100%

AECB Building Standard

The Association for Environmentally Conscious Building have Certification schemes for both new build and retrofit. The targets are similar to those of the LETI guide, but the Certification process ensures that there can be no 'slip' in the project's intentions.

The house would be designed using the Passivhaus Planning Package (PHPP) software to demonstrate compliance.

Requirements

Air Tightness:	<1.5 air changes/hr
Space Heating/ Cooling Demand:	<40 kWh/m^2
Overheating:	<10% hours over 25^O

calculated using Passivhaus Planning Package (PHPP) software.

Passivhaus

Passivhaus is a world-leading design solution for new build dwellings which focuses on clear, measured targets, backed up by a full certification scheme.

The energy balance must be calculated using the PHPP software, with limiting target U Values and minimal thermal bridging. Third party certification is required, as is a specialist Passivhaus designer.

Requirements

Air Tightness:	<0.6 air changes/hr
Space Heating/ Cooling Demand:	<15 kWh/m^2
Overheating:	<10% hours over 25^O

calculated using Passivhaus Planning Package (PHPP) software.

While the target figures differ, all the Standards listed on the opposite page include the same key areas to consider to achieve a low energy new building:

- Reducing energy consumption.
- Reducing Space Heating and Hot Water demand.
- Designing for on-site renewable energy generation; reducing dependence on fossil fuels.
- High Thermal Performance (U-Values) of the building fabric.
- Excellent Airtightness and added mechanical ventilation.
- Reduced Thermal Bridging (cold spots),
- A Balance between daylighting and overheating.
- Sensible Form Factor (the shape of the building; complex shapes are less energy efficient)

which? for retrofit

Retrofit projects often come with constraints which may guide you towards one set of standards over another. In all cases, analysis of the type of structure and it's condition must be undertaken to understand the most appropriate route to retrofit.

LETI Retrofit Standard

The LETI Retrofit guide was produced in 2021 to help homeowners target a 60-80% reduction in typical energy consumption through best practice retrofit standards.

As with the new build standard, this is not a certified scheme, but a helpful Retrofit Guide is available from the LETI Website.

Requirements

Energy Use:	<50 kWh/m^2
Space Heating/ Cooling Demand:	<50 kWh/m^2
Renewable Energy:	40%
Fossil Fuel Free Home	

AECB Retrofit Standard

The Retrofit Standard produced by AECB is a self-certification standard, which is primarily focussed on improving the fabric of the building, while also considering low carbon heat sources.

The retrofit strategy must be designed using the Passivhaus Planning Package (PHPP) software to demonstrate compliance.

Requirements

Air Tightness:	<2 air changes/hr
Space Heating/ Cooling Demand:	<50 kWh/m^2
Overheating:	<10% hours over 25^O

calculated using Passivhaus Planning Package (PHPP) software.

EnerPHit

EnerPHit is the Passivhaus standard for retrofit projects which follows the same principles but with slightly relaxed targets to allow for the constraints of working with existing buildings.

The PHPP software is utilised to design a whole house retrofit strategy, with governing target U Values for thermal elements, and third party certification required.

Requirements

Air Tightness:	<1.0 air changes/hr
Space Heating/ Cooling Demand:	<25 kWh/m^2
Overheating:	<10% hours over 25^O

calculated using Passivhaus Planning Package (PHPP) software.

Alongside the low energy principles outlined for New Build projects, the following are key considerations in retrofitting an existing building:

- A Whole House Retrofit Plan will help ensure that the measures being taken are compatible, especially when the works are being phased.
- There is no 'one size fits all' approach; each building must be considered individually, and the more you can research and understand the construction of the existing building, the better.
- Insulation upgrades to existing building fabric must have the condensation risk analysed to ensure that there won't be damp issues caused.
- Older buildings will benefit from the use of natural & breathable materials and finishes.
- When undertaking any insulation upgrade or improvement in air tightness, ventilation must be considered, to ensure good air quality.

ARCHITECTS

If you would like any more information on the topics covered within this brief guide, or wish to discuss low energy buildings with us further, please get in touch using one of the methods below, or using @livarchitects on our social media platforms.

Liv Architects are proud members of the Built Environment Collective, a group of companies working together across different areas of the built environment to simplify, improve and enhance the process of coordinating our clients projects.

BEcollective
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