

APOLLO

ENERGY RESEARCH

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Energy Costs the Earth



APOLLO PRODUCTS ...

- Block over 95% of radiant heat
- Are BBA Certified
- Dramatically reduce a buildings energy requirement
- Enhanced comfort levels for occupants
- Stabilise interior temperatures
- Reduces Carbon Emissions

www.apollo-energy.com

THE SOLUTION

APOLLO'S HEAT REFLECTING MEMBRANES THE SOLUTION FOR REFLECTIVE FOIL INSULATION

Manufactured in the UK in an ISO 9001 factory, Apollo's range of foil membranes have undergone substantial testing and have achieved certification by the British Board of Agrément (BBA), the Building Research Establishment (BRE), Dubai Municipality and many other international bodies. Apollo membranes also hold fire Certificates to BS476: Parts 6 & 7.

When you buy one of our Heat Reflecting Membranes (HRMs) not only are you buying the best in reflective foil insulation but you're also receiving the security that every one of our products has been fine tuned precisely for its stated application.

Apollo's HRMs are essential in your structure design, to ensure you achieve the optimum thermal performance in summer and winter.

Key Advantages of our Range

- Block over 96% of radiant heat.
- Dramatically reduce a building's energy requirement
- Enhancing comfort levels for occupants
- Stabilise interior temperatures
- Saves energy
- Reducing Carbon Emissions

As well as supplying the UK domestic and commercial markets, Apollo also exports worldwide, and has been involved in prestige projects such as the Beijing Olympics, The Canadian Embassy, The Grand Mosque and the Ministry of Foreign Affairs in Abu Dhabi, as well as major structures in Dubai, Singapore, Thailand, Malaysia, USA and Saudi Arabia.

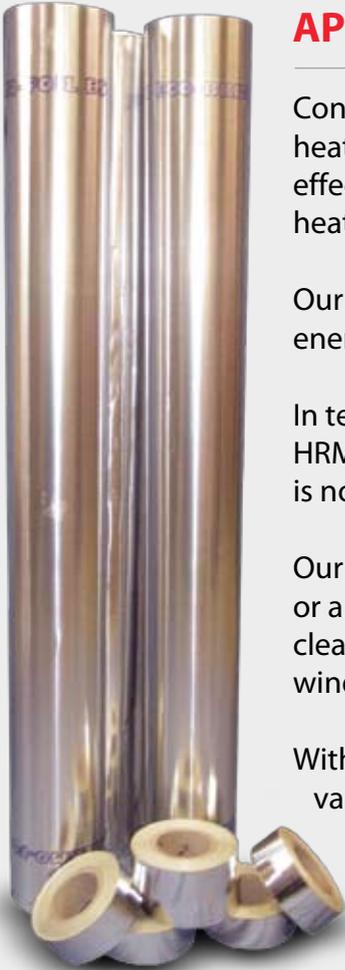
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WHY INSULATE BUILDINGS?

Effective insulation will make a considerable difference to the comfort and durability of your building. Insulation creates a barrier against the transmission of cold or heat through walls, floors or roofs. The average house loses around 70% of heat loss through infrared radiation, Apollo's HRMs will reflect over 96% of radiation and can reduce the amount of soft insulation required.



APOLLO'S SOLUTION

Conventional soft insulation, such as fibre glass and foam boards reduce heat transfer by trapping heat, however these traditional methods are not effective at reducing radiant heat transfer which is often the main source of heat loss through a building's envelope.

Our HRMs work by reflecting back most (over 96%) of the radiating infrared energy.

In temperate climates, used in conjunction with traditional insulation our HRMs will enhance U-values and seal the building's envelope, ensuring fuel is not wasted in heating or cooling the building.

Our HRMs are tough and tear resistant, but can easily be cut with scissors or a craft knife. Simply installed in roofs, ceilings, walls and floors they are clean to handle and easily moulded around fittings, door openings and window frames.

With low moisture transmission rates, Apollo's HRMs act as excellent vapour barriers, halting moisture migration into the building's insulation layers. They offer a significant thermal, strength and performance enhancements over conventional vapour control layer materials.

IN WINTER



Our HRMs stop warmth escaping from ceiling, wall and floor structures by sealing the building's envelope and deflecting infrared energy back into the interior. Fuel is not wasted in heating up the building's insulation layers and the internal environment is controlled by using less energy.

IN SUMMER



Our HRM System blocks the infrared energy passing through structures so the insulation layers and the interior are kept cool and the internal environment is controlled by using less energy.

No matter the season, room temperatures are far easier to control with Apollo's HRMs installed.

APOLLO'S PRODUCTS

BBA CERTIFICATION

Thermo-Foil ES, Eco-Brite and Apollo's adhesive tape have been certified by the BBA who confirm that our products are;

"... effective in reducing the U value (thermal transmittance) and acting as a vapour control layer in new or existing dwellings and buildings of similar occupancy, type and condition."

"... rot-proof, do not tear easily and will have a life equal to that of the building in which it is installed, for example, a minimum design life of 60 years."

Apollo our proud to be members of the Timber Frame Association and the Modular and Portable Building Association.



THERMAL PERFORMANCE

To act as a radiant barrier the HRM is installed within a structure facing at least one air space, usually 19 to 25mm.

Structural Elements	Direction of Heat Flow	Thermal Resistance
Ceiling	Upward	0.45 m ² KW
Pitched Roof 45°	Upward	0.51 m ² KW
Wall	Horizontal	0.67 m ² KW
Floor	Downward	0.80 m ² KW

GREEN PERFORMANCE

When installed correctly our products will save you money on your heating or cooling bills by up to 30%. They are the most effective foil membrane currently on the market today.

Our radiator pack Radflek, which is made from Eco-Brite® has been approved for use in the Government's Carbon Emission Reduction Target (CERT) scheme administered by Ofgem.

Eco-Brite® was tested by the BRE and it concluded that every square metre saves up to 23kg of CO₂ emissions per annum on an un-insulated wall and 12.33kg of CO₂ emissions per annum on an insulated wall.

This equates to a huge saving, every roll of Eco-Brite® or Thermo-Foil®ES installed will save over **1400kg** of CO₂ emissions per annum.

BENEFITS

DURABLE

Thermo-Foil® ES and Eco-Brite® certified by the BBA for 60 years
Does not provide a food source or nesting for rodents
Tough and Strong

EASY TO INSTALL

Easily cut with a cutter or scissors
Fixed using staples or nails
Won't spring back
Clean, requires no protective equipment when handling

SPACE SAVING

Less than two mm thick
Will reduce the thickness of soft insulation required

ENERGY EFFICIENT

Every square metre will save 12.33kg of CO₂ per annum on an insulated wall and 23kg of CO₂ per annum on an un-insulated wall
That is a saving of 1400kg of CO₂ emissions per annum per roll

Buildings Incorporating an Apollo HRM



Raffles Hotel



Log Cabin - UK



Pfizer Warehousing



Ducts in Abu Dhabi



Grand Mosque in Abu Dhabi



Prefabricated School Complex

ENHANCED U-VALUES

Our products **ENHANCE** the efficiency of other insulating products included in structures, by stopping warm or cold air migrating through insulation mats, blocking un-wanted air infiltration and eliminating moisture migration. Below are some examples of U-Values with and without an Apollo membrane.

Construction Type	Insulation	λ (W/m K)	U-Value (W/m ² K)	
			Without Apollo's HRMs	With Apollo HRMs
Wall				
Timber Frame	Mineral Batt - 100mm	0.038	0.38	0.30
Timber Frame	Foam Board - 100mm	0.023	0.34	0.27
Brick & Block	Mineral Batt - 100mm	0.042	0.35	0.29
Roof				
Ceiling	Mineral Wool -200mm	0.044	0.19	0.17
Attic Room	Foam Board - 150mm	0.023	0.19	0.17
Floors				
Suspended Timber Floor*	Foam Board - 75mm	0.023	0.28	0.24
Light Steel Frame Floor**	2 layers of Eco-Brite	N/A	0.45	0.24
<small>*Floors calculations based on Area -50m², perimeter 28.5m **Floors calculations based on Area -76.5m², perimeter 39.7m</small>				

APPLICATION EXAMPLE

AIR-CONDITIONED BUILDING WITHOUT THERMO-FOIL

Solar heat (infrared energy)
 Ambient outside temperature 43°C
 Roof surface temp 73°C
 Air temp in attic 68°C
 Air temp in rooms 26°C
 Moist air infiltrates buildings envelope

AC run time = 54 minutes per hour

AIR-CONDITIONED BUILDING WITH THERMO-FOIL

Solar heat (infrared energy)
 Ambient outside temperature 43°C
 Roof surface temp 73°C
 Air temp in attic 48°C
 Air temp in rooms 26°C
 Thermo-Foil seals buildings envelope

AC run time = 14 minutes per hour

BEIJING OLYMPICS

Thermo-Foil® ES was specified in the roof and walls of the 2008 Beijing Olympic Shooting Range stadium. The contract was secured with invaluable help from the Commercial Department of the British Embassy in Beijing. During the games the outside air temperature was expected to be in excess of 35°C with humidity heading towards 90%. The Chinese engineers involved in the design of the Shooting Range stadium calculated that by installing Thermo-Foil ES and sealing the buildings envelope using Thermo-Foil tape would reduce the air-conditioning load by 30 to 50%.



STRUCTURAL INSULATION

Whether building your dream home, an extension on you existing home, a new housing estate or new warehousing, Thermo-Foil® ES and Eco-Brite® are specifically developed to enhance the U-value of ceiling, wall and floor insulation. In combination with fibre insulation, they can provide the most cost-efficient insulating method to meet the requirements of current Building Regulations.

Thermo-Foil® ES

Therrno-Foil® ES (also banded as Thermo-Brite III in Europe) is a two sided single foil for use as a heat reflective liner in domestic, commercial and industrial buildings. This tough product has been specifically engineered to withstand the rigors of site work. It has BBA Approval and has been designed and tested to last the lifetime of a house.

Thermo-Foil® ES will reflect 96.7% of infrared energy striking the surface. Used by itself or in conjunction with soft insulation, it will substantially minimise energy needs and improve comfort for occupants. The membrane eliminates excessive heat gain caused by incoming solar radiation yet can keep the room warm during cold weather.

It is ideally suited to large warehousing, as the cross laminated Valéron core provides the strength to allow it to be stretched tightly across ceilings and walls without the risk of tearing, and increasing the distribution of light within the building.

Our membrane, with a low moisture transmission rate of less than 0.021 g/m^2 , can be used as an excellent vapour barrier to seal new or existing soft insulation. Ensuring insulation performance is not compromised by interstitial condensation, which reduces insulation performance and may cause damage to the overall construction. Dust particles are also sealed in reducing levels to acceptable safe levels.

Our products have been rigously tested against UV rays and humidity and stand undamaged for 30 years, far out performing similar products on the market worldwide today.



Thermo-Foil ES in a warehouse roof - UK



Thermo-Foil ES in a shopping Mall - US



Thermo-Foil ES in the Royal Court of Justice, Guernsey, Channel Islands

STRUCTURAL INSULATION

ECO-BRITE®

Eco-Brite® has been used successfully in many designs of buildings from timber frame homes and log cabins to pre fabricated buildings. It holds BBA certification.

It will reflect 96.1% of infrared energy, insuring that minimal energy is lost when heating or cooling a building. Eco-Brite®s inclusion can reduce the thickness of the soft insulation required, substantially minimising energy needs and improve comfort for occupants. The membrane eliminates excessive heat gain caused by incoming solar radiation yet can keep the room warm during cold weather. The membrane, with a low moisture transmission rate of less than 0.048 g/m², can be used as an excellent vapour barrier to seal new or existing soft insulation. Ensuring insulation performance is not compromised by interstitial condensation.

Eco-Brite® greatly improves heat distribution when installed below the heat emitting element and piped systems. Draped over the floor joists and below the pipes, Eco-Brite® reflects the radiating heat back up to the floor, warming the surface more rapidly and evenly so providing better temperature control and comfort levels in the room.

It is installed with its bright aluminium side facing the under-floor electric element or pipe but not touching so as to prevent heat conduction. Eco-Brite® can also help restrict the ingress of methane and carbon dioxide from landfill sites and the movement of airborne radon from subsoil into the building.



Eco-Brite® in timber frame walls



Eco-Brite® in timber frame walls



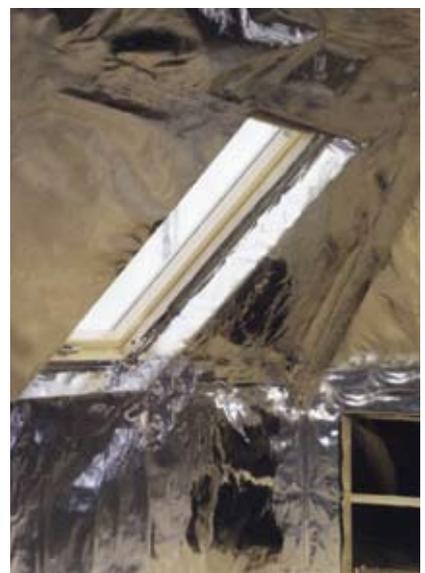
Prefabricated building



Eco-Brite® in a cabin floor



Eco-Brite® used in conjunction with under floor heating



Eco-Brite® in an attic room

STRUCTURAL INSULATION



THERMO-FOIL P®

Thermo-Foil® P is a two sided single foil for use as a heat reflecting membrane. It holds the same reflectivity properties as Thermo-Foil® ES, but has micro perforations for breathability.

This product can be installed in any type of building where a breathable Heat Reflecting Membrane is desirable. It also allows Water Vapour Permeation.

The Water Vapour Permeation (WVP) for Thermo-Foil P is certificated at 25°C, 50% RH to be 20200 g/m²/day and at 25°C, 75% RH to be 27000g/m²/day. Testing the WVP was by the gravimetric method ASTM E96-90 using a single 50cm² specimen where the even perforations were observed to be representative of the product as a whole.

INSUFLECT™

InsuFlect™ is a specifically designed foil membrane, with one side bonded to kraft paper, enabling it to be adhered to a variety of foam insulation.

It comprises of a 12.5 micron aluminium foil having a unique non-tarnish finish that is guaranteed to stay-bright for the life-time of the building. This is bonded to a Valéron® core which in turn is bonded to a stout kraft paper. The paper acts as an interface allowing the foam to adhere to the InsuFlect™.



Outperforming other materials currently in use, the reflectivity of the bright aluminium foil on InsuFlect™ is certified at over 96% so most of the infrared energy striking its surface is effectively blocked.

The membrane, has a low moisture transmission rate of less than 0.021 g/m. InsuFlect™ also act as an excellent vapour/dust barrier, halting moisture migration into the foam insulation layers.

InsuFlect™ has had great success in the Middle East where it has been used on notable projects. Most recently a new palace in Abu Dhabi, where it is being bonded to a phenolic foam board, which is manufactured locally.

APOLLO ADHESIVE TAPE

Apollo's Thermo-Foil Tape is used to seal the joins between adjacent sheets, of Heat Reflecting Membrane. It is also used to seal off these products around stud-work, door or window frames. So without having to use a variety of mastics or other tapes the structure can be effectively sealed preventing air infiltration and ensuring the building meets its mandatory air pressure test.



TERRETHENE™

Terrethene™ developed for sub-surface applications, is a multi-layered membrane made from polyethylene, aluminium foil and high tensile woven substrates that block the migration of vapour, moisture, water and various environmentally harmful gases.

Terrethene™ is a tough 460+ micron thick five layer process membrane designed for use as a:

- 100% water-proof barrier under buildings.
- Radon gas barrier under buildings.
- Liner for commercial fish farm ponds.
- Gas barrier for landfill sites to prevent the migration of methane and carbon dioxide gases.
- Liner for SUDS (Sustainable Urban Drainage System) trenches.
- Water trap layer under golf greens and sports pitches to control water seepage into the sub-soil.
- Water-proof stratum for roof gardens.
- Liner for reed beds.
- Meets BS Standards for DPC.
- NHBC approved.

For distribution outside of Europe

Royal Botanical Gardens in Oman

“ Terrethene™ developed for sub-surface applications, is a multi-layered membrane made from polyethylene, aluminium foil and high tensile woven substrates... ”



ENCASEAL™

EncaSeal™ is a 130 micron thick heat reflecting material used on internal air-conditioning ducts, pipe work and storage tanks. EncaSeal™ is also suitable for food preparation areas.

ENCACLAD™

EncaClad™ is a durable 345 micron thick material designed to completely encase external insulated or un-insulated structures, pipelines and ducts. It can also be used to clad flat surfaces and large storage tanks.

In both cases, the aluminium surface has a special UV resistant coating that ensures its bright finish never tarnishes. 100% waterproof and bug proof. EncaSeal™ has a high density polyethylene (HDPE) substrate core whilst EncaClad™ has a polypropylene (PP) core making both difficult to puncture or tear; properties essential for a long working life and keeping wastage to a minimum during installation.

One side of the sheet has a specially developed waterproof acrylic adhesive with release liner. Once in position, the adhesive is formulated to migrate into the substrate, where it sets providing a lifelong bond that will resist even high-pressure water cleaning techniques. The adhesive has a working temperature range of minus 37°C to plus 127°C.

Simply cut with a craft-knife, once in position both materials will not spring back. There is no need to fit retaining wire-mesh around pipe-work or ducts or have any other protection for the insulation.

For smaller pipes or ducting EncaSeal™ Adhesive Tape can be used, supplied roll sizes of 50mm x 100m, it can be installed with confidence as it holds the same properties of EncaSeal™.

EncaSeal™ and EncaClad™ have seen great success in the Middle East, and has been used on some prestige projects including The Canadian Embassy, The Grand Mosque and the Ministry of Foreign Affairs in Abu Dhabi as well as other major structures.



EncaClad applied to external pipe foam insulation



EncaSeal on internal ducting



EncaSeal



EncaSeal on square ducting



EncaSeal on circular ducting

AGRILINER™

AgriLiner™ is a two sided single foil for use as a heat reflective lining in agricultural buildings. It reflects 96% of radiant energy and is ideal for use in refurbished or new poultry buildings.



AgriLiner™ has been developed for all aspects of the international food and agricultural industry. It is designed to allow continuous pressure cleaning when necessary and compliments Bio Security to the maximum level. AgriLiner™ is ideal for controlling your need for heating or cooling in poultry and livestock buildings.

AgriLiner™ is a rot and mould-proof system which remains extremely hard to tear even when punctured, nailed or stapled. It is a pre-stretched, cross laminated coated multi-layer membrane with a low moisture vapour transmission rate that remains consistent throughout the life cycle of the system despite regular pressure washing and handling.

This avoids the need to install a separate vapour membrane during original construction. The reflective properties of our system allow an even light spread and therefore flock spread and reduce the energy consumption of your interior lighting by up to 10%.

In semi-tropical and tropical climates, interior temperatures can easily rise to detrimental levels as infrared energy from the sun penetrates into the building's interior.

By incorporating an Apollo HRM System, a poultry house is far easier to seal and infrared energy can no longer penetrate the structure. The system helps stop the ingress of outside humidity and allows better control of temperature and ventilation.

BENEFITS OF FITTING APOLLO AGRILINER™ IN A POULTRY HOUSE

1 Allows much easier environmental control over:

- ▶ Temp
- ▶ Humidity
- ▶ Ventilation
- ▶ Lighting
- ▶ Airflow

2 Increase rearing capacity in a given physical area, from 8-9 chickens per square meter to 15 chickens

3 Can increase the weight of a chicken from 40 grams at one day old to 2.6kg at 42 days

4 Decrease rearing period of chickens from 50 days to 44 days

5 Increased population growth rate from 5 to 6 generations per year

6 Increased egg production when using lighting controls

7 Disease control. Decreased mortality rate of 6% - 8%

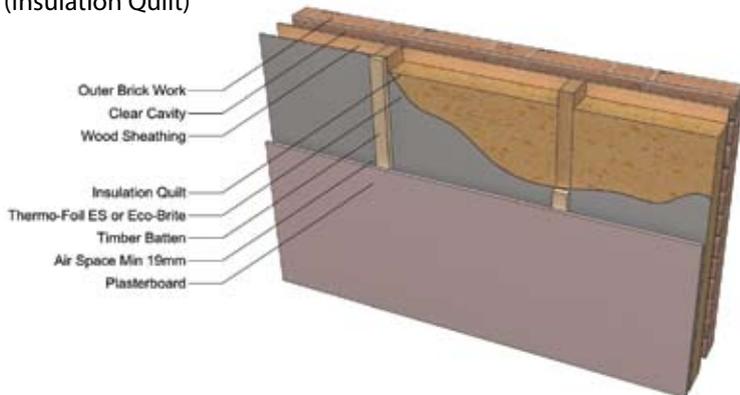
8 AgriLiner™ prevents methane and carbon dioxide gases produced by external sources from migrating into the building

9 Reduces Energy Costs

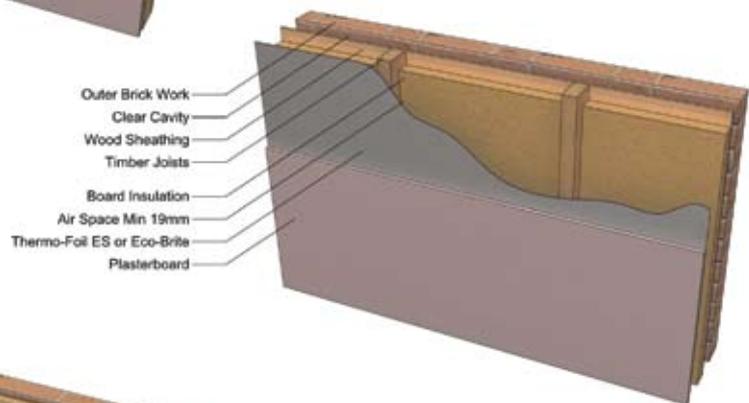
INSTALLATION GUIDE

WALL INSTALLATION GUIDES

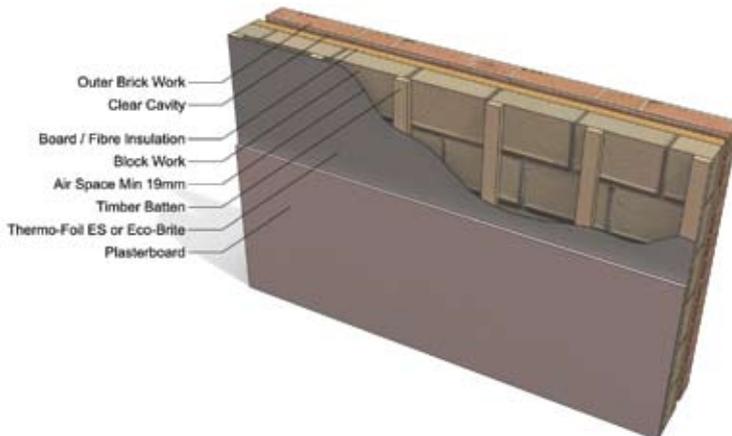
Timber Frame Wall (Insulation Quilt)



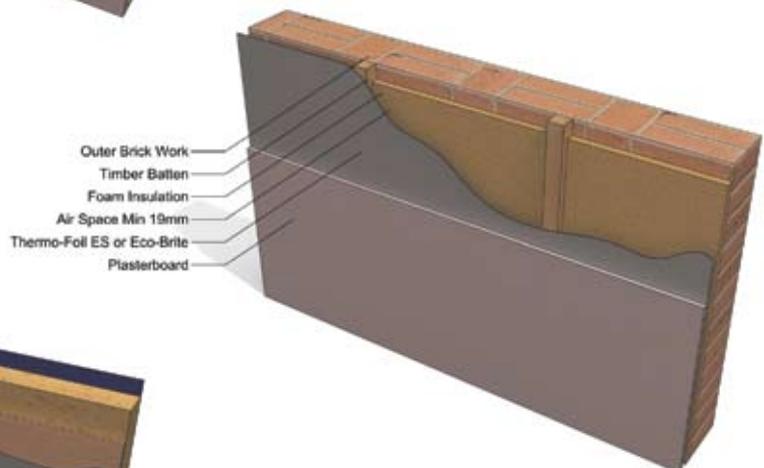
Timber Frame Wall (Insulation Board)



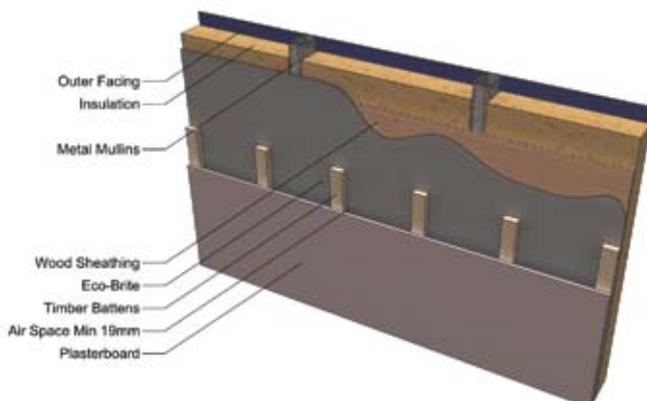
Masonry Wall



Masonry Wall Refrubishment

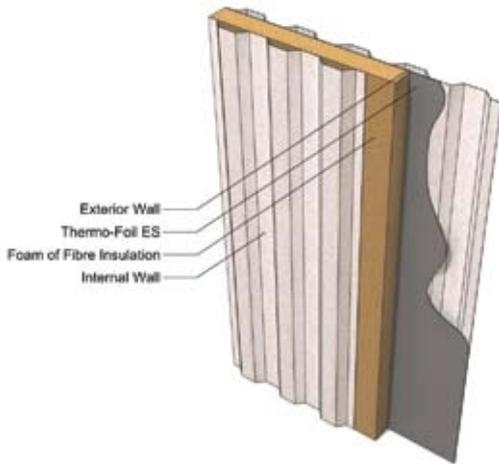


Modular/Portable Building

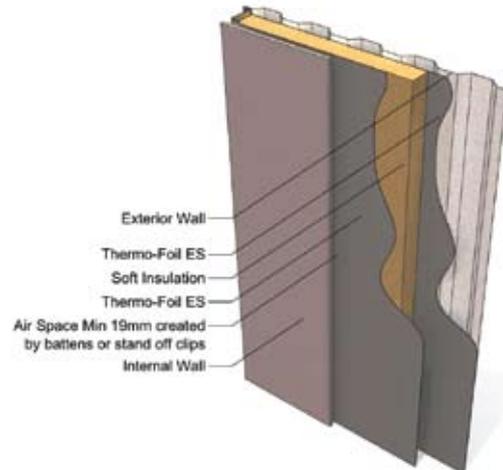


INSTALLATION GUIDE

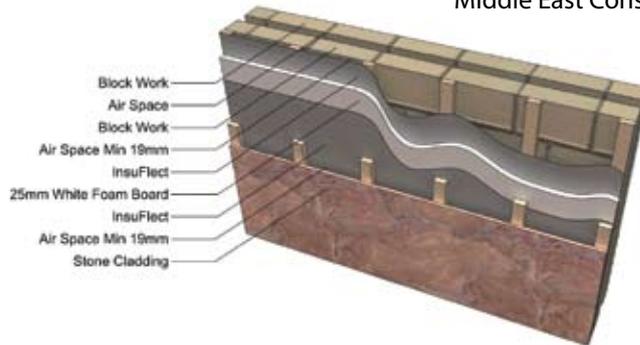
Metal Wall Profile



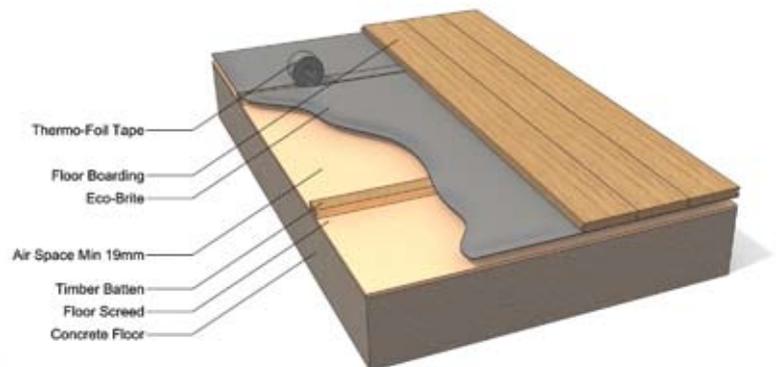
Cold Storage Facility



Block Wall Middle East Construction

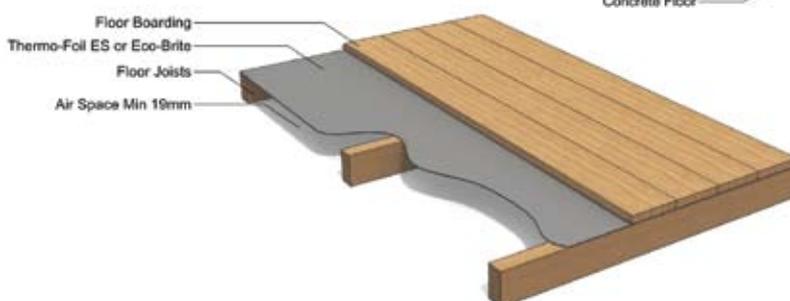


Concrete Ground Floor

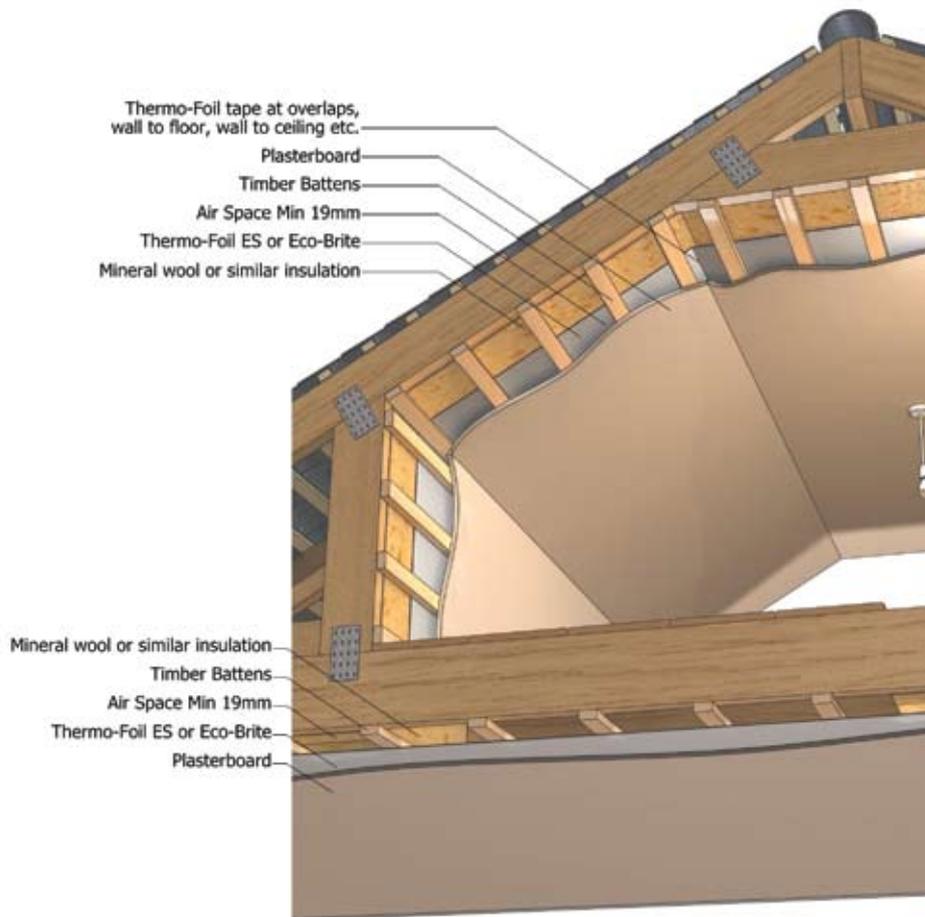


FLOOR INSTALLATION GUIDES

Timber Suspended Floor

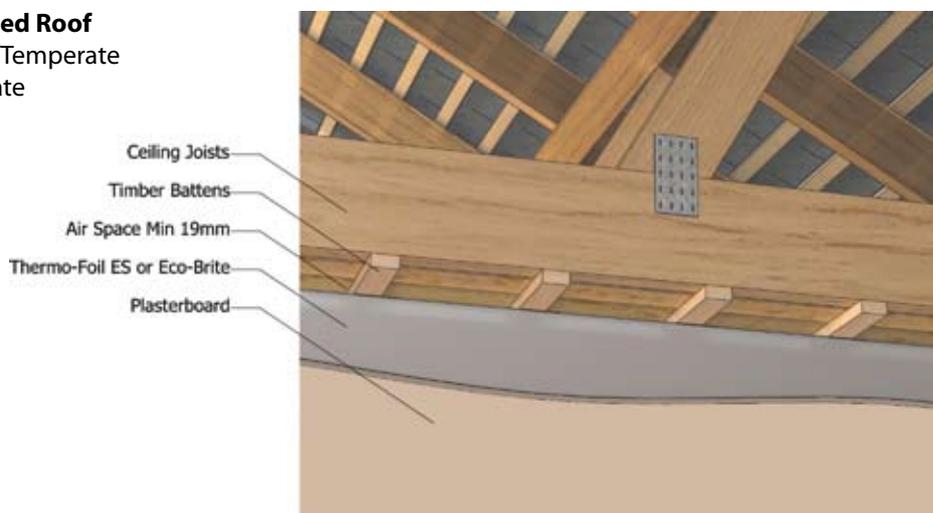


ATTIC ROOM INSTALLATION GUIDE



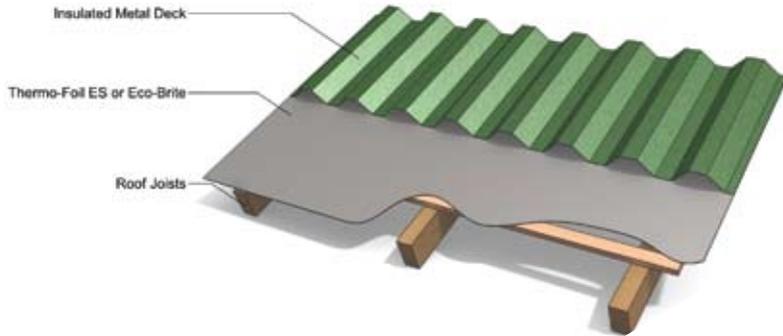
ROOF INSTALLATION GUIDES

Pitched Roof Cold/Temperate Climate



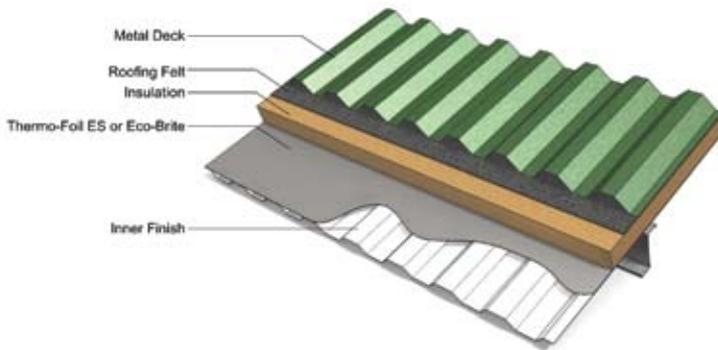
INSTALLATION GUIDE

ROOF INSTALLATION GUIDES

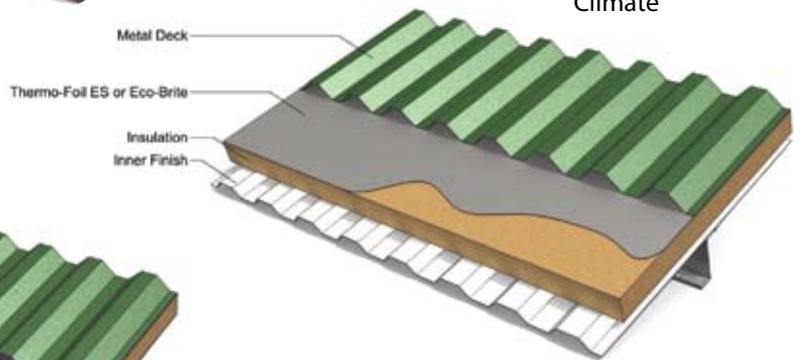


Pitched Roof
Hot Climate

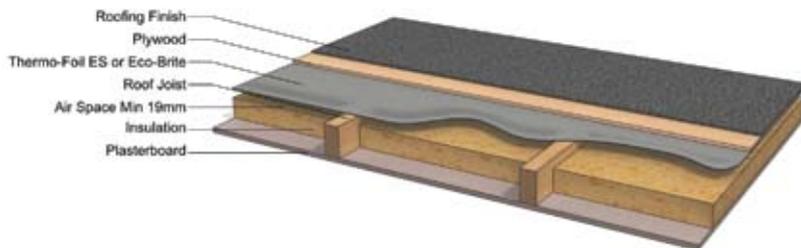
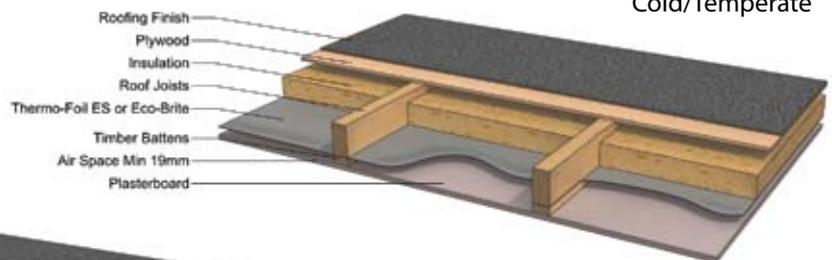
Metal Decks
Hot Climate



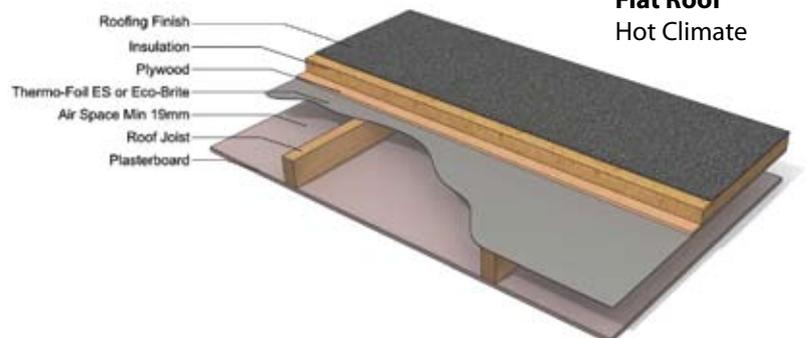
Metal Decks
Cold/Temperate
Climate



Flat Roof
Cold/Temperate



Flat Roof
Hot Climate



PHYSICAL CHARACTERISTICS

	Thermo-Foil Tape	EncaSeal Tape
Reflectivity (ASTM E903)	96.10%	96.10%
Emissivity (ASTM E408)	0.048	0.048
Roll Size	100m x 50mm	100m x 50mm
Thickness without Release Liner	45 micron	150 microns
Peel Adhesion – PSTC-1	11.4 N/25mm	11.4 N/25mm
Shear Adhesion –PSTC-7	Indefinite at 15.2 k/Pa	Indefinite at 15.2 k/Pa
Tensile PSTC-31	99.4 N/25mm	99.4 N/25mm
Elongation	150%	150%
Max. Temperature	+ 127°C	+ 127°C
Min. Application Temperature	- 37°C	- 37°C
Release Liner	75g	75g
Tear Resistant	Tensile MD 3.905kN/m	Tensile MD 6.620kN/m
Puncture Resistant	40.5kg-cm	41.1kg-cm
Moisture/Vapour Transmission Rate	0.045 g/m ²	0.021 g/m ²

Apollo's HRMs – an essential in your structure's design for optimum thermal performance in summer and winter



PHYSICAL CHARACTERISTICS

	Thermo-Foil® ES	Eco-Brite®	Thermo-Foil® P
Reflectivity (ASTM E903)	96.70%	96.10%	96.70%
Emissivity (ASTM E408)	0.046	0.048	0.046
Carbon Emissions Saved	up to 23kg of CO2 per m ² per annum	up to 23kg of CO2 per m ² per annum	up to 23kg of CO2 per m ² per annum
Roll Size and Weight	96m x 1.25m 120m ² 18 kg 315 x 4.1ft 40lbs	96m x 1.25m 120m ² 18.72kg 315 x 4.1ft 41.1lbs	96m x 1.25m 120m ² 18 kg 315 x 4.1ft 40lbs
Nominal Thickness	145 microns	135 microns	145 microns
Tear Resistant Machine Direction (MD) (ASTM D882)	Tensile MD 6.620kN/m Trousar tear MD 33.1N Elongation at break MD 222.6%	Tensile MD 3.905kN/m Trousar tear MD 10.2N Elongation at break MD 232.8%	
Tear Resistant Cross Direction (CD) (ASTM D882)	Tensile CD 5.487kN/m Trousar tear CD 33.9N Elongation at break CD 210%	Tensile CD 4.096kN/m Trousar tear CD 15.6N Elongation at break CD 100.4%	
Beach Puncture Resistance	40.1kg-cm	40.5kg-cm	
Moisture/vapour Transmission Rate (ASTM E96, Procedure B, MVTR)	0.021g/m ²	0.045g/m ²	
Corrosion resistant	Unique surface coating	Unique surface coating	Unique surface coating
UV resistant	Testing for the equivalent of 30 years 100% humidity & 100% UV	Testing for the equivalent of 30 years 100% humidity & 100% UV	Testing for the equivalent of 30 years 100% humidity & 100% UV
BS476 Part 6 Fire Propagation	Class 0	Class 0	Class 0
BS476 Part 7 Surface Flame Spread	Class 1	Class 1	Class 1
Temperature Resistant	-50°C to +127°C	-50°C to +127°C	-50°C to +127°C
Cross Laminated Valéron® Core	YES	NO	YES
Chemical Resistant	Tested with approved concentrated disinfectants		

PHYSICAL CHARACTERISTICS

InsuFlect™	AgriLiner™	EncaSeal™	EncaClad™
96.70%	96.70%	96.10%	96.10%
0.046	0.046	0.048	0.048
up to 23kg of CO2 per m ² per annum	up to 23kg of CO2 per m ² per annum	up to 23kg of CO2 per m ² per annum	up to 23kg of CO2 per m ² per annum
96m x 1.25m 120m ²	96m x 1.25m 120m ² 18 kg 315 x 4.1ft 40lbs	96m x 1.25m 120m ² 20 kg 33m x 1.25m – 41.25m ² 7 kg	1.25m x 26.4m 33m ²
230 microns	145 microns	130 microns	345 microns
Tensile MD of 6.000kN/m	Tensile MD 6.620kN/m Trousar tear MD 33.1N Elongation at break MD 222.6%	Tensile MD 6.620kN/m N/A N/A	Tensile MD 5.9kN/m N/A N/A
Tensile CD of 5.000kN/m	Tensile CD 5.487kN/m Trousar tearCD 33.9N Elongation at break CD 210%	Tensile CD 5.000kN/m N/A N/A	Tensile CD 4.900kN/m N/A N/A
40.0kg-cm	40.1kg-cm	40.1kg-cm	40.0kg-cm
0.021 g/m ²	0.021g/m ²	0.021g/m ²	0.020g/m ²
Unique surface coating	Unique surface coating	Unique surface coating	Unique surface coating
Testing for the equivalent of 30 years 100% humidity & 100%	Testing for the equivalent of 30 years 100% humidity & 100%	Testing for the equivalent of 30 years 100% humidity & 100%	Testing for the equivalent of 30 years 100% humidity & 100%
Class 0	Class 0	Class 0	
Class 1	Class 1	Class 1	
-37C to +127°C	-50°C to +127°C	-37C to +127°C	-35C to +127°C
YES	YES	YES	NO
Tested with approved concentrated disinfectants	Tested with approved concentrated disinfectants	Tested with approved concentrated disinfectants	Tested with approved concentrated disinfectants

APOLLO

ENERGY RESEARCH

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