

Part One: Consumer Information

At Ark we believe that all good businesses must be environmentally aware. That's why we're committed to finding ways to minimise impact on the environment through our building





practices, along with using sustainable products and materials where possible. We worked on an eco-design project with James Dorrell of the EDECON project to pow to do more

investigate how to do more.

We think green in our day-to-day practices, from the paper we use in our office to our principles on recycling and reusing materials on site. For example Freecycle.com is a great resource that we use to offer up your unwanted but useable items, such as an old kitchen or bathroom suite, to a new home, rather than heading for landfill. We employ GreenAcre recycling services to collect and recycle all our building waste and we use sustainable timber in all aspects of construction. We're also very open to talk to you about energy efficient building practices and specialist products and materials that can be used in your project.

"As a result of working with the EDECON project we are now committed to offering green building materials and insulation options. Customers will now be able to specify low impact eco-materials

which deliver lower energy bills year after year." Tom Pike, Director.

Operational Carbon Saving

Decisions on windows and insulation affect the "operational carbon" of the building throughout its lifetime. Ark generally provide loft conversion services to consumers who have properties in Brighton and built before 1980. As a result, many properties will have little, poor performing or no insulation. The Ark building service will improve the thermal efficiency of the whole property but there are choices that can make further lifetime improvements.

The table below shows typical insulation savings according to The Energy Savings Trust for homes with insulation 20+ years old.

Туре	Installation cost	Savings per year	CO2 savings per year (kg)	Payback time
Loft	£395	£250	1,050	1-2 years
Cavity Wall	£870	£250	1,040	3-4 years
Floor	£900	£45	800	10+ years



The table clearly demonstrates that loft and cavity wall insulation should be incorporated to reduce operational carbon and costs. The savings are significant: up to 20% of an average person's annual carbon footprint can be saved through this work. Home owners can save £500 per year in energy bills.

REDUCING THE CARBON FOOTPRINT OF MATERIALS

Conventional insulation is better than no insulation and engineered PIR based insulation (e.g. Celotex) has thermal properties than outweigh the carbon footprint in production. With the advent of high performance synthetic fibres, natural fibres have lost much of its importance and market share. However, sheep's wool and hemp based cellulosic insulation can be carbon positive. A product made of natural materials fixes carbon from the atmosphere as the animal or the plant grows. In some circumstances, the energy used in processing is offset by the carbon fixed and therefore it is extremely beneficial, environmentally.

Wool

British hill sheep withstand the harshest conditions protected by their wool it so it must be pretty effective. As a natural material it has gained in popularity because of its insulating properties and eco-friendly credentials. After all, sheep withstand the harshest conditions protected by it so it must be pretty effective.



Thermafleece and Black Mountain in the UK only use insulation made from British hill sheep.

The trick wool has up its sleeve is the waviness of its fibres. The crimp, as it is called, means they create a three-dimensional latticework that traps air in tiny pockets. Air, in turn, is a very good insulator, and that benefit can be carried over for walls, ceilings and roofs. From that point of view it hardly seems worth – or indeed appropriate – to question the qualities of the material. It is from a natural source, it grows back and is, therefore, truly renewable, not to mention recyclable. For environmentally friendly, low-impact buildings, these characteristics are perfect. Insulation works both ways. What keeps the cold out in winter, keeps the heat out in summer. In addition to that sheep wool can absorb moisture but doesn't become any less insulating, in contrast to artificial material such as glass wool. Some sources talk about a third of its own weight without compromising performance. A balanced climate is the result.

Key advantages of Sheep's Wool Insulation

- Carbon Positive Resource: by using mountain sheep wool we are utilising a by-product since this grade of wool does not normally entire the textile supply chain. Thus, the carbon that is "fixed" into the wool as the sheep grows is actually carbon positive as it is not realised until the end of the life of the building when it is treated as waste.
- Sheep's wool can absorb 40% of its own weight in moisture without affecting its thermal properties. (Mineral becomes ineffective after 5% moisture).
- Sheep's wool keeps it shape much better than mineral wool which is prone to being squashed





• Sheep's wool will last the lifetime of the building. Mineral wool only lasts 20 years.

Disadvantages

• Compared to PIR, sheep's wool requires an extra 50mm for the same theoretical thermal performance.

• Sheep's wool is more expensive than mineral wool (but performs better and lasts longer).

Cellulosic Insulation

Hemp based insulation from Black Mountain or Thermafleece is UK sourced. The payback period in environmental terms is less than 6 months: i.e. the energy in agricultural processes, manufacture and distribution is offset by the energy saved in use in a building within 6 months. Hemp insulation is cheaper than wool but has a lower practical performance than wool. It does, however, have excellent acoustic properties and is very suitable for use on party walls.

Part Two: Further technical information for Ark.

Contrasting the cost, thermal and environmental performance of insulation

The "embodied" CO2 emissions associated with supplying materials can be as much as 50% of total emissions over a building's lifetime.

If you reduce embodied carbon, you can benefit financially from:

- Reductions in materials use and waste;
- Less reliance on energy-intensive manufacturing routes; and
- A reputation for good environmental management.

The material carbon saved for using wool materials compared to conventional is high. If the same u-value is reached the operational carbon saving will be equal to that of the conventional options using approved calculation processes. However, when adding the thermal mass of wool and the fact that it is easier to eliminate thermal bridges compared to rigid PIR board, sheep's wool is a better performer. The table below contrasts some natural insulation with conventional alternatives. It is more expensive per metre than mineral wool but cheaper than PIR (Celotex).

EDECON ADVANCE SERVICES – SUSTAINABLE BUILDING SERVICES



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Product	Example Use	Material	$\mathbf{\Lambda}$	U	Cost / m2 k	gCO2e / m2
100mm CosyWool	Wall	30% rplastic, 70% wool	0.04	0.39	£9.42	-0.46
100mm Natuwool	Loft and Wall	90% wool, 10% plastic	0.04	0.39	£11.29	-0.38
100mm Natrahemp	Stud Wall	100% hemp	0.04	0.40	£9.42	0.24
100mm Thermafleece Original	Loft and Wall	100% wool	0.04	0.38	£9.42	-1.22
90mm Ultrawool	Loft and Wall	90% wool blend	0.04	0.39	£9.42	0.00
100mm Celotex GA4000	Loft and Wall	PIR	0.02	0.22	£10.41	13.07
50mm Celoxtex PL4000	Insulating Plasterboard	PIR	0.02	0.43	£11.60	6.53
100mm Knauf Mineral Wool	Cavity	Mineral wool	0.04	0.44	£4.10	2.82
Alumaflex 1.2m wide	Loft	Alu composite	0.02	0.70	£7.21	33.70

When the environmental arguments are valid, the important consideration is meeting Building Regulations and u-values specified on the drawings. The following example outlines how to meet Building Regulations and utilise the maximum amount of natural materials.

The minimum U-Value needs to be 0.18wm2

Dormer Roof (conventional plan): To Structural Engineer's details. Flat roof to be single ply membrane roofing on 22mm exterior grade plywood, to give a 1:40 fall on joists. Cross ventilation to be provided on opposing sides by a proprietary eaves ventilation strip to give 25mm continuous ventilation, with fly proof screen. Flat roof insulation is to be continuous with the wall insulation but stopped back to allow a 50mm air gap above the insulation for ventilation. Insulation to comprise 130mm Celotex between joists with 12mm Celotex to inside face, all in accordance with manufacturer's recommendations plus 12.5mm plasterboard and skim. Minimum 50mm clear ventilation gap to be provided behind insulation.

Dormer Roof (natural): To achieve 0.18wm2 using the official data, 200mm of Thermafleece Ultrawool (90mm and 70mm layers) will have to be used in place of approximately 142mm of Celotex. This is an increase in thickness (and therefore reduction in ceiling height in the dormer) of 58mm.

The roof is 31m2. The total cost of Ultrawool is £622.48 against a price for the two Celotex products of £934.39.

- Using Ultrawool will achieve a U-Value rating of 0.18wm2.
- The thermal mass of wool will deliver greater heating and cooling properties.
- It will save £300 compared to the conventional foam alternative.
- The will save 390kgCO2e.

END.

bloom

APPENDIX: Costs and where to buy

PACK QUANTITIES

Product sizes

Black Mountain Natu	1) silos loovr	ninimum Order	1 pallet plus carr	iage charge)		
Thickness	Width	Length	Rolls/Pack	m² Pack	Packs/Pallet	m² Pallet
50mm	600mm	10 mts	2	12	9	72.0
75mm	600mm	7.5 mts	7	6	9	54.0
100mm	600mm	5 mts	2	9	9	36.0
125mm	600mm	4 mts	2	4.8	6	28.8
Black Mountain Natu	uwool Batts (minimum Order	1 pallet plus car	riage charge)		
Thickness	Width	Length	Batts/Pack	m² Pack	Packs/Pallet	m ² Pallet
50mm	400mm	1200mm	10	5.76	12	69.12
75mm	400mm	1200mm	Ø	3.84	12	46.08
100mm	400mm	1200mm	9	2.88	12	34.56
150mm	400mm	1200mm	4	1.92	12	23.04
150mm	600mm	1200mm	4	2.88	ø	23.04
200mm	600mm	1200mm	с	2.16	00	17.28

http://www.just-insulation.com/002-brands/black-
<u>mountain-natuwool-sheeps-wool-insulation.html</u>
http://www.naturalinsulations.co.uk/