PROJECT ABOUT SUSTAINABLE INSULATION MATERIALS

The introduction

Insulations plays a major role in energy efficiency enhancement, carbon emission reduction and creates a comfortable environment for living.

The demand for sustainable insulation materials has been on the rise thus sustainability becoming a key consideration in construction and renovation projects.

Some background information on impacts made by insulation materials in buildings includes:

- **Noise reduction**
  - Insulation acts as sound barriers by absorbing and dampening noise transmission between rooms and external sources. This creates and enhances privacy and a quiet peaceful indoor space.
- **Thermal comfort**
  - Insulation maintains a consistent room temperature enhancing a comfortable living and working environments for residence.
- **Condensation control**
  - Insulation materials with vapor retardant elements help control moisture condensation in ceilings, floors and walls, thus preventing growth of mildew, mold and any other kind of moisture-related issues, promoting better room air quality.
- **Energy efficiency**
  - Proper insulation minimizes heat transfer within the interiors and exterior of a building.
  - Helps retain heat during colder seasons and prevents heat gain on hotter seasons.
  - Through reducing the reliance on heating and cooling systems, insulation significantly enhances energy efficiency and lowers energy consumption.

OBJECTIVES OF THE PROJECT

– Some of the key objectives of sustainable insulation materials are discussed below:

- **To identify insulation materials**

– This involves researching and identifying insulation materials that have very minimal negative impacts on the environment throughout their life cycle.

– These sustainable materials may include natural fibers such as cotton, hemp, wool and cellulose as well recycled materials like recycled paper, denim and plastics.

- **Analyzing cost-effectiveness**

– The objective involves analyzing the economic viability of sustainable insulation materials.

– It includes assessing upfront costs of materials, installation expenses and potential long-term energy savings resulting from improved insulation.

– Helps stakeholders be informed and make right decisions regarding the adoption of sustainable insulation solutions.

- **Promote adoption of sustainable insulation materials**

– The objective aims at raising awareness and encourage widespread adoption of sustainable materials.

– It involves advocating for the benefits of sustainable insulation, educating customers, policymakers, architects and builders about available options and provides resources and incentives to promote the use of sustainable insulation in the construction and renovation projects.

The findings will provide a comprehensive heads up on sustainable insulation including the details, main features, operations, construction, characteristics, specifications, dimensions, cost and market availability.

1) **Main features.**

– Sustainable insulation materials possess key features that distinguish them from traditional insulation options. These features include;

- **Renewable and recyclable:** Sustainable insulation materials are often made from renewable resources such as recycled glass, cellulose fibers, hemp, cotton and wool.
- **Low embodied energy:** Sustainable insulation materials require minimal energy in their production thus reducing the overall carbon foot print of the building or renovation project.
- **Non-toxic and indoor air quality:** Several sustainable insulation options are free from harmful chemicals and volatile organic compounds contributing to better indoor air quality and a healthier living space.
- **High thermal performances:** The sustainable insulation materials offer an excellent thermal resistance, effectively leading to a reduction in heat transfer and energy consumption.

2) **Operation and construction**

– Sustainable insulation materials have various methods of installation which depend on the type chosen. The methods include;

- **Blankets and rolls:** Insulations materials are available in pre-cut rolls or blankets that can be easily installed between framing members such as studs or joists.
- **Spray foam:** Insulation is applied as a liquid that expands and solidifies creating an airtight barrier filling gaps, cracks and voids.

- **Loose fill:** Insulation comprise of small particles or fibers that are blown or poured in attics, cavities or hand-to-reach areas providing an effective thermal resistance.

3) Characteristics and specifications

– Insulation materials possess certain characteristics and specification which varies depending on a material used. Common characteristics are;

- **Thermal resistance:** Insulation materials have varying values of resistance indicating their resistance to heat transfer. The higher the resistance value, the better the insulation performance.
- **Sound proofing:** Insulation materials can provide excellent sound proofing properties thus reducing external noise transmission and enhance acoustic comfort.
- **Fire resistance:** Other insulation materials are naturally fire-resistant or treated with non-toxic fire retardants to enhance safety.

4) **Dimension and cost:** Insulation materials are available in various dimensions and forms enabling flexible installation. Cost and dimension at some point varies depending on material and manufacturer, for instance;

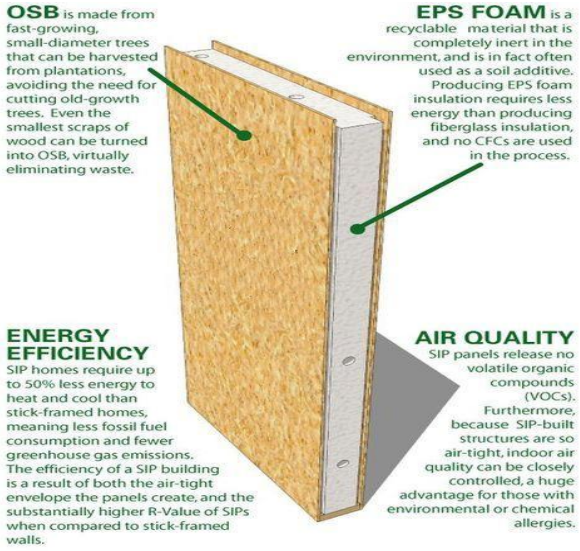
- **Blankets and rolls:** The common dimension ranges from 16-24inches wide and lengths vary based on projects requirements. Cost typically ranges from $0.5-$2 per square foot
- **Spray foam:** Insulation is applied by professions using specialized equipment. Cost can vary, ranging from $1.5-$4 per square foot.

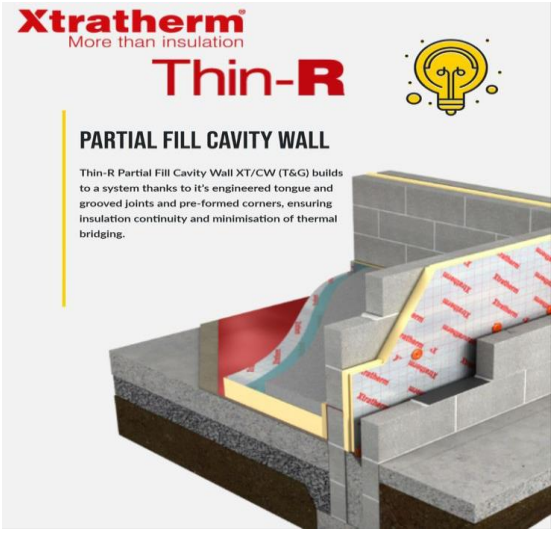
5) **Market availability**

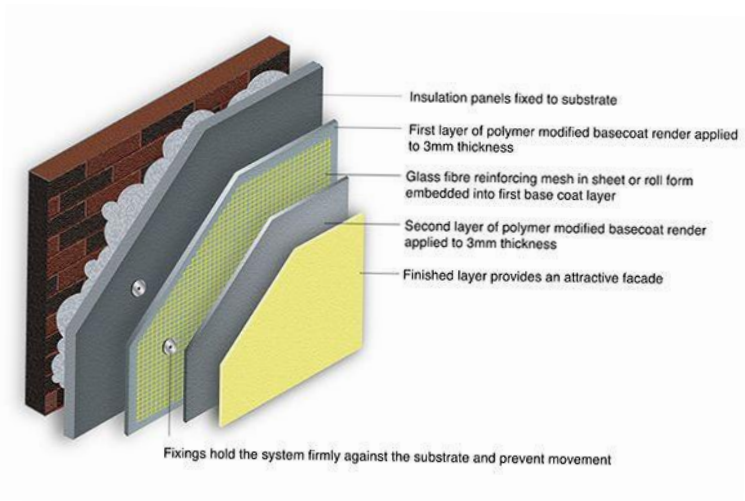
– Sustainable insulation market has experienced a significant high growth in the recent years. The growth has been driven by an escalated awareness of environmental issues and energy-efficient building practice

CONLUSION

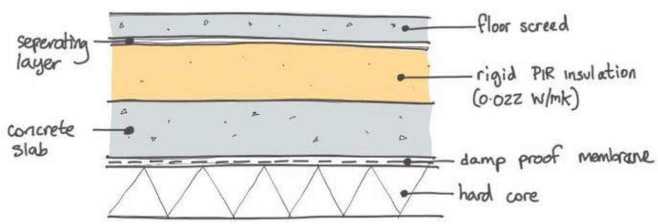
- Sustainable insulation materials offer significant positive impacts in terms of energy efficiency, reduced environment impacts and occupant comfort.
- The continuous development and widespread adoption of the materials will play a very huge role in achieving sustainable construction practices globally. Thus, by incorporating natural fiber insulation, recycled materials and other sustainable options into building design, we can contribute to a greener future.

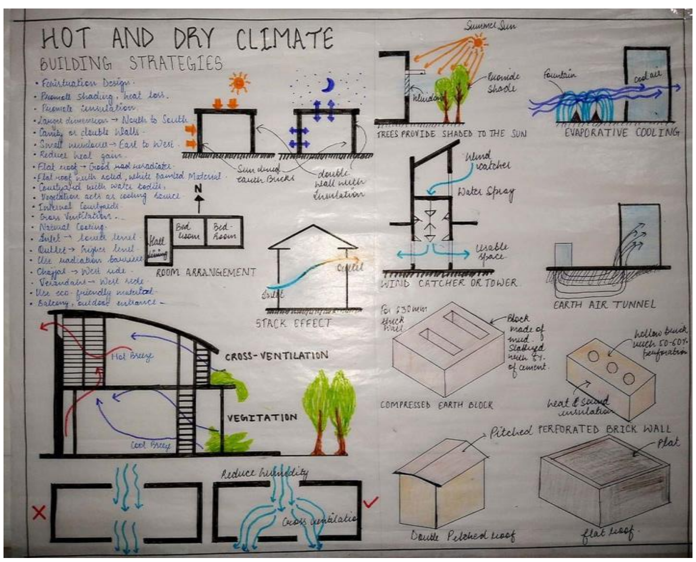


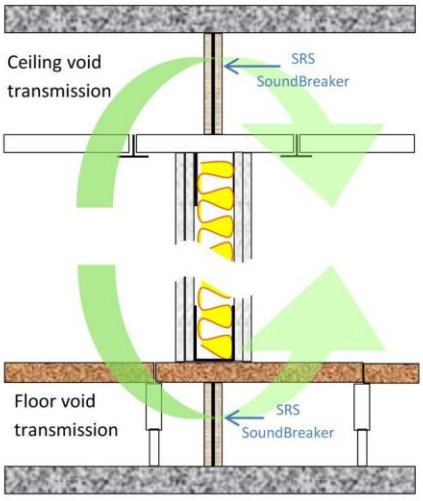


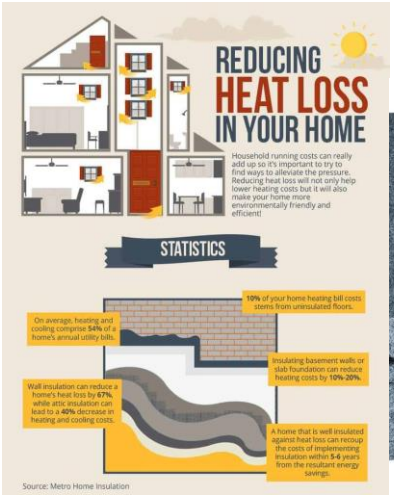


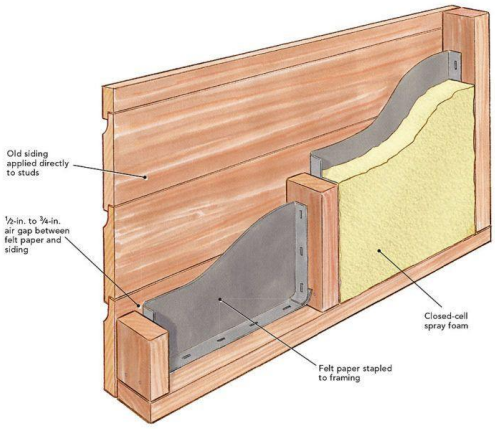

BATT INSULATION :
IT CONSISTS OF FLEXIBLE , FIBEROUS THERMAL INSULATION OF GLASS OR MINERAL WOOL MADE IN VARIOUS THICKNESSES AND LENGTHS AND IN 406 OR 610MM WIDTHS TO FIT BETWEEN STUDS AND JOISTS.
MINERAL WOOL
FIBER GLASS
ADNAN AL KARAKI
DR. M.ABDULLAH
ARCH. LALLWEH
B.C 2
RIGID FOAM INSULATION :
IS A PREFORMED, NON-STRUCTURAL INSULATING BOARD OF FOAMED PLASTIC OR CELLULAR GLASS WHICH IS FIRE-RESISTANT, IMPERVIOUS TO MOISTURE, AND DIMENSIONALLY STABLE.
POLYISCYANURATE
(XPS)
EXTRUDED POLYSTYRENE
(EPS)
EXPANDED POLYSTYRENE
FOAMED-IN-PLACE INSULATION :
IT CONSISTS OF A FOAMED PLASTIC THAT IS SPRAYED OR INJECTED INTO A CAVITY .
LOOSE-FILL INSULATION :
IT CONSISTS OF MINERAL WOOL FIBERS, POURED BY HAND OR BLOWN THROUGH A NOZZLE INTO A CAVITY .
REFLECTIVE INSULATION :
UTILIZES A MATERIAL OF HIGH REFLECTIVITY AND LOW EMISSIVITY, AS PAPER-BACKED ALUMINUM FOIL OR FOIL-BACKED GYPSUM BOARD, IN CONJUNCTION WITH A DEAD-AIR SPACE TO REDUCE THE TRANSFER OF HEAT BY RADIATION.
ALUMINUM SURFACE
DOUBLE BUBBLE
ALUMINUM SURFACE
FOIL
POLY
BUBBLE
POLY
BUBBLE
POLY
FOIL

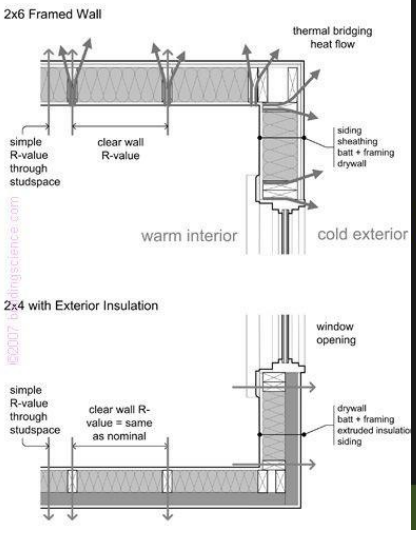

floor screed
seperating layer
rigid PIR insulation (0.022 W/mk)
concrete slab
damp proof membrane
hard core


HOT AND DRY CLIMATE
BUILDING STRATEGIES
Summer Sun
TREES PROVIDE SHADED TO THE SUN
EVAPORATIVE COOLING
Fountain
cool air
N
Bed Room
Bed Room
ROOM ARRANGEMENT
Wind catcher
Water Spray
Usable Space
WIND CATCHER OR TOWER
STACK EFFECT
EARTH AIR TUNNEL
CROSS-VENTILATION
Hot Breeze
COMPRESSED EARTH BLOCK
VEGITATION
Pitched
PERFORATED BRICK WALL
Flat
Double Pitched roof
flat roof

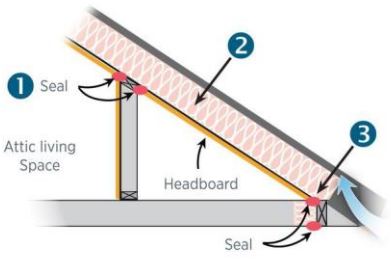

Ceiling void
transmission
SRS
SoundBreaker
Floor void
transmission
SRS
SoundBreaker

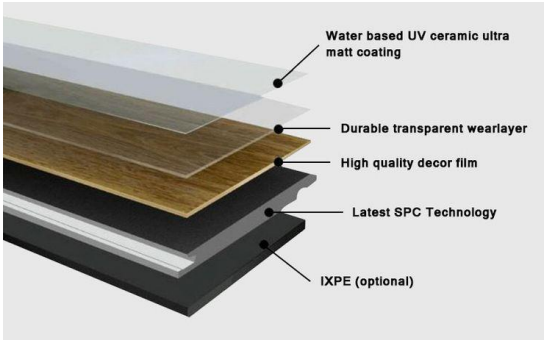

REDUCING
HEAT LOSS
IN YOUR HOME
Household running costs can really add up so it's important to try to find ways to alleviate the pressure. Reducing heat loss will not only help lower heating costs but it will also make your home more environmentally friendly and efficient!
STATISTICS
10% of your home heating bill costs stems from uninsulated floors.
On average, heating and cooling comprise 54% of a home's annual utility bills.
Insulating basement walls or slab foundation can reduce heating costs by 10%-20%.
Wall insulation can reduce a home's heat loss by 67%, while attic insulation can lead to a 40% decrease in heating and cooling costs.
A home that is well insulated against heat loss can recoup the costs of implementing insulation within 5-6 years from the resultant energy savings.
Source: Metro Home Insulation

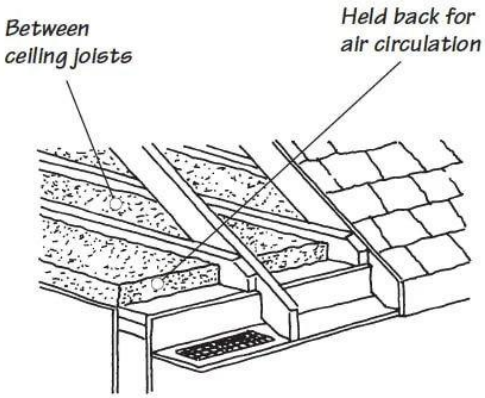

Old siding applied directly to studs
½-in. to ¾-in. air gap between felt paper and siding
Closed-cell spray foam
Felt paper stapled to framing

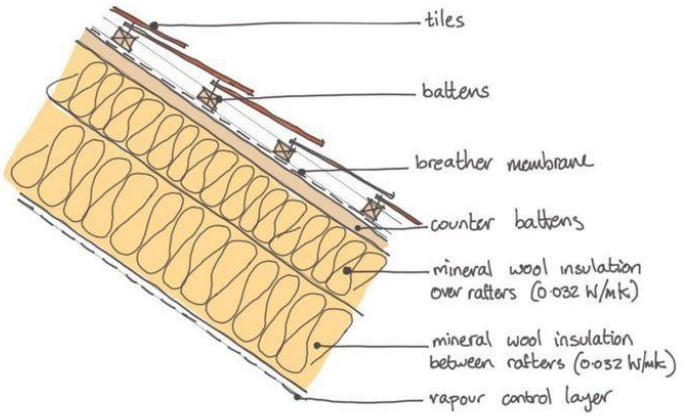

2x6 Framed Wall
thermal bridging heat flow
simple R-value through studspace
clear wall R-value
siding sheathing batt + framing drywall
warm interior
cold exterior
2x4 with Exterior Insulation
window opening
simple R-value through studspace
clear wall R-value = same as nominal
drywall batt + framing extruded insulation siding

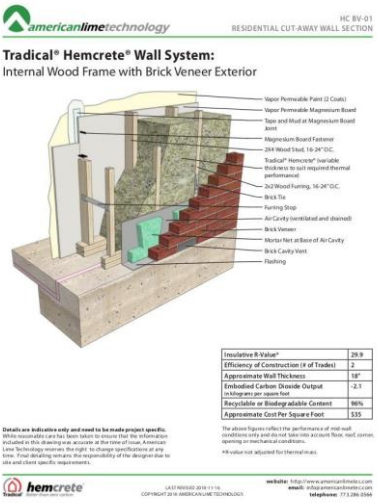

HTTPS://WWW.ABCDEPOT.CO.UK/
HOW DO YOU INSULATE A SOLID WALL?
Solid walls let twice as much warmth escape as cavity walls, so insulating them bodes well.
HOW CAN I TELL IF MY HOME HAS SOLID WALLS?
In the event that your house was worked before 1920, it presumably has solid outside walls instead of cavity walls, which just came into boundless use during the 1920s.
HOW MUCH DOES EXTERNAL WALL INSULATION COST?
The expense of external wall insulation remotely is around £100 per square meter, so it can extend from £8,000 for a little level up to £22,000 for an enormous withdrew house, and it could take numerous years to acquire back your speculation.
How could I reduce the costs of solid wall insulation without compromising on quality?
What is internal wall insulation?
Solid walls can be types of insulation inside by fitting inflexible sheets to the wall, or building a different stud wall and filling the hole with insulating material – for instance, mineral fleece fiber.


1 Seal
2
3
Attic living Space
Headboard
Seal

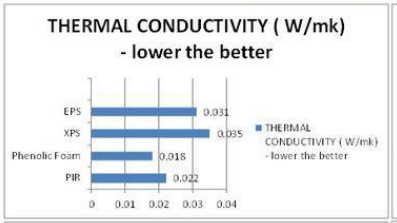

Water based UV ceramic ultra matt coating
Durable transparent wearlayer
High quality decor film
Latest SPC Technology
IXPE (optional)

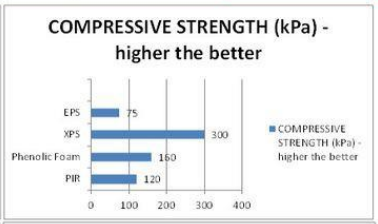

Between ceiling joists
Held back for air circulation

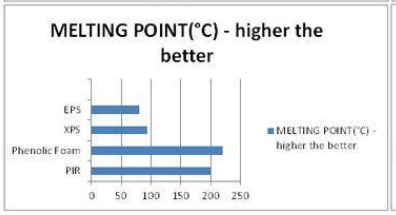


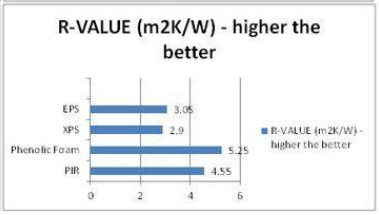


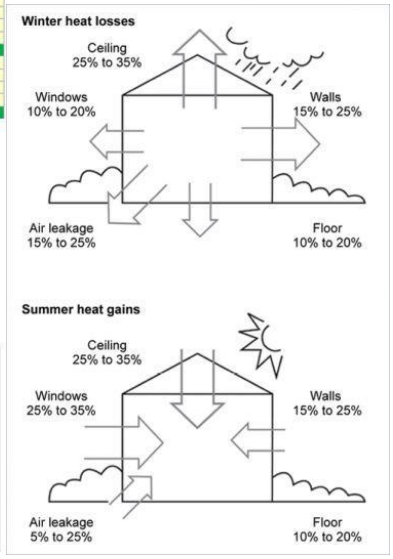
	PIR	Phenolic Foam	XPS	EPS
SIZE	2400x1200	2400x1200, 1200x600	1250x600, 1265x615, 1200x600	2400x1200, 1200x600, 1000x500
THERMAL CONDUCTIVITY (W/mk) - lower the better	0.022	0.018	0.035	0.031
COMPRESSIVE STRENGTH (kPa) - higher the better	120	160	300	75
R-VALUE (m2K/W) - higher the better	4.55	5.25	2.9	3.05
PRICE/(m2) Date:11/10/2022	£23	£38	£26	£15
FINISH	Aluminium foil facing	Composite foil	Unfaced	Unfaced
MELTING POINT(°C) - higher the better	200	220	94	80
FIRE CLASS	F	C-s2,d0	E-F	E-F
HISTORY (years)	70	55	15	30
DIFFICULTY IN CUTTING	***	***	**	*

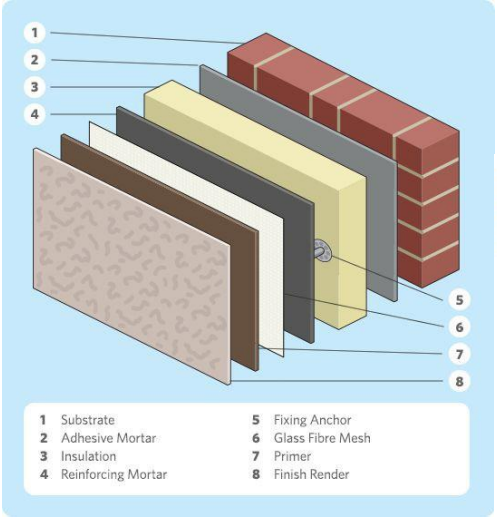






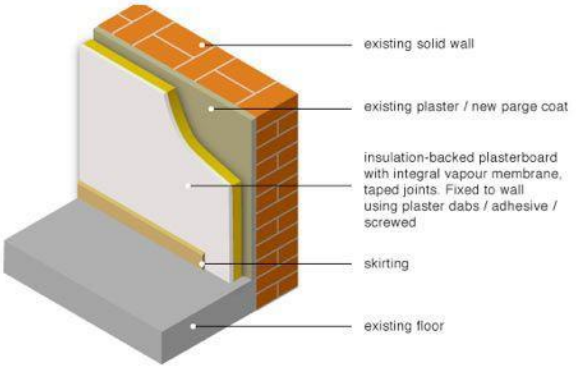


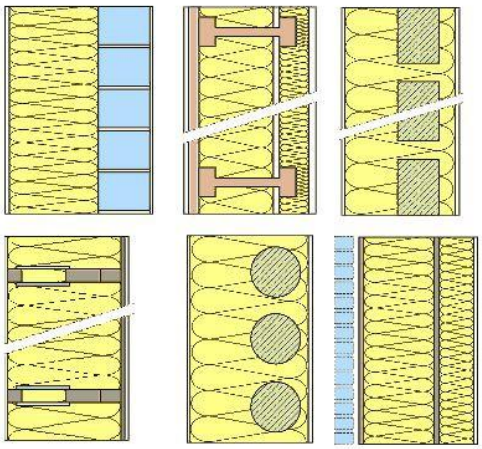


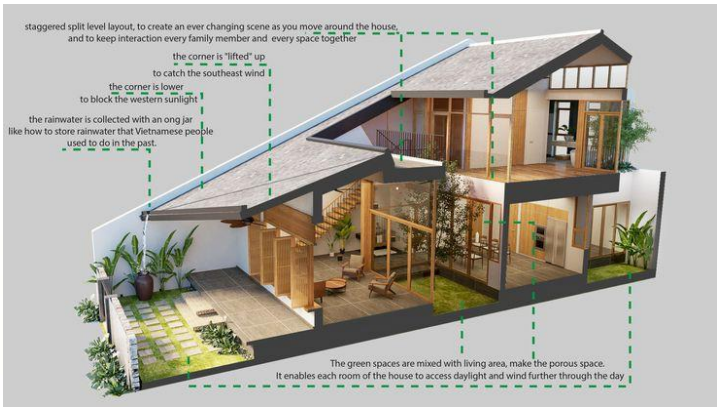


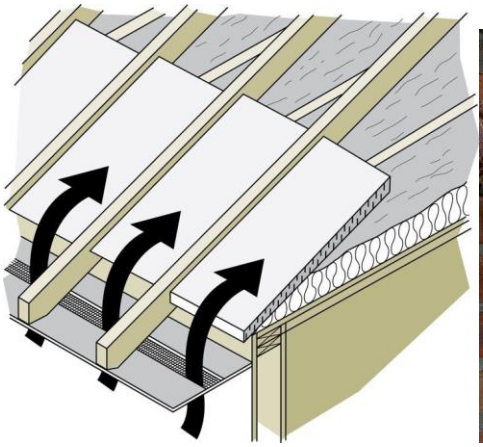
- Softer feel
- Less dusty
- Odourless
- Easy to cut

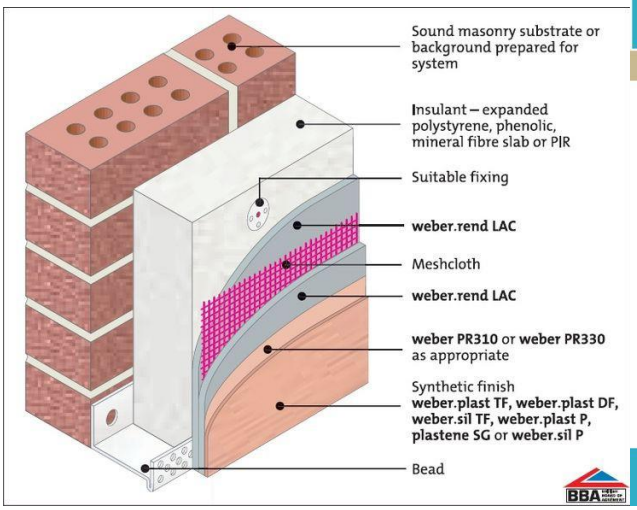
Knauf Insulation
mineral wool with ECOSE Technology
is naturally brown: there are no artificial colours or dyes added.

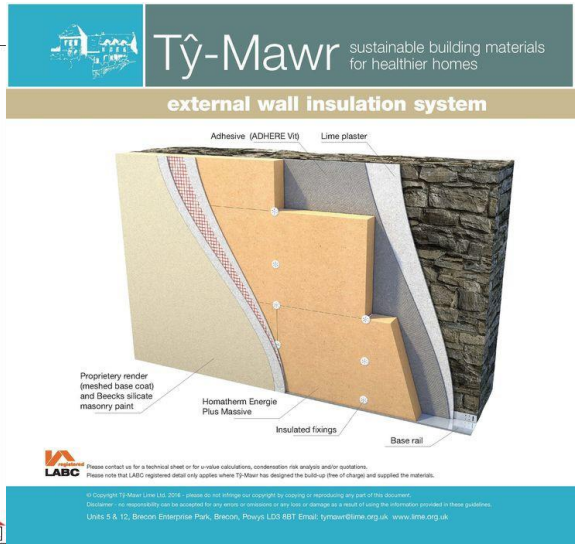

existing solid wall
existing plaster / new parge coat
insulation-backed plasterboard with integral vapour membrane, taped joints. Fixed to wall using plaster dabs / adhesive / screwed
skirting
existing floor

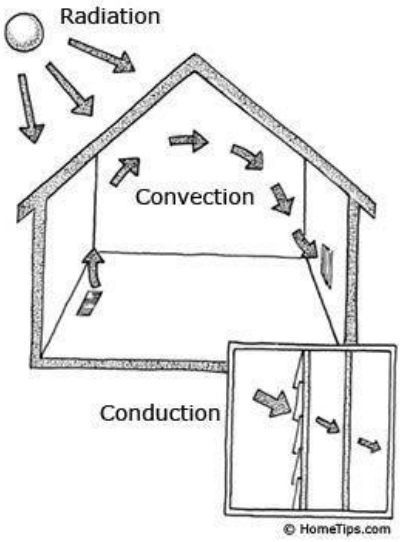


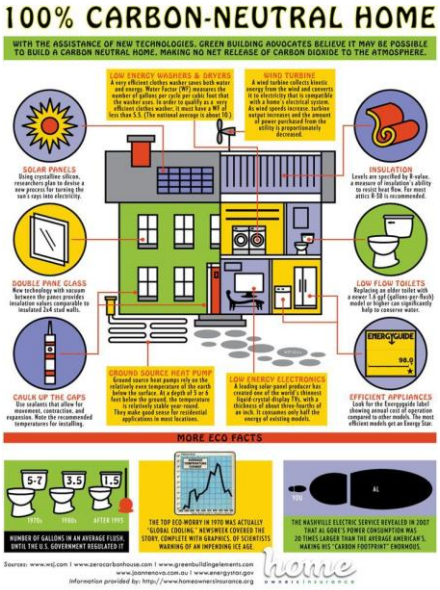

staggered split level layout, to create an ever changing scene as you move around the house,
and to keep interaction every family member and every space together
the corner is "lifted" up
to catch the southeast wind
the corner is lower
to block the western sunlight
the rainwater is collected with an ong jar
like how to store rainwater that Vietnamese people
used to do in the past.
The green spaces are mixed with living area, make the porous space.
It enables each room of the house to access daylight and wind further through the day



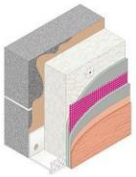

Sound masonry substrate or background prepared for system
Insulant – expanded polystyrene, phenolic, mineral fibre slab or PIR
Suitable fixing
weber.rend LAC
Meshcloth
weber.rend LAC
weber PR310 or weber PR330 as appropriate
Synthetic finish weber.plast TF, weber.plast DF, weber.sil TF, weber.plast P, plastene SG or weber.sil P
Bead
BBA


Tŷ-Mawr
sustainable building materials for healthier homes
external wall insulation system
Adhesive (ADHERE Vit)
Lime plaster
Proprietery render (meshed base coat) and Beecks silicate masonry paint
Homatherm Energie Plus Massive
Insulated fixings
Base rail
LABC
Please contact us for a technical sheet or for u-value calculations, condensation risk analysis and/or quotations.
Please note that LABC registered detail only applies where Tŷ-Mawr has designed the build-up (free of charge) and supplied the materials.
© Copyright Tŷ-Mawr Lime Ltd. 2016 - please do not infringe our copyright by copying or reproducing any part of this document.
Disclaimer - no responsibility can be accepted for any errors or omissions or any loss or damage as a result of using the information provided in these guidelines.
Units 5 & 12, Brecon Enterprise Park, Brecon, Powys LD3 8BT Email: tymawr@lime.org.uk www.lime.org.uk

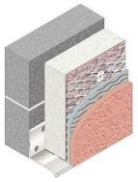

Radiation
Convection
Conduction
© HomeTips.com


100% CARBON-NEUTRAL HOME
WITH THE ASSISTANCE OF NEW TECHNOLOGIES, GREEN BUILDING ADVOCATES BELIEVE IT MAY BE POSSIBLE TO BUILD A CARBON NEUTRAL HOME, MAKING NO NET RELEASE OF CARBON DIOXIDE TO THE ATMOSPHERE.
LOW ENERGY WASHERS & DRYERS
WIND TURBINE
SOLAR PANELS
INSULATION
DOUBLE PANE GLASS
LOW FLOW TOILETS
CAULK UP THE GAPS
EFFICIENT APPLIANCES
GROUND SOURCE HEAT PUMP
LOW ENERGY ELECTRONICS
MORE ECO FACTS
5-7
3.5
1.5
NUMBER OF GALLONS IN AN AVERAGE FLUSH, UNTIL THE U.S. GOVERNMENT REGULATED IT
THE TOP ECO-WORRY IN 1970 WAS ACTUALLY "GLOBAL COOLING." NEWSWEEK COVERED THE STORY, COMPLETE WITH GRAPHICS, OF SCIENTISTS WARNING OF AN IMPENDING ICE AGE.
THE NASHVILLE ELECTRIC SERVICE REVEALED IN 2007 THAT AL GORE'S POWER CONSUMPTION WAS 20 TIMES LARGER THAN THE AVERAGE AMERICAN'S, MAKING HIS "CARBON FOOTPRINT" ENORMOUS.
Sources: www.wsj.com | www.zerocarbonhouse.com | www.greenbuildingelements.com
www.joannenova.com.au | www.energystar.gov
Information provided by: http://www.homeownersinsurance.org

One-Coat System with Lath or Mesh



Polymer Render Systems



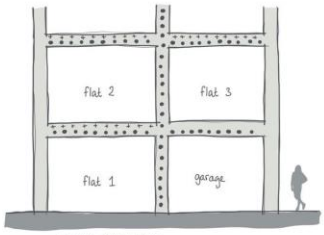
Traditional Render

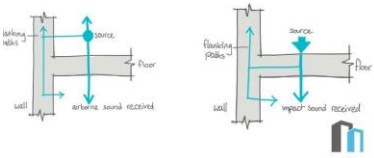
Brick Slip Faced Systems

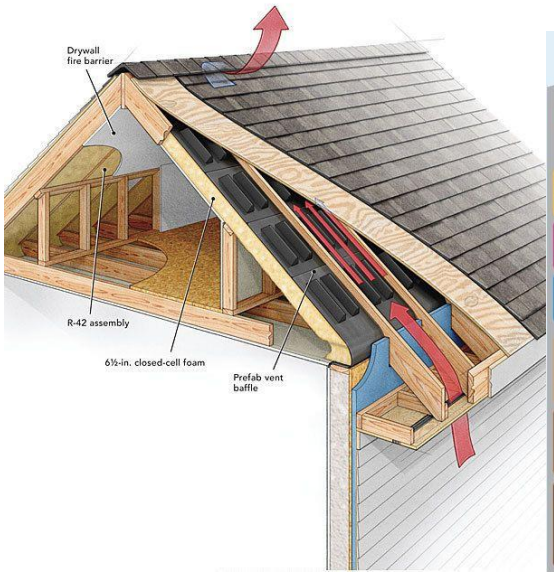
Building Element	Sound Reduction Index (R)				
	Octave intervals (centre frequencies in Hz)				
	125	250	500	1k	2k
Walls					
brick, cavity block	41	45	45	54	58
timber frame, lightweight cladding	24	34	40	45	49
Windows					
4mm single glazing, sealed	20	22	28	32	33
6mm single glazing, sealed	20	24	31	35	27
4mm double glazing, 12mm air gap	24	20	25	34	37
6mm double window, 150mm air gap	29	35	45	56	52
Door, well sealed					
Solid core, 25kg/m²	20	25	27	28	32
					35
					52

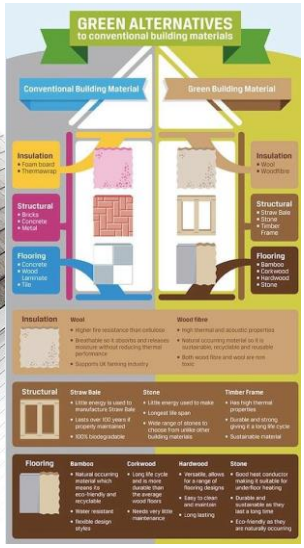
Data from Environmental science in building

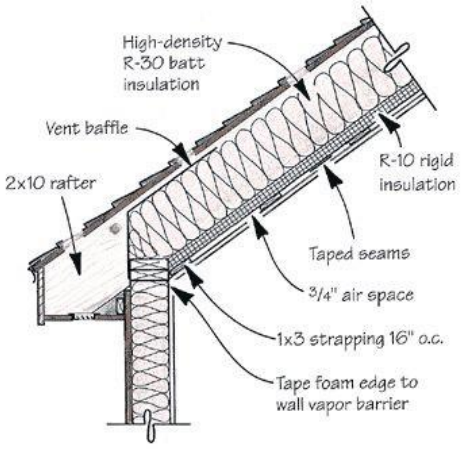
BUILDING FABRIC 04 SOUND











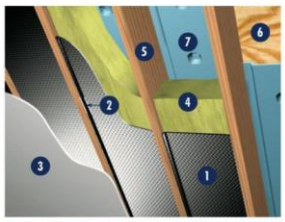
Verizon 6:53 PM 57%

pdf.lowes.com

IMPORTED COMPONENTS

Cathedral Ceiling

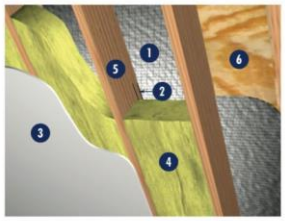
Reflectix® Installation Instructions



Northern Zone of the USA - With Reflectix® Below the Mass Insulation = R-7.0 Summer & R-1.0 Winter and a Vapor/ Moisture Barrier

1. Reflectix® Insulation
2. Continuous 0.75" Air Space (minimum)
3. Sheet Rock
4. Fiberglass Insulation (non-compressed)
5. Rafter
6. Roof Decking
7. Rafter Cavity Vent

Tools Required:
Safety Glasses
Staple Gun
Tape Measure
Utility Knife/Scissors



Southern Zone of the USA - With Reflectix® Above the Mass Insulation = R-6.0 Summer & R-2.0 Winter or a Radiant Barrier - Blocks 96% Radiant Heat

1. Reflectix® Radiant Barrier
2. Continuous 0.75" Air Space (minimum)
3. Sheet Rock
4. Fiberglass Insulation (non-compressed)
5. Rafter
6. Roof Decking

Tools Required:
Safety Glasses
Staple Gun
Tape Measure
Utility Knife/Scissors

Recommended Products:
Reflective/Bubble/Bubble/Reflective - Roll: BP24025 (24"x 25'), BP48025 (48"x 25')
Staple Tab, Reflective/Bubble/Bubble/Reflective - Roll: ST16025 (16"x 25'), ST24025 (24"x 25')
Radiant Barrier, Reflective/Woven Fabric/Reflective - Roll (Heavy Duty): RB4812550 (48"x125')

There are two methods for installing Reflectix products in a Cathedral Ceiling. For the Regional Recommendation on which installation method you should consider for your home, please utilize the "Zip Code Zone Locator" function at www.reflectixinc.com/zip-code-zone-locator, or contact our Customer Service Group at