Brick – a sustainable product

14a Redington Road

Much of the façade of 14a Redington Road will be brickwork.

Brick is everywhere. Made of the most abundant materials on the planet, clay and shale, it is 'of the earth' in the most basic way. Manufacturing is normally located near the natural materials, so as to minimize energy consumption in transporting them. The clay is harvested from the earth's surface by a process that has minimal long-therm environmental effect on the land. The harvested materials are blended with little or no refinement and then extruded or cast into desired shapes. They are then conveyed through a kiln at about 2000 degreesF which transforms the raw material into permanent modular units.

Sometimes recycled and industrial waste aggregates such as incinerator ash and waste glass are mixed with the clay. At Redington Road we are hoping ti use a product from a new company Intellitect that uses recycled glass as a primary material to manufacture bricks.

In all cases the high temperatures used in the manufacturing process render the bricks environmentally safe and use friendly. Throughout this process there is virtually no waste – nearly all of the mined clay is used in the manufacturing process.

Brick has an amazing lifecycle, conservatively estimated at 100 years.

The actual 'embodied energy' of brick (the energy required to mine, manufacture and transport it), is approximately 4000 BTU's per pound. This is less than concrete, glass, steel, aluminium and even wood.

Bricks are often re-used (salvaged) for new buildings or they cab be crushed an re-used as road sub-bases. Or if they are returned to the earth they require no special handling they are inert – simply earth.

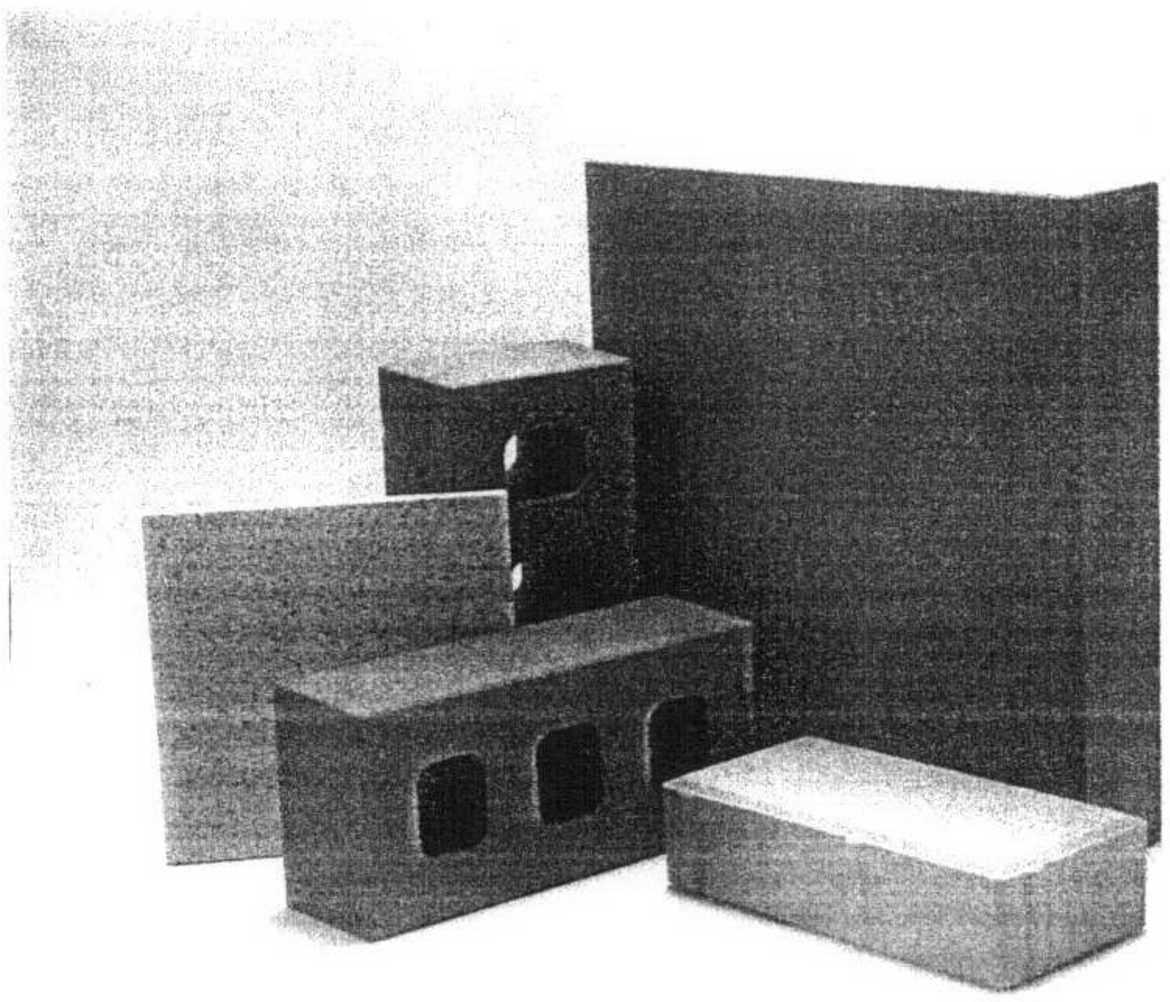
14a Redington Road

Sustainable bricks from Intellitect

It is estimated that the UK generates around 3.4 million tonnes of waste glass every year. Over 1.1 million tonnes is collected and recycled … but there is a growing need to do much better – see below!

"Converting waste glass into quality building products"

>97% waste glass masonry products



Examples of bricks, paver and cladding tiles

- New commercial solution to help boost UK glass recycling performance
- Uses any waste glass type (container, TV/PC monitors, lighting, auto, sheet)
- More environmentally friendly than most existing masonry building products
- Equivalent functionality and performance to products already on the market
- Extensive range of through-body colours and textural finishes
- Conserves raw materials and resources for future generations

WEBB ARCHITECTS LIMITED

Lime based render – a sustainable product

14a Redington Road

It is intended to use lime based renders, plasters and mortars for the new house at 14a Redington Road. These products will be supplied by Womersleys Ltd*** or an equivalent alternative.

Even the British Cement Association in their publication 'External Appearance Matters' recognise that it is inappropriate to use a hard cement based render on most backgrounds because they trap water behind the render within the wall. The simple advantage of using a lime render is that they allow walls to breathe-out any water that penetrates into them. In addition, lime renders do not put the same stresses and strains *on older more fragile building materials. These often require the use of stainless steel* mesh when cement based render is used.

The important benefits of the lime we sell and use are numerous. For any particular compressive strength, it is far more 'breathable' than cement and so is far less likely to trap moisture and cause damp and decay. It has excellent sulphate resistance, important on historic masonry which is frequently contaminated with salts. It is more flexible than gypsum or cement, so is less likely to crack when plastered on walls or used for repointing. Lime doesn't contain Chromium VI, which is highly toxic to humans. And finally, lime is burnt at 2/3 of the temprature of portland cement, so its manufacture gives off fewer greenhouses gases.

Lime uses less energy to produce and re-asorbs carbon dioxide as it sets.

Lime products are lighter than many alternatives, some renders by as much as 300%! That saves on transport - in the UK we use as much energy transporting construction materials as making them.

Lime plasters use recycled aggregate, with some of them 60% of everything in the bag is *recycled.*

Lime products are durable (excellent freeze thaw and sulphate resistence), yet compatible with old backgrounds, such as soft bricks. That means mortars can last a long time without causing damage such as spalling, or trapping moisture.

***
Womersleys Ltd.
Walkley Lane,
Heckmondwike,
WF16 0PG
01924 400 651

Energy piles

14a Redington Road

As it is very probable that structural piles will be required for the new house the possibility of using geothermal energy is being considered.

Geothermal energy can be harnessed with the use of energy piles, which are particularly practical in areas of soft ground where the stability of building foundations must anyway be enhanced using piles driven deep into the earth. Tubing is attached to the pile reinforcing rods, and fluid pumped through it carries the absorbed subsurface heat to the heat pump. The cycle is reversed when the building needs to be cooled.

Condensing Boilers

14a Redington Road

A condensing boiler is a high efficiency modern boiler that incorporates an extra heat exchanger so that the hot exhaust gases lose much of their energy to pre-heat the water in the boiler system. When working at peak efficiency, the water vapour produced in the combustion process condenses back into liquid form releasing the latent heat of vaporisation.

It is proposed that boilers of the highest efficiency, such as the Keston Celcius 25, will be installed.

Celsius 25 boasts high performance and energy-efficiency with a SEDBUK 'A' rating of 90.4% and a peak efficiency of 97% when in full condensing mode. NOx emission levels have earned a Class 5 rating, the highest achievement under European Standards, meaning minimal atmospheric pollutant emission. Heat output is automatically adjusted to suit installation heating requirements from 7kW (23,900 Btu/h) to 25.2kW (86,000 Btu/u) (click here for higher output), making the unit ideal for most domestic applications. Optimum modulation maintains combustion efficiency at all heating output levels. The appliance automatically sets the heating output required for each individual installation up to 25.2 kW (86,000 Btu/h), by constantly monitoring the boiler temperature as required by the thermostat.

For additional efficiency, the unit monitors the water flow-rate and controls the integral standard domestic pump to match the pump speed to the boiler output.

Underfloor heating

14a Redington Road

Because wet underfloor heating (UFH) runs at lower flow temperatures than radiator systems, fuel can be used more efficiently, and it is also possible to make more effective use of renewable energy sources. The maximum temperature for underfloor heating is typically 50°C — and sometimes as low as 35°. The flow temperature is largely dependent on the floor construction, pipe spacing, water flow rate, heat output required and type of floor finish.

Condensing boilers and alternative heat sources such as geothermal heat pumps, both work better at lower water-flow temperatures and are therefore suitable for use in with UFH. The low flow temperature of UFH (about 35°C) can allow a boiler to operate at 98% efficiency, compared to only 88% with systems requiring a higher flow temperature, such as radiators.

The underfloor heating system will be controlled centrally in the building.

Central control is justified when the thermal resistance of the floor finishes are similar throughout the building. Central temperature control has several advantages.

• The temperature of the water is kept to a minimum, making full use of the condensing abilities of the boiler.

• Distribution pipework temperatures are lower, so pipework heat loss will be reduced.

• Only one centralised speed-controlled pump set is required — compared to a centralised pump plus satellite pumps on each manifold. This can further help to save energy and reduce capital cost.

UFH emits more of its heat as radiant heat than radiators. People tend to feel comfortable at lower air temperatures with a radiant heat source than when the air is being solely heated convectively. In practical terms, this is likely to mean that the air temperature could be reduced by 1.0 to 1.5 K, further improving overall energy efficiency.

In theory, underfloor heating with a gas boiler is treated no differently to a radiator system when calculating carbon dioxide emissions. However, in practice there is a difference, as underfloor heating is designed to run at lower temperatures than a radiator system.

In general, the lower the return temperature of water to the boiler, the lower the carbon emissions from the boiler will be. Radiator heating systems traditionally have a water flow temperature of 82°C and a return of 71°C. Such a high return temperature does not permit the boiler to work in condensing mode.

Underfloor heating, in contrast, typically, has a flow temperature of 50°C with a return temperature of 43°C. This is well within the condensing range of a modern gas boiler,

which ultimately results in a reduction of greenhouse gases and makes the entire system more environmentally friendly.

To summarise, with underfloor heating, the return temperature of the water to the boiler maximises its condensing potential and therefore ensures a far more efficient use of fuel than a traditional radiator system.

Underfloor heating can also help to reduce carbon emissions when installed with alternative heat sources. It is estimated that 30 000 homes are built every year with no mains gas supply. In this situation, there is a choice between oil or solid-fuel boilers, electric heating and heat pumps. However, the new regulations do not rate electric systems favourably. An obvious alternative for such houses is a ground-source heat pump, which used with underfloor heating conforms to the new regulations.

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Rainwater – soakaway and harvesting

14a Redington Road

It is proposed that the rainwater from hard surfaces at the new house will be released back into the surrounding ground or harvested for irrigation of plants.

Traditional drainage practice is designed to move rainwater as rapidly as possible to a watercourse or river via gravity pipelines or culverts. However, this approach is now increasingly being called into question. Emphasis is now placed on dealing with stormwater run-off at source in a more sustainable manner, thus reducing flood risks downstream and replenishing ground water levels. The new Waterloc system from Marley Plumbing and Drainage is a new design of stormwater storage cell, which combines tried and tested materials and designs in an innovative way.

Waterloc is constructed from 12 columns of honeycomb cell extrusion, manufactured from recyclable polypropylene. Water fills each cell and flows between each of the 12 columns, enabling a rapid dispersion of the stormwater throughout the installation. The hexagonal nature of the extrusion gives it added strength. The grids at the top and base of Waterloc provide additional flow paths and a means to form a monolithic stable structure.

Waterloc connectors are used to join Waterloc cells together. The versatile design of the connector allows it to be connected 'back to back', securing each layer as well as adjacent cells.

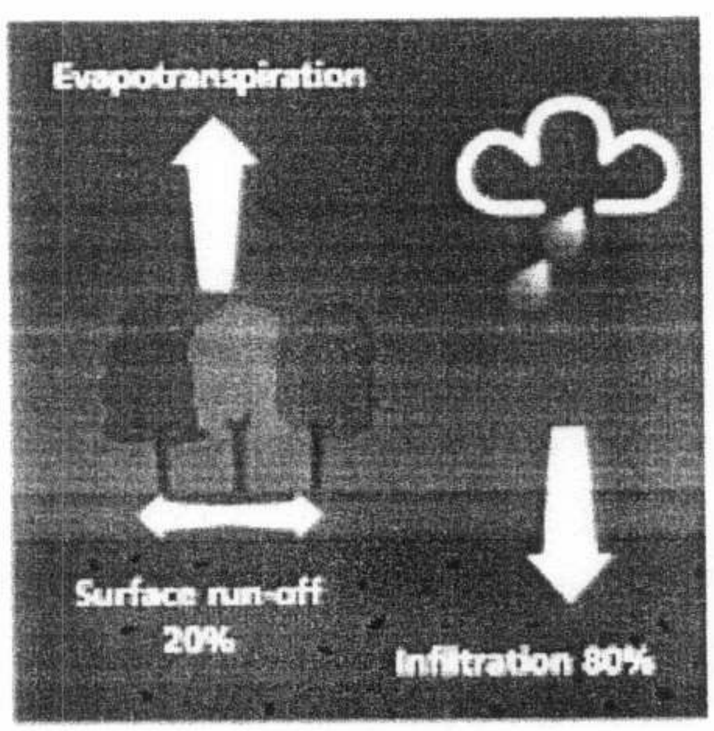
Marley is also launching a range of new ancillary items, chief amongst these is the new Inlet Chamber. As with conventional soakaways, concerns have been expressed over the tendency of cell type structures to silt up over time with no means of cleaning or removal of debris. This is dependent on site conditions, however use of the new Inlet chamber provides a number of benefits over conventional installation methods. Access to the soakaway for inspection and cleaning, a housing for an optional filter, access to the incoming pipe connection and improved inflow capacity via a single connection to the drainage system.

In recent years, important changes have taken place in the design philosophy associated with the collection and disposal of stormwater run-off.

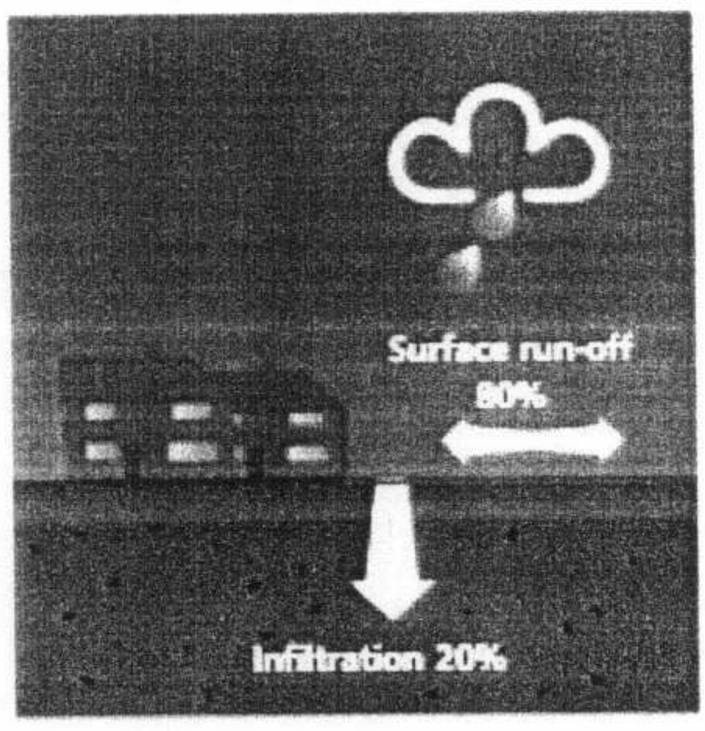
Traditional drainage practice is designed to move rainwater as rapidly as possible to a watercourse or river. This is normally achieved via gravity pipelines or culverts. However, this approach is now being reviewed because of the following factors:

- The Government's latest estimates suggest a two fold increase in the number of house starts each year. This increase in the built environment results in a reduction of permeable surfaces
- By diverting surface water run-off to piped systems, the groundwater levels are reduced
- Existing stormwater drains are becoming increasingly overloaded
- The difficulty in locating water courses with sufficient spare capacity to accept additional flows, without the risk of flooding
- Surface water run-off can contain contaminants such as oil, organic matter and toxic metals. Although often at low levels, cumulatively they can result in poor water quality in rivers and groundwater
- Increasingly extreme weather conditions due to climate change

Natural drainage



Drainage after development



As a result, the re-evaluation of how stormwater is dealt with has led to a more sustainable approach

Rainwater harvesting in Kedington Road