

- 
- ✓ 100% SUSTAINABLE
 - ✓ 100% RENEWABLE ENERGY
 - ✓ PRODUCING OWN ELECTRICITY, WATER AND GAS
 - ✓ OFF GRID
 - ✓ PROTECTING AND BENEFITING THE ENVIRONMENT
 - ✓ RECYCLING ONSITE WASTE AND REDUCE WASTE COLLECTION
 - ✓ CONTEMPORY LOW MAINTENANCE DESIGN TO BLEND WITH THE ENVIRONMENT
 - ✓ ZERO CARBON
 - ✓ ENERGY PLUS
 - ✓ ON SITE ORGANIC PRODUCE
 - ✓ ACHIEVING THE BIODIVERSITY BALANCE
 - ✓ ENERGY EFFICIENT LIVING
 - ✓ PREVENTING POLLUTION
 - ✓ PROMOTING HEALTHIER WELLBEING AND COMMUNITY
 - ✓ MEETING NEEDS OF MODERN DAY CONVENIENCE LIVING

SUSTAINABLE BUILDING FOR THE FUTURE

Probuild Limited have been building and improving homes since January 2004 and is now approaching its 12th year of trading.

The construction industry is continually striving for better ways to improve standards, materials and products and methods to create more sustainable and energy efficient buildings. Over the last few years, Probuild Ltd has taken a keen interest by training, gaining knowledge and creating a network of skilled manufacturers, suppliers and installers to provide specialist expertise in sustainable buildings, renewables and improving energy efficiency.

Probuild Limited provide a complete *one-stop-shop* ranging from energy efficiency consultancy and auditing services (*DEA - domestic and level 3 & 4 NDEA - commercial*), plus design, manage, build and monitor using the latest and proven systems, products and technologies aimed at providing sustainable new-builds and improvements for existing domestic and commercial buildings.



MEMBERSHIPS & ACCREDITATIONS



UK GREEN BUILDING COUNCIL is a charity and membership organisation which campaigns for a sustainable built environment. UK Green build work to inspire best practice and leadership, influence government and policy, and impact our members' to strengthen the business case for green building, helping them to develop and deliver their sustainability goals.

PASSIVHAUS TRUST is an independent, non-profit organisation that provides leadership in the UK for the adoption of the Passivhaus standard and methodology. Passivhaus is the leading international low energy, design standard. Over 37,000 buildings have been designed, built and tested to this standard worldwide. The Trust aims to promote the principles of Passivhaus as a highly effective way of reducing energy use and carbon emissions from buildings in the UK, as well as providing high standards of comfort and building health.



FEDERATION OF MASTER BUILDERS is the largest trade association in the UK construction industry who champion for continuous improvement in building standards acting as the voice of small construction; influencing policy makers to improve the regulatory environment for construction SMEs.

TRUSTMARK is a Government quality mark which operates a framework under which 30 Scheme Operators work in the RMI (repair, maintenance and improvement) sector, including trade associations, local government trading standards teams, and independent Scheme Operators. These schemes are approved to carry the TrustMark logo and recruit reputable and trustworthy tradesmen

LOCAL AUTHORITY BUILDING CONTROL Is the largest provider of building control services to the construction industry. (LABC) is a not-for-profit membership organisation that represents all local authority building control teams in England and Wales. Our members ensure that all buildings are habitable, safe, dry and warm, and with over 3,000 professional surveyors and building technicians working in local authority building control we provide a consistent national service that's delivered locally.



A Domestic Energy Assessor (DEA) is an accredited individual who undertakes energy assessments in existing dwellings and produces Energy performance certificates (EPCs) using the Reduced data Standard Assessment Procedure (RdSAP) Methodology. A level 3 and 4 Non Domestic Energy Assessor (NDEA) undertakes energy calculations using approved Simplified Building Energy Model (SBEM) or Dynamic Simulation Modelling (DSM) software on commercial buildings to produce an EPC.

SUSTAINABLE PASSIVE 'POWER PLUS' HOMES

A *passive energy plus* house is an *extremely energy-efficient, zero carbon, comfortable, super insulated* and *air tight* home which generates and produces more *on-site energy* (from *renewable energy* sources) than it consumes.

Probuild Ltd specialise in the design and construction of these very unique new builds, upgrades, replacements and re-modelling of existing properties.

Poor energy performance of existing buildings and disused sites of which currently serve no beneficial purpose can serve a *beneficial* purpose by being developed in this *sustainable* and *biodiverse* way.

All properties follow the same principles, but each are bespoke designed to *work in unison with the particular natural environment* and to be constructed to *certified Passivhaus* which are highly insulated, airtight, cold bridge free structures with triple glazing and HRV that requires minimal heating. In addition, the homes will be *fully sustainable* and make use of the best *renewable energy* products and methods to enable the properties to be *100% off grid* will assist with *reducing the carbon footprint* and the *drain on fossil fuels*, plus *reduce further strain on the infrastructure* of services and amenities in the area.

Furthermore, the properties will each have a *basement level* to maximise internal floor space and keep the rooflines low so that they do not dominate the landscape (helped with the integration of *green walls* and other *sustainable* sourced complimentary materials.)

The homes will produce more energy than required (*energy +*) which will be sufficient to power each property during day, evening and night (*battery storage*) plus power *electric vehicles*. There will also be an optional to supply and *sell excess energy back into the grid*.

It is not only the property structures which are sustainable. The landscape and the external gardens are designed with *biodiversity* in mind, plus incorporate easily manageable *kitchen gardens* to grow on-site low maintenance *organic produce*.

Each garden will have individual *compost containers* for onsite waste plus the kitchen gardens, green walls and plants will have *recycled automatic irrigation* derived from the effluent produced from the on-site sewage treatment plant.

A single *sewage anaerobic waste digester* will break down all of the sewage biodegradable waste material from the combined properties which also provides *bio-gas* which then generates CHP (combined Heat & Power) to serve as electricity, heat and gas cooking use to each property and the pollution free effluent from the treatment is also utilised for irrigation.

These builds will encourage the type of occupier/families who have a keen interest for *healthy and environmentally aware lifestyle* with *modern day convenience living* taken into account.

Therefore, the builds, the gardens, and the persons living in the homes will all be contributing to *provide a sustainable and healthy environment* which will be a benefit both to the local community and on a much wider environmental

The many benefits include:

- **Much better indoor air quality** – comfortable humidity levels, low CO2 levels because of comfort ventilation, with optimum ventilation flowrates calculated for each room
- **Increased thermal comfort** -- highest level of interior comfort of any building, with all surfaces equally warm (including the windows), no drafts (ever), no setbacks, no temperature swings. All aspects to assist the mental and physical health & wellbeing of occupants
- **Superior sound insulation** -- extraordinary airtightness levels, triple-pane glass and thick insulation also provide superior sound insulation – Passive Houses are very quiet indoors!
- **Almost-unbelievable energy efficiency**- The passive house construction along with the renewables provide the best efficiency on the market including 100% led lighting
- **Development material waste**- great planning and care is applied to limit the waste of materials
- **Reduced ecological footprint / carbon emission zero (ZEB)**- renewable energy with zero carbon, recycling waste plus on-site organic produce.
- **More durable** – detailed and advanced design, better building components, proven building science
- **Almost no maintenance** – very simple mechanical systems compared to normal construction along with low maintenance materials.
- **Sustainable, environmentally friendly build & living** –zero energy consumption and durable construction
- **Versatile** – Passive Houses can be built in any climate zone and applied to any building type, utilizing a wide variety of sustainable building materials and methods
- **Cost saving to occupants immediately and for future**- with no utility bills
- **No demand on local utilities and services** – off grid water, gas, electric, heating, waste all helping to reduce the fossil fuel usage and carbon footprint
- **Helping to recycle and reduce waste and pollution**- through the refuse chutes, compost and the on-site waste treatment

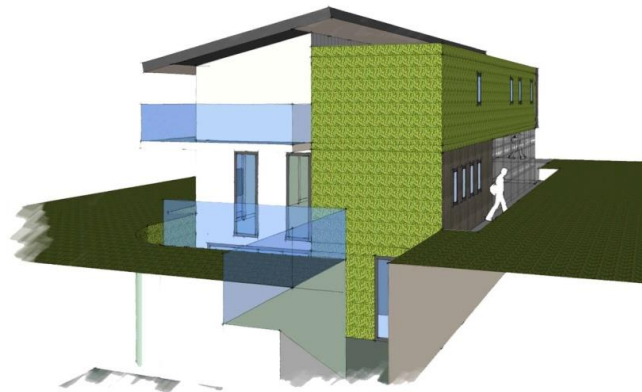
- Aesthetically pleasing biodiverse homes and gardens- *contemporary modern homes which are specifically designed and proven to work well with the natural landscape, wildlife and provide positive health and wellbeing to the occupants*

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[1] Example of a suitable design

designed to Passivhaus standards



[2] PASSIVE BASEMENTS

basements provide many benefits without making an external visual impact. The benefits include: -

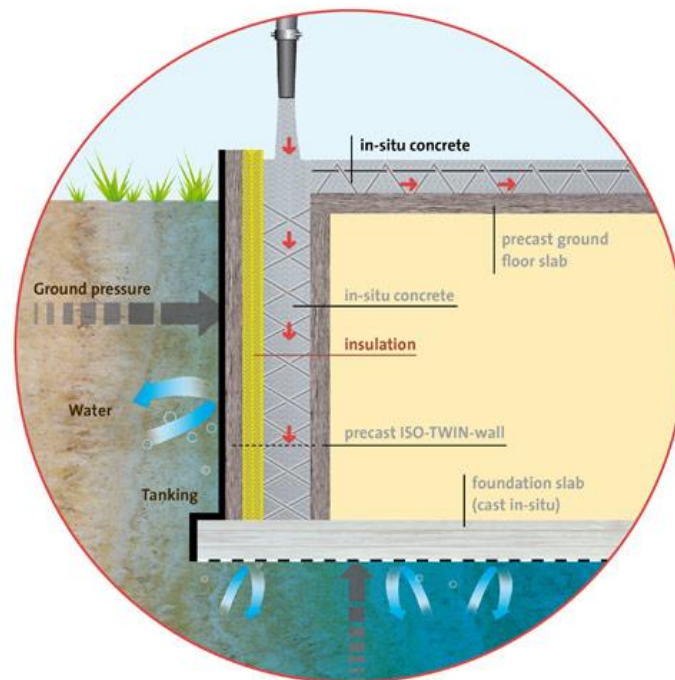
- Increased comfortable and convenient floor space without increasing the building footprint or significantly reducing garden size
- Roof line of the property designs can be kept as low as possible.
- Added Energy efficiency [thermal efficiency, air tightness, thermal mass, sound insulation, sustainability] due to being below ground
- Natural light can be transferred into the basement areas with use of sun tubes or light wells
- Basements create a good stable structural base, capable of supporting heavy loads above. By combining foundation design with the provision of habitable space, the extra depth of structure provides the building with greater ability to cope with climate change affects in the soil, such as shrinkage or tree roots
- A further benefit of the basement designs for this proposal is to have the vehicular driveways sloping down into the basement so that vehicles can be parked under each property in a protected car port. This helps to keeps the landscape clear from vehicles, and is convenient for the occupiers/owners to keep their vehicles secure, under cover and the distance between the vehicle and home is reduced



[2.1] Insulating Concrete Formwork (ICF) Basement Block

The construction of the basements is via ICF system which addresses many of the problems associated with traditional basement construction.

Building a basement with ICF allows for concept providing warm, bright and spacious living comfort:



- *Ease and speed of construction*
- *Elimination of retaining wall construction*
- *Superior Thermal insulation*
- *Air tight*
- *Made from recycled materials*
- *Very low material wastage*

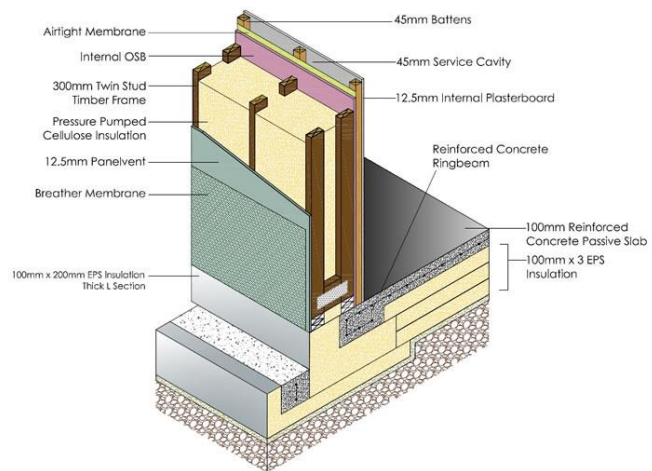


[3] PASSIVE WALLS

ICF as per basement or

3.1 Twin-Stud Timber Frame

- Wall U-values of $0.11W/(m^2K)$.
- Air-tightness tests between $0.26-0.56ACH$ @50Pa.
- Twin-Stud is sustainable and reduces material costs (less waste) and provides increases performance.
- Closed Panel walls delivered pre-finished with Cellulose Insulation and triple glazed windows fitted.
- Walls pre-finished in the factory, so no wet trades are required on site.
- Factory finished Timber Frame Passive houses have many advantages over traditional construction methods in terms of quality and construction speed.



Passive Wall & Foundation Junction

* Suitable for a variety of external leaf options

The 300mm Twin-Stud insulated with cellulose insulation ($60kg/m^2$) achieves a cold bridge free wall and roof $0.11Wm^2K$ U-value from the passive institute. Timber frame house walls have a Decrement Degree of over 12 hours giving the house a high thermal mass effect and excellent heat retention. The internal MgO board absorbs noise, regulates humidity internally and is impact resistant.



[4] WALL FINISH (Externally)

The external finish of the timber frames homes will consist of a combination of stylish and sustainable materials combining modern aesthetics with eco-friendly touches.

Ranging from GREEN WALLS, timber cladding, stone and tiles, and render finish will also be utilised (all from a sustainable source) which are all long term, low maintenance. i.e. the render being colour through and allowing the building to breath.



Example of how combining materials produces an aesthetically pleasing look in a rural environment



[5] TRI SOLAR ROOF (Water heating plus electricity)

We all understand the importance and benefits provided by solar panels which have been gradually covering our roofs over the last few years with the aid of the government RHI scheme. However, installation of solar panels is often considered by many as ugly and an eye sore.

In contrast, a Tri-solar roof is fully integrated and actually form roof to become part of the building envelope spanning from ridge to gutter and produce and aesthetically pleasing design.

A Tri-Solar PV-T Roof transforms a Passive House into an Energy Plus House, combining the roof covering, Solar Thermal and Solar PV into one panel. The roof areas on each home will be sufficient to produce excess electricity to power an electric car or other power.

Tri-Solar roofs eliminate the need for heat pumps, gas boilers and stoves often fitted in Passive Houses and free up extra space.

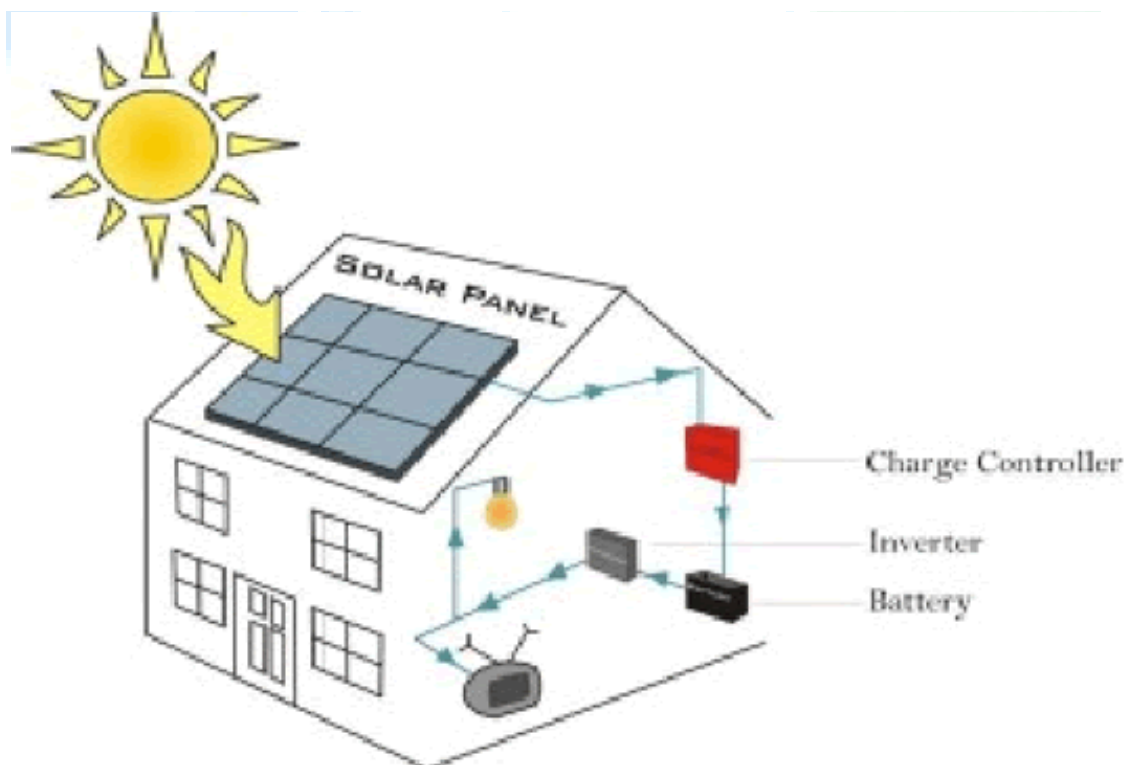


[5.1] ON-SITE ELECTRICITY STORAGE (Solar Powered Day and Night)

Typical roof solar PV panels generate electricity to power a standard home during day light. At night, the property then reverts to drawing / buying power from the network. This means relying on electricity from the grid after dark

However, with the tri-solar system will incorporate battery energy storage for each property which will enable the excess energy captured during the day to be also used at night.

This is possible due to the energy efficiency each home will offer (Passivhaus, high efficiency led lighting, efficient appliances (A+), biogas cooking and minimal heating loss) The low energy demands (kwh) in each energy efficient home, means that correctly calculated energy storage will be sufficient power the homes during darkness, plus provide additional power to supply an electric car

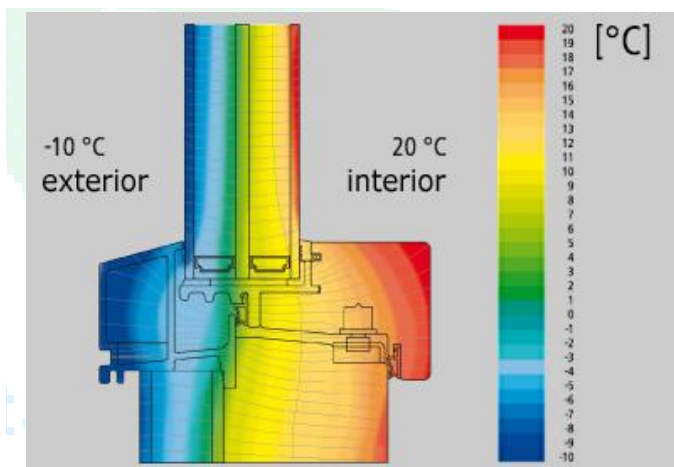


[6] WINDOWS (Triple glazed 0.8 u-value)

Passive House windows serve two purposes. Firstly, they must provide good thermal resistance to heat escape, and secondly, they act to utilise the sun's energy to heat and cool the building

Thermal properties

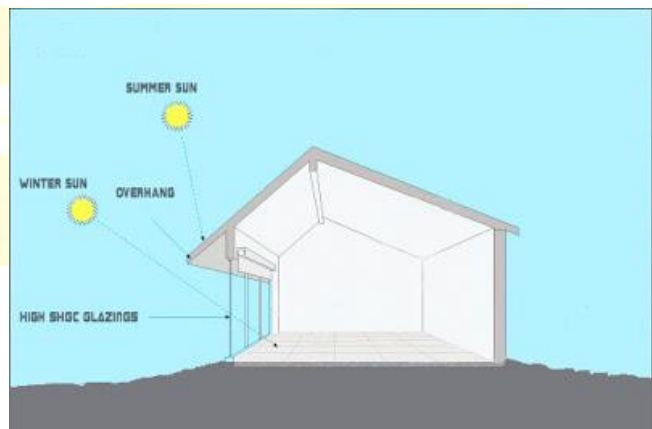
The windows will be low maintenance, energy efficient triple glazed with a u-value of no more than $0.8 \text{ W/m}^2\text{K}$ to provide the best thermal properties to the building envelope



Solar gain

Passive solar buildings typically have windows (glazing) on the southern facing side of the building in order to absorb the sun's heat energy to warm a building during the winter. In order to stay cool in the summer, passive solar houses rely on a system of shading (or an overhang) to keep the building cool.

Simply by building in this way, a house can reduce its heating and cooling costs



[7] 100% LED LIGHTING

LED (light emitting diodes) lighting can be 75 to 90% more efficient than old incandescent bulbs. LEDs can be dimmable, directional and are quick to reach full intensity unlike CFL bulbs.

They are also able to deal with repeat switching and have a long life expectancy (over 35,000 hrs). LED lights can also be specified to produce a warm/soft light, or a cold, bright light

External lighting (security and safety) is also LED lighting. External LED lighting helps reduce light pollution as the angle of light beam is directed towards the desired area to eliminate.



[8] A-RATED APPLIANCES

The difference in the cost of running a domestic appliance can be in the hundreds of pounds over the lifecycle of the product, quickly negating any discount the retailer may offer on the initial purchase price of a product with a poor energy rating.

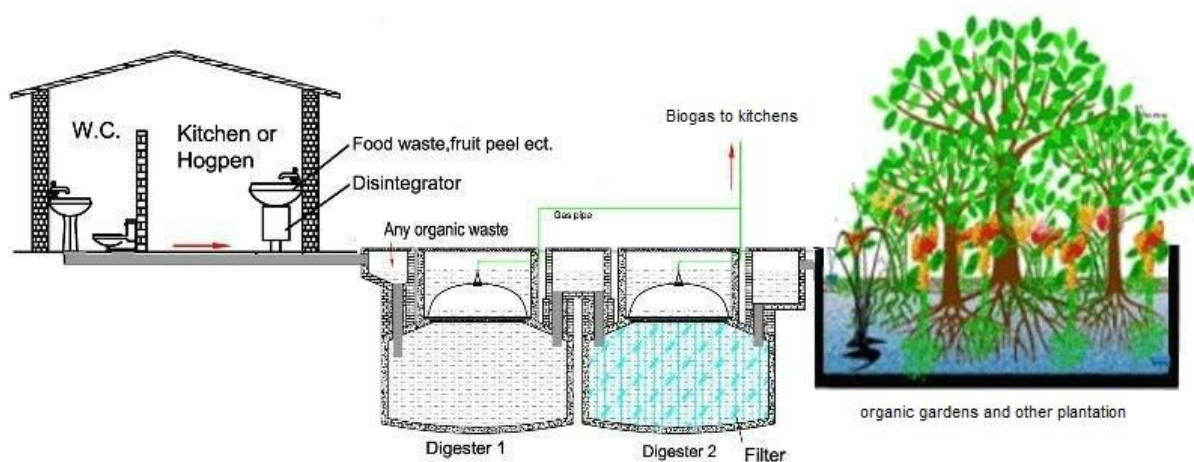
Labels are placed on products and light bulbs which rate them from A to G (up to A++ for fridges). By law, retailers, mail-order companies and manufacturers must display these labels on all new domestic fridges, freezers and fridge-freezers, washing machines, electric tumble dryers, combined washer-dryers, dishwashers and light-bulbs for sale. Labels for different products contain different pieces of information. The purpose of these labels is to allow consumers to easily compare the efficiency of appliances. We all lead busy lives, so high-performance, reliable kitchen appliances are essential to the smooth running of any household. And, when you consider the environment and rising energy costs, getting an energy-efficient appliance is a smart buy.



[9] NATURAL ON SITE SEWAGE TREATMENT

The sewage / waste from each property will be treated on-site through an anaerobic digester system which allows naturally occurring micro-organisms to grow and degrade the waste water including solids. This underground system therefore requires no pipework connection to the network. A number of properties can provide adequate waste matter to provide sufficient biogas to serve electricity and gas to kitchen stoves in each property. Just about any organic waste can be decomposed as a methane generator - plant (soft material is better than woody material) food waste, and animal wastes, and human waste. (see chart) A further benefit to the environmentally friendly sewage and waste disposal system is the final treated effluent which is produced, is a clear odourless liquid suitable for irrigation into the organic gardens and other plantation.

[9.1] Thermophilic Anaerobic Digester producing Biogas energy



Environment

Un-burnt methane released into the atmosphere is a powerful greenhouse gas, 10% of our personal impact on the climate comes from the food refuse we put in our garbage bins that ends up decomposing under landfill.

Benefits

- Makes good use of organic wastes. You can obtain fuel from sewage sludge and animal slurries first, and prevent runoff and methane emissions at the same time – and you still get fertiliser at the end of the process.
- Is a clean, easily controlled source of renewable energy
- Uses up methane, a powerful greenhouse gas.
- Reduces pathogen (disease agent) levels in the waste.
- Residue provides valuable organic fertilizer.
- Simple to build and operate.
- Low maintenance requirements.
- Can be efficiently used to run power and cooking hobs
- No smell (unless there's a leak, which you'd want to know about and fix immediately anyway!).



M3 Methane per Kg Dry Matter

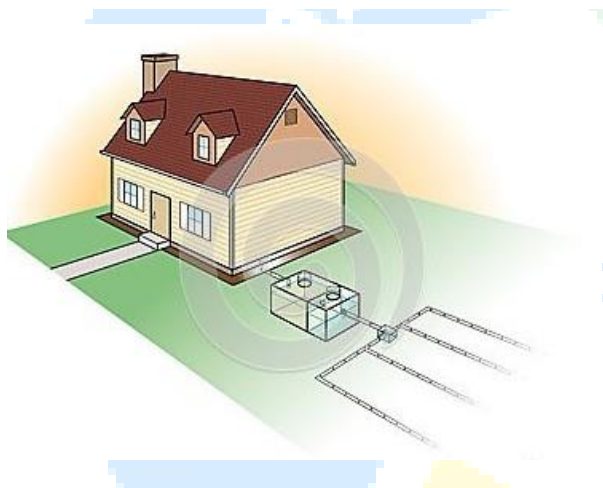
	Mesophilic	Thermophilic
Cattle Dung	0.14	0.42
Pig Dung	0.36	0.85
Human sewage	0.32	0.96
Poultry Manure	0.5	1.5
Horse Manure	0.16	0.48
General Food waste	0.54	1.62
Grass	0.42	1.26
Silage	0.38	1.14
Wheat	0.38	1.14
Barley	0.58	1.74
Oats	0.34	1.02
Sawdust	0.37	1.11
Miscanthus	0.22	0.66
Bran / Grain Dust	0.29	0.87
Bracken	0.18	0.54
Straw	0.19	0.57
Wood	0.18	0.54
Carrot waste	0.417	1.251
Maize	0.44	1.32
Maize silage	0.75	2.25
Hay	0.37	1.11
Lawn Clippings	0.3	0.9
Nettles	0.42	1.26
Newspaper	0.09	0.27
Potato	0.51	1.53
Rape seed	0.33	0.99

The four by-products from the digester plant will therefore be:



1/ **Electricity** for power and lighting

2/ CH₄ (**Methane gas**) to be used for cooking



3/ **Recycled water** for general use (is not suitable for drinking) only for irrigation by the above mentioned Netifim system or something similar.

4/ High grade **fertiliser** that will be free of almost all heavy metals. The fertiliser can be drawn off as either a dry powder or as liquid slurry; the liquid slurry concentration can be adjusted at the time of removal.



[10] ORGANIC KITCHEN GARDENS & COMPOSTING

In its simplest form, a kitchen garden produces fresh fruits, vegetables and herbs for delicious, healthy meals. An easily maintainable kitchen garden, education and the on-site irrigation along with on-site compost and fertilizer encourages the occupiers to continue to grow their own organic produce.



The benefits are numerous including exercise, good health and satisfaction, making full use of recycling waste, plus the attractive green and pleasant gardens

[11] CONVENIENT WASTE RECYCLING

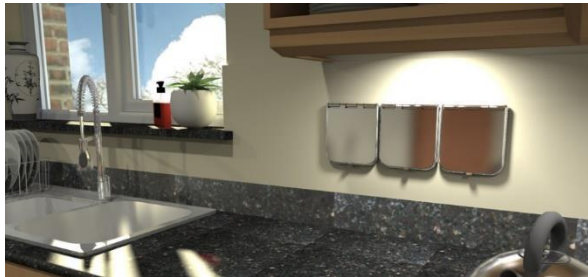
East Herts Council provide 4 separate bins (*black bin for non-recyclable waste, brown bin for bio-degradable food waste, grass and tree cuttings, blue lid bin for tin, plastic and cardboard, and a smaller bin for paper*)



Transferring waste from the internal bins, separating waste, and the location of the outside bins, smells, flies and maggots associated with the bins can become an inconvenience. People often combine waste in their internal bins and simply throw recyclable waste into the black bins.

SOLUTION

Chutes which allow the home owner to simply segregate and directly dispose of waste from the comfort and convenience from inside their kitchens so that the waste enters the appropriate bins.



The brown bin which is used for food waste as well as garden waste will generally become redundant, which will prevent the common problem of bad smells, flies and maggots and the need to continually be cleaning and disinfecting the bins.

FOOD WASTE



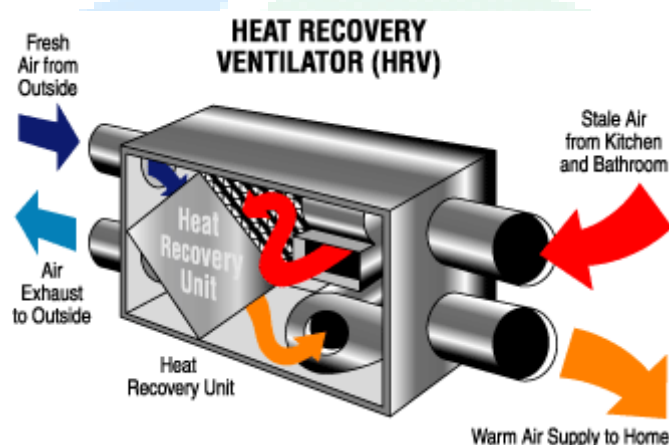
Food waste will be discharged directly into the onsite sewage treatment digester aiding the production of biogas for cooking use, and irrigation for the organic produce and plants.

There will be an additional composter where excess garden and food waste can be placed to produce natural compost.



[12] MHRV. Mechanical Ventilation with Heat Recovery

Passive Homes are air tight, so sufficient fresh air transfer is a vital aspect for sustainable healthy living and keeping the home to a comfortable condition MVHR is a whole house ventilation system that both supplies and extracts air throughout a property. It offers a balanced low energy ventilation solution for new dwellings and re-uses up to 95% of the heat that would have otherwise have been lost.



FreshR Ductless/Filterless HRV



Centralised HRV systems use filters to reduce dust and grime building up in ducts, but often the pipes between the filter and the room remain dirty! (In a UK study only 10% of HRV owners changed filters, a Dutch Health Dept HRV spot check showed 52% had dirty filters). Despite 15,000 HRV units sold in the UK in 2011, only 2,000 filters were sold in 2012.

FreshR combines the best heat exchanger in the world, with the most efficient EC fans in the world, with intelligent controls that constantly adjusts fan speeds, add in its ability to only ventilate occupied areas and it becomes something remarkable.

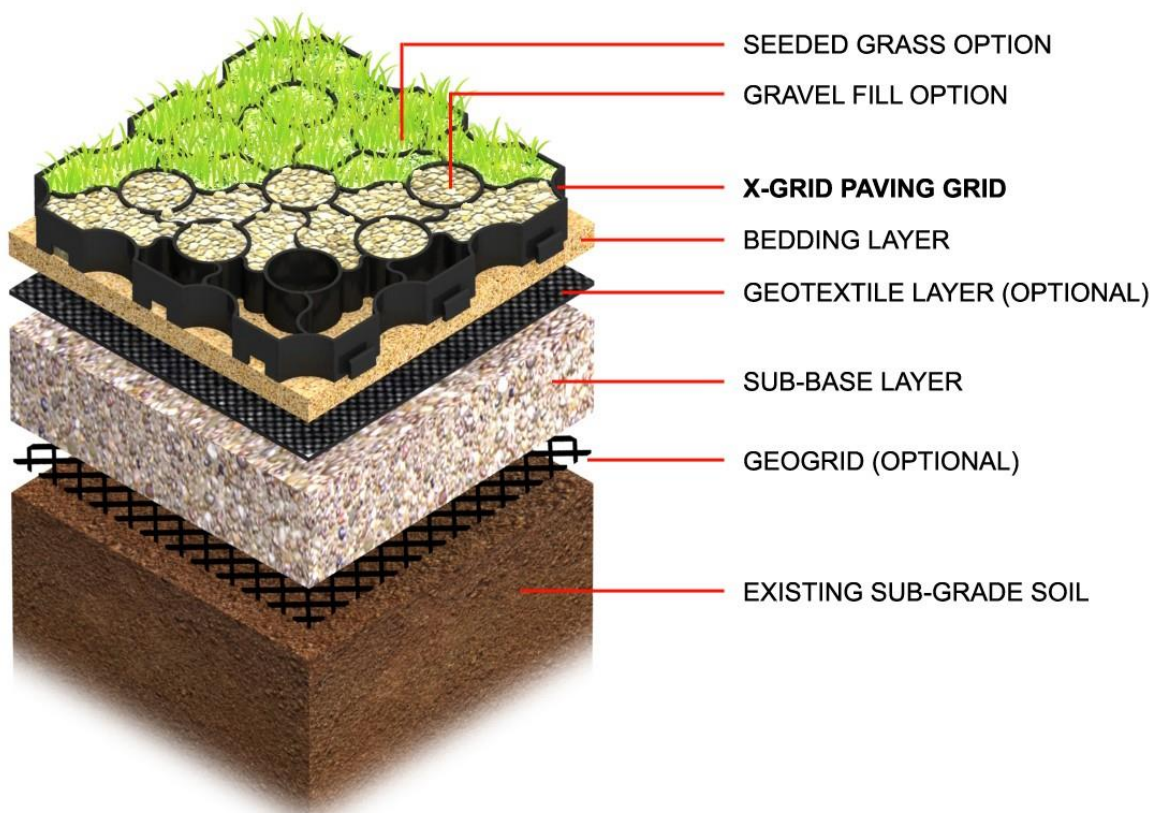
[13] SUDS compliant driveways & hardsurfaces

The existing land at 23 Tatlers Lane drains extremely well. Therefore, the complete driveway and any hard stands will be suitable for SUDS compliant surface, and the selected surface type will be appropriate to complement the designs and natural landscape. i.e.

- *Geo-cell grid sub base with gravel finish*



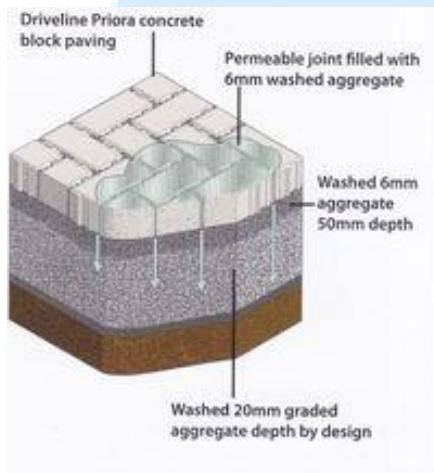
- *Or, Geo-cell sub base with finish which promotes grass*



- Or, Permeable resin bound



- Or, Permeable block paved



12.

[14] WATER – ON SITE BOREHOLE

Aston provides the ideal location for natural underground aquifers and the local water company supply all of Stevenage and the surrounding towns and villages from boreholes located in Aston.

The nature of the ground being chalk allows for rain and surface water to naturally filter as it drains through the ground, therefore the only treatment required upon abstraction to make the water pure and safe to drink is for the water to pass through an inline ULTRA VIOLET CHEMICAL FREE STERILIZATION TREATMENT which kills any bacteria.

All properties will receive their clean treated water supply from an onsite borehole.

Example of the borehole head which is all hidden under a cover



Example of a treatment hut which contains the power, storage vessel, UV treatment and testing point



To further help reduce water wastage, all properties will have water saving outlets at point of use to prevent wastage of water and to keep the water demand (taps, toilets which can account for around 30% of water usage) to a minimum. The appliances such as dishwasher, washing machine will be A+ rates to also keep the water usage low

[15] ECOLOGY, Enhancement and Protection

If an existing site has ecological value by way of natural habitat for wildlife such as bats and birds, a qualified ecologist will carry out a detailed study and help with the preservation or improvement in terms of design of the site to ensure it remains undisturbed as much as possible. This can be achieved by the provision of Bat Boxes and Bird Boxes on site in trees as well as being designed in to the new dwellings. The landscape, trees and hedgerows all provide a valuable natural habitat which is encouraged to be maintained or re-planted. Existing ecological features will be protected during the construction works and site preparation.

Solid boundary fencing may look pleasant, define land and provide security, however this often disrupts ground bearing animal patens. Simple small openings in timber fencing or walls allow animals the passage without having to dig.

