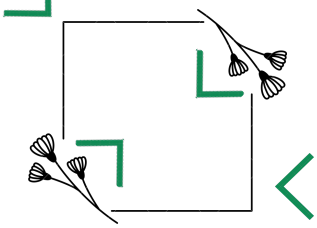
SUSTAINABILITY GUIDE

This guide is designed to empower clients, helping them to make sustainable and conscious decisions when it comes to extensions and alterations in their homes.

This starts from the initial brief, important design considerations, through to making the construction process more sustainable.

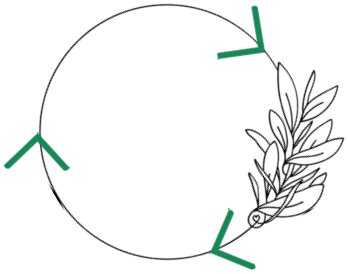
It is key to consider the whole life of a building, known as Circular Life Cycle or Cradle to Cradle design.

REDUCE



RE-USE

RECYCLE



GENERATE

GUIDING DESIGN PRINCIPLES

This document aims to enable discussion with your architect, engineer and contractor to minimise waste, maximise re-use wherever possible and overall provide a practical, buildable and sustainable renovation and extension.

Not every area covered here will apply to all projects, and this cannot be an exhaustive list. The topic is vast and ever-changing, this guide is designed to be a starting point for conversation for those looking to improve the sustainability of their building project.

LACEY-ARCHITECTURE.CO.UK
01225 832 840 | Email: studio@lacey-architecture.co.uk

PRE-CONSTRUCTION:
REDUCE

RIGHT-SIZE DESIGN

One of the most effective ways to enable a home to be more sustainable is to design a space that is just big enough to serve your needs – and not more.

Often re-organising the existing space to give an efficient, effective and pragmatic layout helps greatly towards this goal. Every m² counts, so we seek to create a fantastic layout of your extension but also the existing house, considering any under used area and making it a useful and functional part of the house.

In addition, the focus will be on creating flexible spaces that can adapt over time and serve multiple purposes.

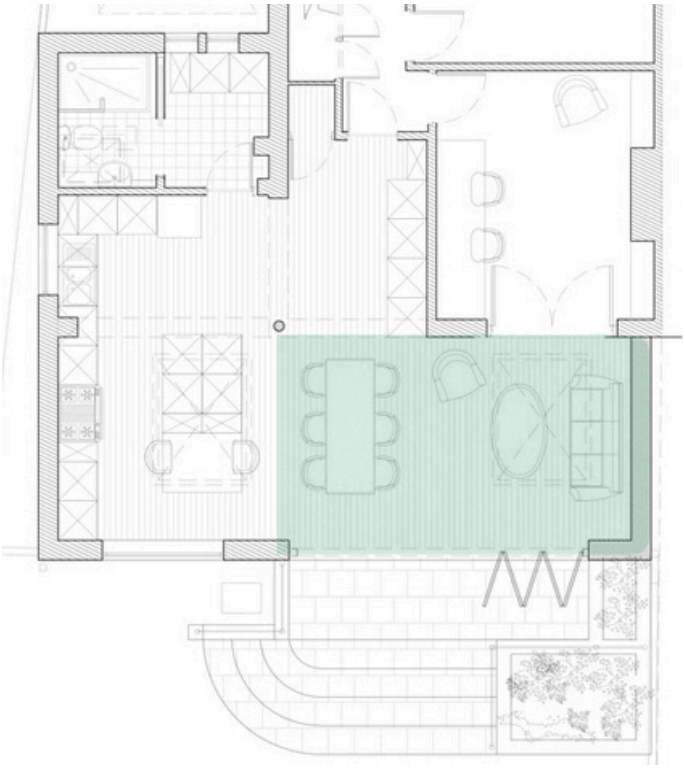
For example, an open living-dining area may be furnished for everyday use, but offer the flexibility to accommodate an expanded or additional table for larger gatherings.

Overall this will reduce construction costs, minimise material use and lower ongoing costs.

BEST SHAPE DESIGN

When adding new spaces to the existing house, as well as thinking about pragmatics and aesthetics, it is helpful where possible to minimise external wall area.

For example, long L-shaped extensions have a lot of external wall area, instead would a square infill extension meet the brief as well as minimising external wall area?



Infilling around this existing rear extension allowed us to improve the thermal performance of the house.

LACEY-ARCHITECTURE.CO.UK
01225 832 840 | Email: studio@lacey-architecture.co.uk

THINKING HOLISTICALLY

We can create a green extension which will be well insulated and conserve warmth. However, we can also help you think about reducing energy loss in your home as a whole.

Is your loft insulated? Is there sufficient insulation? Should part of the project involve increasing the insulation and re-boarding the loft to maximise storage. This can make significant energy savings for the entire house and ensure your family is warm.

Do you have any draughts from areas of your house that might not be altered by the works? For example, a beautiful and original Victorian front door, could this be thoroughly draught-proofed, or instead a thick full length curtain in place to be drawn over the door in the evenings to prevent heat from being lost. Are your floors insulated, could we add insulation as part of the project?

PLASTER OPTIONS

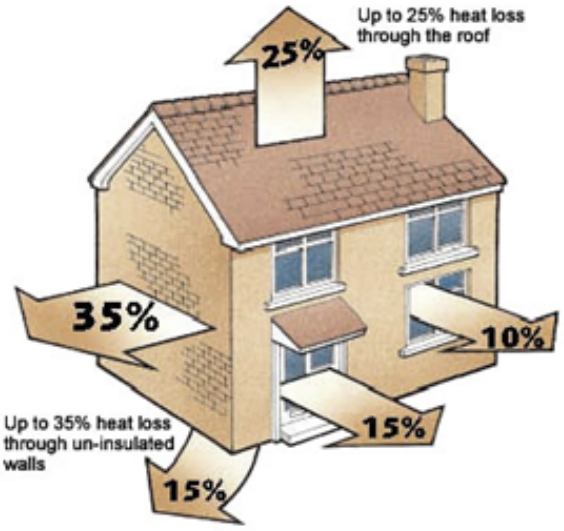
Lime plaster is usually associated with listed buildings, however, unlike cement/gypsum plaster, the lime-based version is carbon-neutral and can be easily recycled.

It is considered to create a healthier home environment, as it's porous, thus allowing walls to breathe and reduce condensation/damp issues. It also helps buffer moisture, and it is naturally antibacterial. It has large, air-filled pockets, so it has some insulation properties (some products specifically offer improved insulation properties). Plus, it is durable due to its flexibility.

However, if using lime plaster, it is key to only use lime-based paints on top to keep the surface porous and ensures the surface remains breathable.

DESIGN TO REDUCE

DESIGN FOR LONGEVITY



Every extension must be built to comply with current Building Regulations. Usually the rest of the house will be below this standard. Assuming we cannot add insulation externally (for aesthetics) clients could consider adding insulation internally.

This often involves adding insulated plasterboard (houses built post 1940s). This insulation comes in different thicknesses and means a very small amount of the internal space is "lost", but that the walls conserve more energy. This approach works particularly well when combined with electrical re-wiring, re-plumbing or prior to a bathroom being fitted or re-installed. The thicker the board, the higher the cost, but the greater the insulation properties.

Average cost per room would be around £755 for typical boarding and plastering, with insulated plasterboard it would be closer to £1000. Alternatively, insulating plaster can also provide some benefits of heat retention without the same loss of space (although much less heat retaining than insulated plasterboard).

LACEY-ARCHITECTURE.CO.UK
01225 832 840 | Email: studio@lacey-architecture.co.uk

NATURAL LIGHT

Simply having ample windows, allows you to leave lights off longer and gives a greater connection to the outdoors.

Skylights (and sun tubes) may be used on their own to bring natural light to windowless rooms or in conjunction with windows. Can we add in a rooflight to ensure no room (even a utility or en-suite) relies only on artificial lighting?

DAYLIGHT VS OVERHEATING

We want to take advantage of sunlight, both for light and heat.

Large windows can be fantastic for a sense of space, connection to the garden as well as natural light. However, the amount of glazing needs to be carefully considered.

On the south or west elevations, lots of glazing has the potential to create significant overheating issues. The building could act as an unintentional conservatory, trapping the heat and overheating the whole house and creating a requirement for air-conditioning.

In these locations it is important to think critically about the amount of glazing balanced with the overheating risk and consider putting in place mitigation measures to prevent too much solar gain (heating) as a result of the sunlight.

DESIGN FOR ADAPTABILITY

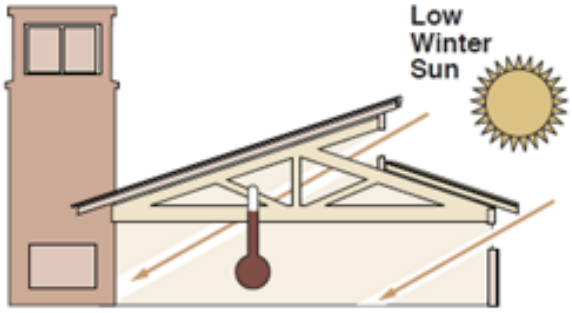
DESIGN TO REDUCE

SOLAR SHADING

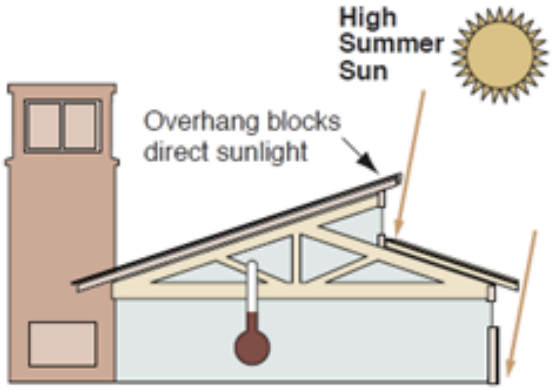
In balance with light, shade plays an important role in reducing energy use. Shade can take many forms from trees, roof overhangs, external structure like brise soleil or pergolas and window treatments. These may all be helpful as a means to prevent overheating and reduce energy use in summer.

Deciduous planting on the south and west can be helpful for shading in the summer, while still allowing full natural light during the winter.

In addition, overhanging roof eaves can be a great architectural feature, as well as providing shading in the summer but allowing in all the light in the winter when the sun is lower in the sky.



South windows accept direct sunlight to light and warm the building interior



Overhanging eaves help the building to collect low sun in winter, but shade it from high sun in summer.

LACEY-ARCHITECTURE.CO.UK
01225 832 840 | Email: studio@lacey-architecture.co.uk

STRUCTURAL STEEL?

Different materials have varying amounts of embodied carbon or energy used during the manufacture. We can use materials which have a lower carbon/energy cost or can be sourced locally.

For example when opening up the existing structure to enable an extension, usually steelwork would be used. Steel is highly carbon/energy intensive. Instead could we consider different a material, like glue laminated timber instead. This could result in a slightly higher cost but a beautiful feature timber as a central piece in the ceiling of the extended room.

DESIGN TO OPTIMISE

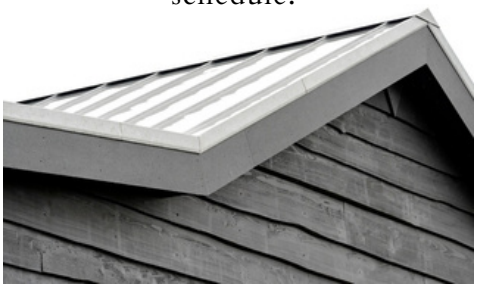
DESIGN FOR REGENERATION

TIMBER CLADDING

When considering timber there are two eco standards for cladding (or turn key garden building) the Programme for the Endorsement of Forest Certification (PEFC), an umbrella organisation that cares for forests locally and globally; and the Forest Stewardship Council (FSC), an expert in sustainable forest management.

Timber cladding can be wonderful, but if it has travelled from America /Siberia the green benefit may be offset.

Accoya and Tricoya are rot-resistant wood composites are another eco-friendly option worth exploring, they have a higher price tag but offer longevity with a reduced maintain schedule.



ROOFING OPTIONS

An ideal choice for a flat roof is EPDM (ethylene propylene diene terpolymer), as it is a durable rubber membrane that can last 30-50+ years. Usually it is made from recycled rubber, making it environmentally friendly. This can also be used in conjunction with green roofs.

However, some roof shingles can also be made from waste materials including wood fibre, rubber and plastic. There are also faux slate roofing designs made from recycled plastic and limestone.

DESIGN FOR MAINTENANCE

DESIGN TO REDUCE

LACEY-ARCHITECTURE.CO.UK
01225 832 840 | Email: studio@lacey-architecture.co.uk

GREEN ROOFS

There are many benefits to having a green roof, they increase biodiversity, offering an undisturbed rich habitat for birds, and insects such as bees and butterflies. They can be planted with British wildflowers or an evergreen sedum matting.

Green roofs also help to mitigate flash flooding, which is particularly beneficial for consideration in urban areas with so much of the ground being sealed by buildings, paving and roads. Green roofs can hold a lot of water, which the plants absorb, and the soil slows down the water returning to the rivers again, helping prevent flash flooding. The plants and soil also help to purify rainwater as it runs off.

A green roof can help to regulate the temperature inside the building as it insulates the roof, cutting the demand for heating in winter and cooling in summer. They also help to soundproof the room below.

Green roofs reduce the urban heat island effect (where roofs absorb heat during the day and release it at night when the environment should be cooling down), as they absorb far less heat.

The green "layer" can also protect the roof's waterproofing membrane from UV damage and weathering, helping to double and sometimes triple its life.

The initial cost will be more than for an ordinary roof, as the structure needs to be sized to carry all that soil when wet just after it has rained.

DESIGN FOR ADAPTABILITY

DESIGN FOR REGENERATION

There are two main types of green roof, wildflower roofs and sedum roofs. Sedum is a perennial with succulent leaves, fleshy stems and clusters of star-shaped flowers. It's perfect for extensive green roofs as it provides lush coverage and needs very little soil ~ 80mm (reducing the weight of the roof). Sedums are hardy, too, shrugging off cold and heat alike. Sedums change colour with the seasons, with many species turning red in late autumn, with different-coloured flowers throughout the year.

Wildflower roofs, "since the 1930s, the UK has lost 97% of its wildflower meadows" Ref: The Royal Botanic Gardens Kew, so adding even a handkerchief-sized patch goes some way to redressing the balance. Wildflowers are arguably more vibrant than sedums. Usually wildflowers only flower in the summer, although with naturalising bulbs the flower season can be brought forward to early spring. Wildflower roofs are heavier than sedum roofs, as they require a deeper substrate ~150mm.

With the correct roof makeup, maintenance should be infrequent, with buddleia being the only "weed" of concern, given its strong tap root. It can be beneficial to cut down the long dried flowering stems at the end of the summer. Allowing natural re-seeding when the heads are shaken out on the roof for a full bloom next summer.

LACEY-ARCHITECTURE.CO.UK
01225 832 840 | Email: studio@lacey-architecture.co.uk

LOCALLY SOURCED

Locally harvested and sourced materials help reduce the carbon footprint of the materials as well as supporting local businesses.

WILDLIFE

As well as avoiding removing trees, if possible it is also best to avoid building on areas of the garden which are long-established, rich in wildlife and difficult to replace, such as ponds or hedgerows.

Hedgerows are great environments for wildlife as they provide food, shelter and places to shelter and nest for a wide variety of garden birds, including robins, blackbirds, and chaffinches.

Flowerbeds, lawns and vegetable patches tend to be much younger habitats with more mobile wildlife communities. Among the best areas of a garden to extend onto are those already covered by hard landscaping, such as patios.

In addition, to encourage wildlife, an extension could incorporate swift boxes, bat bricks or nesting cups where the orientation creates appropriate locations.

Further, ideally we could consider integrating trees, hedgerows, water features and other habitats into the proposals. Maybe existing garden boundaries could be made more wildlife-friendly, and even consider adding a pond too if this is practical. Ponds are a fantastic feature to attract wildlife into the garden. In addition, a lawn which is usually not biodiverse could be transformed into a wildflower meadow to support butterflies, bees and other insects.

Established wildflower green roof after 2.5 years, surveyed by RHS Wisley for its rare bee habitat.

Wildlife likes variety, so ensuring there's a decent mix of habitats and features is a great way of supporting different species throughout the year.

A landscape designer can also help you consider incorporating native plants into the landscape improvements. Native plants provide food and shelter for wildlife and beneficial insects, they contribute to the larger ecosystem without relying on valuable resources or extensive maintenance to survive. They also reflect your region's distinct makeup, using local species specific to the area.

DESIGN FOR ACCESS

DESIGN FOR REGENERATION

LACEY-ARCHITECTURE.CO.UK
01225 832 840 | Email: studio@lacey-architecture.co.uk

RETROFITTING EXTERNAL WALL INSULATION (EWI)

When working with an existing building, external wall insulation is much easier and more effective to apply than internal wall insulation, as you are effectively wrapping the whole house in a cosy blanket. This is much less disruptive to the occupiers and is particularly effective in exposed locations.

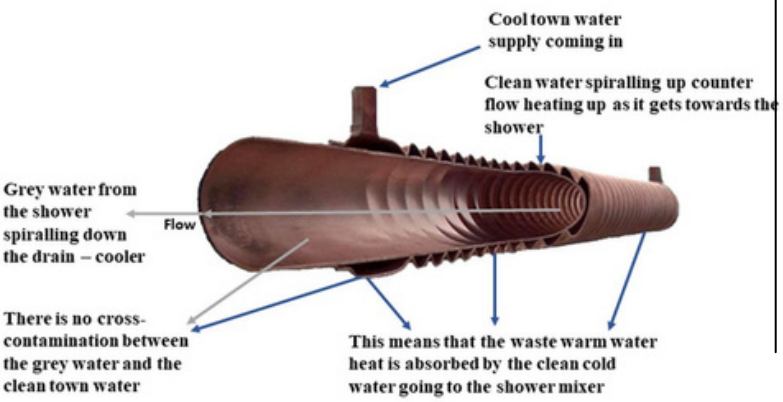
However, this is usually only an appropriate solution when the exterior of the house is rendered or clad already, or the local context allows this as an option (Bath / conservation areas not usually viable).

DESIGN FOR LONGEVITY DESIGN TO REDUCE

HOT SHOWERS FOR LESS

A shower water heat exchanger uses heat from the water flowing out of the shower to warm up the incoming cold water going into the boiler.

This works best for first floor showers as the heat exchanger (a copper pipe coiled around the waste pipe) sits as a boxed in pipe vertically below the shower waste. This allows you to re-use some "warmth" you have paid to heat being wasted down the drain.



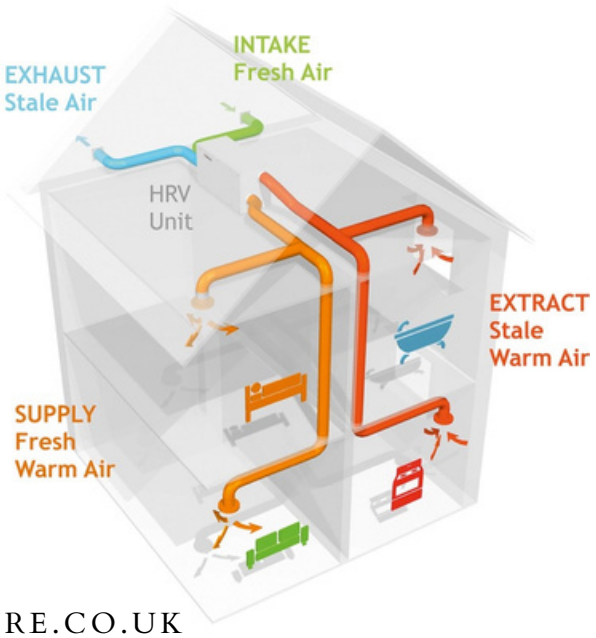
VENTILATION

When adding lots of insulation and making an old house super airtight, there is the potential to create issues with poor indoor air quality. Ie without all the drafts through the house the air becomes stale and moisture builds up inside the home.

Simply kitchen and bathroom extractor fans can be used to manage the issue of stale air and humidity alongside trickle ventilators (those little slatted openings at the top of most modern windows).
Opening roof lights on south elevations can also often be used for stack ventilation.

However, these methods extract the air to the outside, losing the heat from the air you are extracting.

Mechanical ventilation heat recovery (MVHR) extracts the heat from that damp stale air before ejecting it from the house. New fresh air is then warmed up ready to be added to your home. This has the potential to be a great system, but it really only works in a whole house renovation (so the ducting can be added where needed) and where there is also space to give over a large cupboard in the house for this equipment which in its turn also needs to be accessible for filters to be regularly changed.



LACEY-ARCHITECTURE.CO.UK
01225 832 840 | Email: studio@lacey-architecture.co.uk

UNUSUAL & NATURAL BUILDING MATERIALS

MONOLITHIC CLAY BLOCK

Although it is unusual, large format clay blocks can be used for a building. These are a thicker than usual concrete block, but they have air cavities built into them which provides all the required insulation and structure in one simple component.

As well as its simplicity, the clay block is completely recyclable and no plastics/membranes or meshes are required. Simply lime render externally, clay blocks and lime plaster internally. The whole wall makeup is then breathable (but keeps the rain out) helping to buffer the moisture coming from the occupants. In addition to buffering moisture, the walls can buffer heat too. Warming up slowly in the daytime (keeping the house cool) and slowing cooling down in the night, releasing the heat gradually.

With this super straightforward makeup, there is merely one delivery of blocks, making it simple to make a start on site.

While many contractors have not used clay blocks before, most are happy to learn and the training period is usually only a half day.

DESIGN FOR REGENERATION

DESIGN TO REDUCE

ECO/HEMPCRETE

Hempcrete can be used for lots of application, but for renovations to solid walls in older properties it can be installed against highly uneven brick/stone original walls due to its malleable nature. It can provide a level surface and a cost-effective, natural, breathable, moisture buffering and insulated wall finish.
When combined with lime plaster, it can breathe and absorb /release moisture to the house.

It is less common in the construction industry as a whole, although the south-west and Bristol seems a hub for developing expertise. There are local firms who undertake this, so just this area of the works could be subcontracted if the main contractor does not want to take this on.

Overall, it could provide an insulated naturally moisture balancing wall finish which could work well in an older property with solid rather than cavity walls.

DESIGN TO REPAIR

DESIGN FOR REGENERATION

LACEY-ARCHITECTURE.CO.UK
01225 832 840 | Email: studio@lacey-architecture.co.uk

GAS, HEATING AND HEAT PUMPS

HEAT PUMPS

Heat pumps are a highly divisive topic. The technology is constantly evolving, and the grants and government funding are ever-changing. Heat pump suppliers can best advise you on the most appropriate grants and funding opportunities.

In terms of space planning, it's advisable to leave a large cupboard or plan for a plant room to house the heat pump, pipework, and hot water tank. Ideally, this should be located on the ground floor near an external wall, where the heat pump unit can be positioned. Again, ideally, this location should be away from a patio or seating area and at least 1 meter from the boundary.

Heat pumps (at present) typically do not result in immediate cost savings compared to gas boilers. However, they do decarbonize a home's heating and hot water system, allowing it to run solely on electricity. This offers the advantage that if all gas is removed from the house, the supply can also be disconnected, eliminating standing gas supply charges.

Ground source heat pumps are also possible for projects where there are large gardens, this removes the need for a large external unit. Although, there are higher installation costs.

Overall, we tend to recommend heat pumps for homes undergoing a "deep retrofit." This involves installing large areas of underfloor heating, which works particularly well with heat pumps, or significantly upgrading insulation levels throughout the house.

DESIGN TO REDUCE

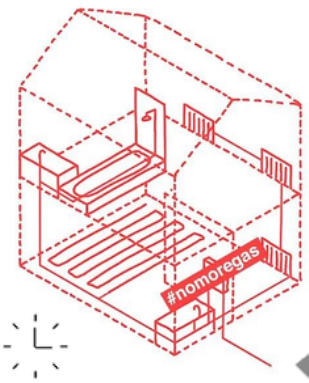
HEAT PUMP ALTERNATIVES

However, there are lesser-known solutions to removing gas supply:

Smart Heat Supply: A ZEB (Zero Emissions Boiler) is a heat battery with a ceramic core that can be heated up to 800°C and maintains its temperature for several hours. The core is heated electrically. When needed, hot water simply passes through the hot core for heating. The ZEB is connected to the internet and adjusts its charging schedule based on the price of electricity. It typically charges at night, when electricity prices are very low. In doing so, it provides an important service to the electric grid by capturing excess energy and reducing demand at peak times.
This could also be combined with a **smart water heater**, which works similarly: like an internet-connected, smart immersion heater.

Both options also have the potential to work with solar panels, allowing any "excess" energy created on-site to be retained for use within the home as hot water.

Checkout **www.nomoregas.org** A great website which clearly explains the most up-to-date options with a breakdown to explore which might be best for you.



DESIGN FOR LONGEVITY

DESIGN FOR REGENERATION

LACEY-ARCHITECTURE.CO.UK
01225 832 840 | Email: studio@lacey-architecture.co.uk

PRE-CONSTRUCTION:
RE-USE

The most sustainable items/fittings are those you already have; however, needs and fashions change, meaning houses have to be adapted to suit the changing needs of the occupants.

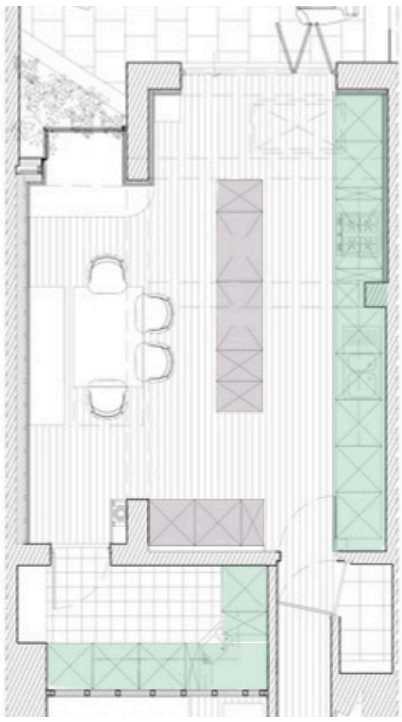
Here we explore ideas during the design process, what can be retained and can we creatively re-use materials on site?

RECONFIGURED KITCHENS

Can we re-use, re-purpose or repair your existing kitchen? Should we alter the layout, maybe adding a stunning new island unit and retaining most of the rest of the kitchen? Would new worktops and paint give the space a fresh new look, while all the fittings and carcasses are kept?

Potentially we could re-use the existing kitchen on site by moving some units to a utility room, or creating a stand-alone larder unit in contrast to the rest of the kitchen. There are companies that specialise in upgrading and reconfiguring old kitchens to give them a new lease of life. New components can be fitted to existing kitchens, and sometimes, simply replacing a worktop and having the doors professionally spray-painted could swerve the need for new units entirely.

This may allow us to give a fresh lease of life to your existing units. Alternatively, maybe you need more storage in a workshop/garage/home office/garden room. Could the old kitchen units be re-used to store, games, toys or tools?



Here the design evolved around re-using the existing kitchen, some units were retained while extra units were re-located to the utility room. Allowing a new configuration with a feature island unit.

DOORS AND WINDOWS

It is easy to get caught up in the excitement of replacing windows and doors throughout the house, but is it "worth" the cost to remove and replace your existing fittings? Would it be beneficial to consider renewing the seals, lubricating the mechanisms, repairing any damage or painting the Upvc (if you are looking for a different appearance)?

High quality windows and doors are expensive, do they offer a worthwhile saving over time? Or could the existing units be maintained and bought up to date?

LACEY-ARCHITECTURE.CO.UK
01225 832 840 | Email: studio@lacey-architecture.co.uk

REGENERATIVE / RECYCLABLE PRODUCTS

When choosing materials and finishes for your home project, also consider using ones that are recycled, recyclable or grown from sources that can easily renew themselves. Sustainably harvested timber (FSC-certified) means that only using wood taken from the forest that can regrow and regenerate as fast as it is being used.

Materials that can be fully recycled or those made from recycled materials are becoming easily available. For example, aluminium roofing can be recycled completely. Other examples of this include PVC products, such as architrave and (some) composite decking. Plus some worktops are made from recycled materials or materials that can be recycled again.

BATHROOM AND FITTINGS

Planning a new bathroom, but could the old suite be re-used? Some very old coloured suites are on trend and usually of far superior quality to modern equivalents. Rather than being removed, could it be retained in situ with new tiles, a rainfall shower head and a smart new shower screen?

If the existing suite is still serviceable and good quality, could we re-configure this and retain the existing white fittings while just changing the taps, shower screen, tiles and flooring to update the appearance?

1957 colour of the year leaf green bathroom suite retained and re-used on site. It's perfect condition and high quality meant it was refitted to avoid the expense of a completely new and inferior quality suite.

EXISTING WALLS

When it comes to creating an extension, usually areas of the existing walls are removed to open up the old house to the newly extended space. Should we retain or reuse any of this material? Could raised planters made from the old walling materials add to the garden? This is often more relevant to houses built with lime mortar, as it is normally possible to separate the bricks quite cleanly. However, considering reusing materials on site saves removal costs and keeps existing materials on site to potentially create garden features.

SOIL

As with the existing walling material, when digging footings (excavation for the foundations), existing soil is removed. Is there space to keep this on site rather than paying to have it removed?

Could this be put to great use to raise low areas of the garden, or create new beds for planting or borders?

LACEY-ARCHITECTURE.CO.UK
01225 832 840 | Email: studio@lacey-architecture.co.uk

PRE-CONSTRUCTION:
RECYCLE

This will be covered again in the Construction Stage, but we also want to make it as easy as possible for you to recycle now and in the future. This includes creating a space in the kitchen or utility for in house recycling storage. Also, we may include a dedicated space to the side or rear of the house for the larger council recycling boxes.

This all helps to make it easier for you to recycle in your day-to-day life following the build.

FLOORS AND DOORS

Often in older properties the quality of the timber work is excellent, far exceeding the modern MDF skirting boards fitted as standard in new build houses. Could any old or underlying flooring be retained, refinished and exposed? Can original doors be stripped and returned to theie earlier splendour?

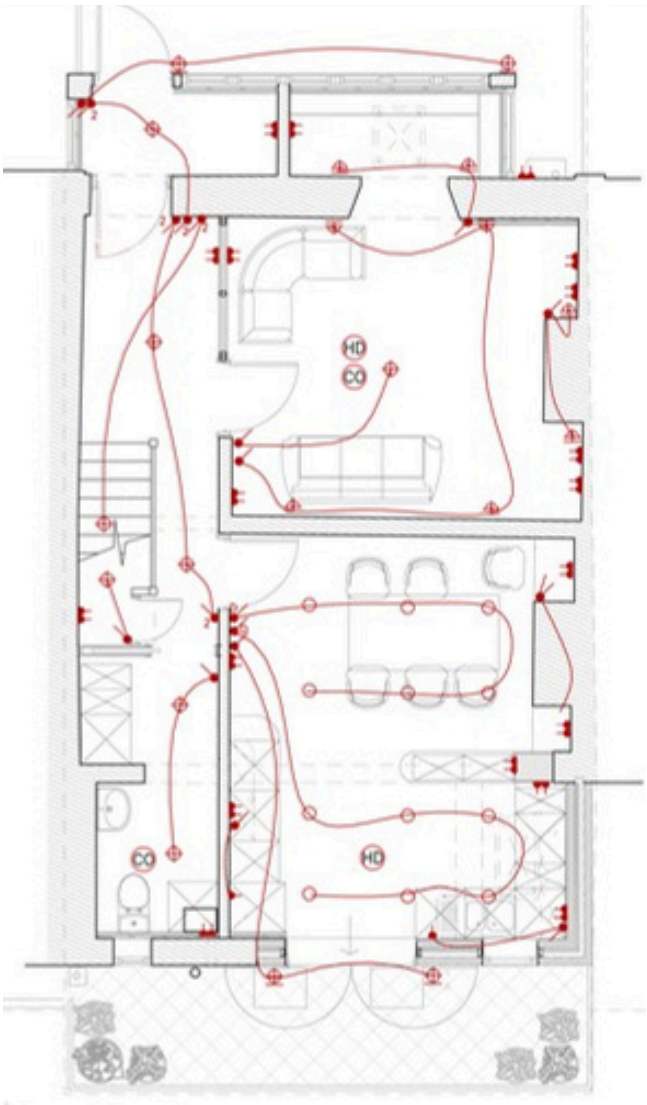
A beautiful example of a 1930s door, to be retained and refreshed rather than replaced.

DESIGN FOR ADAPTABILITY

DESIGN TO REDUCE

FUTURE PROOFING

What might be needed in the future? Can we add extra electrical/Ethernet sockets now in good, logical places to allow different layouts of furniture configurations? Some time and extra thought during the design stage could enable much easier reconfiguration of the house in the future.



Here an example electrical plan (offered as an optional design Stage 4b) planning socket layout in advance of starting on site.

DESIGN FOR FLEXIBILITY

DESIGN FOR LONGEVITY

LACEY-ARCHITECTURE.CO.UK
01225 832 840 | Email: studio@lacey-architecture.co.uk

PRE-CONSTRUCTION: GENERATE

Only once we have covered reduce, re-use and recycle do we start to think about generation.

Does the boiler at the house need to be improved/uprated? If so, could the heating system also be changed to work with a heat pump (i.e. larger pipes/underfloor heating or large radiators combined with space for a buffer vessel). Otherwise, heat pumps are not necessarily an easy or instant answer to heating needs, they are a complex system which needs careful planning to get maximum benefit from the potential advantages. They require indoor as well as outdoor space away from seating space (as they can be noisy), meaning that they are not always suitable for every project.

Here again, it is important to continue thinking holistically about the house as a whole. Below an extract giving an overview of options for domestic refurbishment.

Could photo voltaic (PV/solar) panels be added, is there a large appropriate south facing roof? Or could the extension or outbuilding develop with this in mind? Again, solar panels will not solve all electricity requirements at the home, as they do not provide much output when we typically need the most energy (in the winter, usually in the early morning or evenings). Consider, could you use the power generated for other purposes, i.e., could they be combined with a battery pack and then used to charge an electric car? Is there a driveway or somewhere appropriate to fit an electric car charging point?

DESIGN FOR REGENERATION

DESIGN FOR LONGEVITY

Table 1. The cost, carbon cost-effectiveness and disruption during installation of a selection of home energy improvement measures. Adapted from the Construction Product Association's *Low Carbon Domestic Refurbishment Guide* with permission of the author (see www.constructionproducts.org.uk for more details)

Measure	Cost	Carbon cost-effectiveness	Disruption
Low energy lights	£	☺☺☺☺☺	●
Draught-proofing	£	☺☺☺☺☺	●●●
Loft insulation	££	☺☺☺☺☺	●●
Floor insulation	££	☺☺☺☺☺	●●●●●
Internal wall insulation	££££	☺☺☺☺☺	●●●●●
External wall insulation	£££££	☺☺☺☺	●●●
Upgrading heating controls	££	☺☺☺	●●
Replacement gas boiler	£££	☺☺	●●●
Low energy appliances	£££	☺☺	●
Replacement windows/doors	££££	☺☺	●●●
Wood pellet boiler	££££	☺☺	●●●●
Solar hot water panel	£££	☺	●●
Micro wind turbine	£££	☺	●●
1 kW solar electric panel	££££	☺	●●
Air source heat pump	££££	☺	●●●●
Ground source heat pump	£££££	☺	●●●●

Key	
£	up to £100
££	£100 - £1,000
£££	£1,000 - £5,000
££££	£5,000 - £10,000
£££££	over £10,000
☺☺☺☺☺	pays for itself
☺☺☺☺	< £10/tonne CO2
☺☺☺	£10-£100/tonne CO2
☺☺	£100-£500/tonne CO2
☺	> £500/tonne CO2
●	you will hardly notice
●●	briefly intrusive
●●●	takes longer but you can live with it
●●●●	very disruptive with installers everywhere
●●●●●	you may have to move out

CONSTRUCTION: REDUCE

Contractors are focused on your build, bringing the project to site as smoothly and efficiently as possible, their focus may not be on sustainability and minimising waste. This guide is designed to help empower YOU, the clients, to work with your contractor helping minimise and reduce waste wherever possible on site. In doing so, you may even save money and help your contractor by reducing the amount of waste (via expensive skips) on your project.

INSULATION: THICKNESS & CHOICE

Green insulation options have been provided in the "Building Regulation Compliance" document to make it easy for the contractors to make more sustainable choices on site with insulation substitutions.

The most common PIR insulation is derived from fossil fuels, it is difficult to recycle, but it is very inert, light and easily available. It does not need to be kept dry (helpful on a building site where indoor space may be limited), and it is very effective with excellent insulating properties.

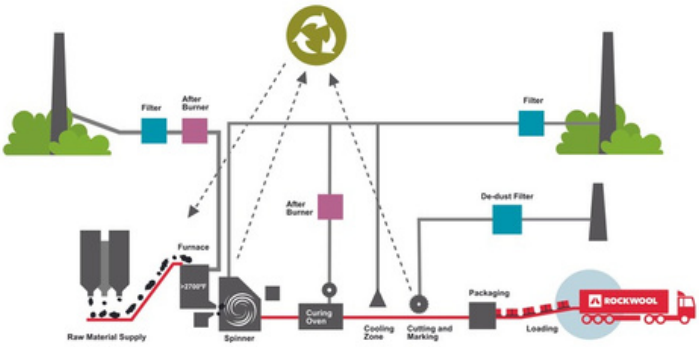
Simply, the most important measure for the improving the sustainability of your home is to add more insulation. This reduces the heat loss from your house across the whole life of the building.

Energy conserved by insulation far outweighs the energy used in its manufacture. So as a first step, we encourage contractors to exceed the minimum building regulation standards and use thicker insulation in all elements (walls, roof and floor).

However, it is even better to swap from PIR insulation (fossil fuel derived) to natural wood fibre insulation or Rockwool which has a more sustainable manufacturing process.

However, wood fibre insulation and Rockwool is a less efficient insulator, so a greater material thickness is required to conserve the same amount of heat as a fossil fuel derived PIR insulation. So not always an easy balance to strike.

We have provided the specification to comply with the minimum building regulations, but we encourage you and the contractor to discuss building with thicker insulation and/or a more sustainable insulation material.



Wood fibre insulation and rockwall manfactuering process.

LACEY-ARCHITECTURE.CO.UK
01225 832 840 | Email: studio@lacey-architecture.co.uk