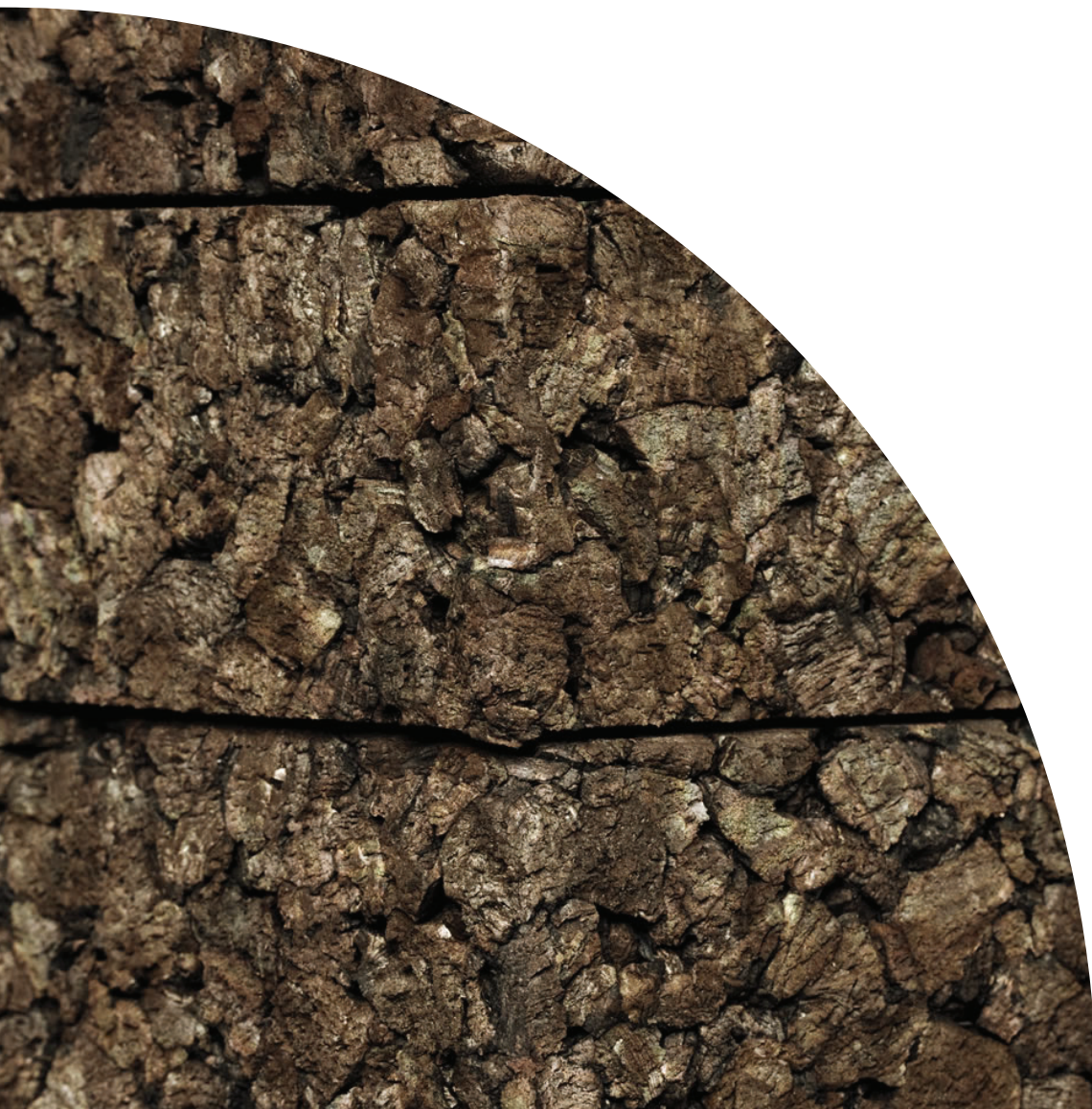

Expanded Cork Usage


Corklink - Your Cork Supplier, Direct From Portugal
www.corklink.com



TECHNICAL DATA SHEET

ICB PRODUCTS	
Density	From 100 to 120 Kg/m ³
Thermal Conductivity Coefficient	From 0,037 to 0,040 W/mK
Thermal Diffusion	1,4x10 ⁻⁷ / 1,9x10 ⁻⁷ m ² /s
Tension to Stress	From 1,4 to 2,0 Kg/cm ²
Tension to Compression at 10%	From 1,4 to 2,0 Kgs/cm ²
Elasticity	≥ 100 Kpa
Permeability to Steam	386 ng/Pa.sm ²
Resistance to the Diffusion of Steam	μ = 7 to 14
Fire Class	E (s1, d0)
Fire Class (ETICS System)	B (s1, d0)
Usage Temperature	-180°C to +140°C

DIMENSIONS OF THE BOARDS	
Length x Width	1000 x 500mm
Thickness	10 to 300mm

CERTIFICATIONS	
Certification / Normalization	 EN13170
Emissions to the interior air	
Certification	FSC - Forest Stewardship Council
Environmental Declaration of the Product - DAP Habitat	

Excellent thermal, acoustical and vibrations insulator, with high elasticity

100% Natural Product - The Cork agglutination process made without synthetic bonding agents, only overheated water steam is used

Eco-friendly product - Low energy consumption (over 90% of the energy consumed is biomass), the Cork forest consumes 5% of the CO2 produced in Portugal

Sustainable product - Renewable Raw material, 100% Recyclable

INSULATION VALUES (R in m ² k/W and K in W/m ² K)		
THICKNESS	R	K
40mm	1,000	1,000
50mm	1,250	0,800
60mm	1,500	0,667
80mm	2,000	0,500

ECOLOGICAL INDICATORS	
Delay time (in hours per 20cm)	13
Primary energy	Very low
Carbon sinks	
100% recyclable	
Reduces the greenhouse effect	



CORKLINK

We are a supplier of a range of cork products, based in northern Portugal. As well as supplying expanded cork board and granules, we also supply cork stoppers, cork homeware products, natural cork granules and cork flooring. Portugal is the world's largest supplier of cork products and the expertise in growing cork as well as harvesting and processing it stretches back through many generations. If you require any information about any of the cork products we commercialise, please visit our website at www.corklink.com or contact us at info@corklink.com.

EXPANDED CORK BOARD

Expanded Cork Board is a natural, 100% vegetable product which derives from the cork taken from cork oak maintenance and cleaning operations.

Cork oak forest maintenance contributes to the sustainability of a vast and fragile ecosystem, on which many animal and vegetal species depend. Some of them are at risk of extinction. It also contributes to a reduction in the occurrence of fires and also ensures the income of a large part of the Iberian rural population, thereby combating rural desertification. The cork oak area contributes to the annual sequestration of many tonnes of CO₂. Cork production and use keeps the CO₂ retained throughout its working life, contributing to a reduction in the greenhouse effect and global warming.

The Expanded Cork Board is made by

expanding cork grains through the action of steam. It is agglutinated from resins in the cork itself, without the use of any synthetic agents, namely glues or solvents.

When heat is produced to generate steam, fossil fuels are not used. Biomass from the manufacturing process is mainly used, representing around 93% of the energy consumed. The physical and mechanical properties of cork afford the creation of an elastic product which is permeable to steam, long-life (without altering its properties) and endowed with excellent thermal, acoustic and vibration proofing characteristics.

Expanded Cork Board has the CE marking - European standard EN 13170 and its technical characteristics are checked periodically in accordance with said

standard at the National Civil Engineering Laboratory - LNEC.

During the course of its commercial activity particular attention is paid to the goods transport to destination market factor, endeavouring to keep the ecological costs thereof to a minimum. With this in mind, low level pollutant transport options are always preferred or, failing that, large-scale transports (truck, container) so as to reduce the impact thereof.

This product thus proves to be environmentally-friendly and ecologically recommendable since it keeps the carbon sequestered and its production does not involve any synthetic, pollutant agent, contributing to a major reduction in energy consumption and it can be recycled after use and is 100% biodegradable.



Facade insulation

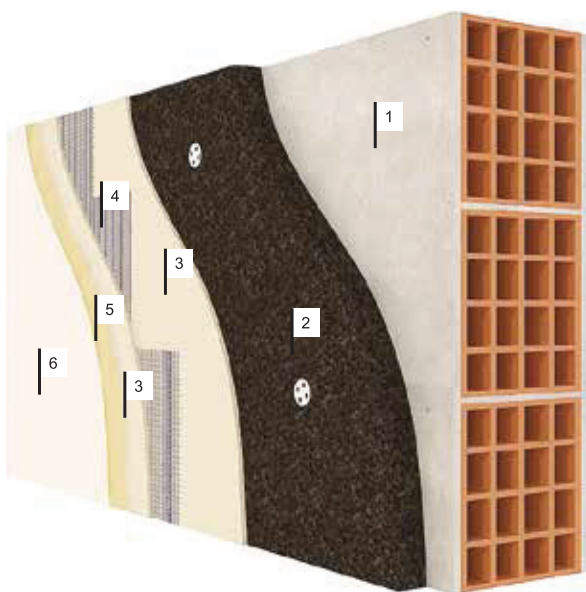
EXPANDED CORK BOARD - ICB PROVIDES EXCELLENT THERMAL INSULATION AND SOUDPROOFING WHEN APPLIED OUTDOORS

Along with other components such as adhesive, framing and plastering, it provides an easy, modern and more economical finish which can be used on old and recent constructions. This facade lining and insulation system is characterized by: saving

energy, reduction in thermal bridges, increase in thermal inertia, reduction in wall thickness, improvement in wall impermeability, reduction in condensation risk, increase in facade durability and facade rehabilitation without disturbing its occupants.



ETICS SOLUTION

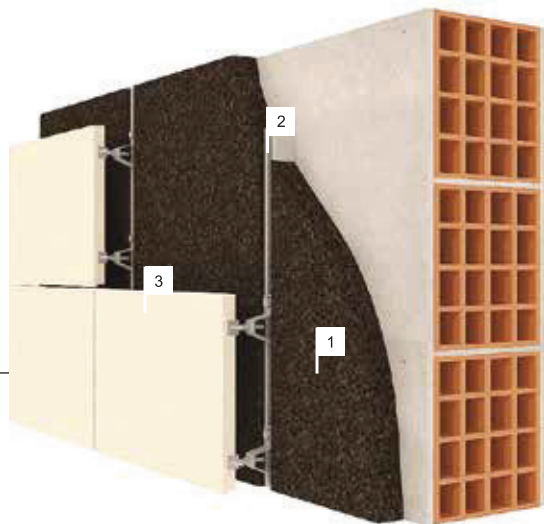


AVERAGE "K" COEFFICIENT VALUES (IN W/m ² °C)				
Wall characteristics	K WITH INSULATION/THICKNESS			
	e=4cm	e=5cm	e=6cm	e=8cm
Ceramic brick 22	0,580	0,529	0,450	0,370
Stone >40 t<60	0,740	0,675	0,540	0,420
Light concrete block t = 20	0,580	0,529	0,450	0,370
Normal concrete block t = 20	0,650	0,593	0,490	0,400
Reinforced concrete <10 t< 20	0,790	0,721	0,560	0,440

1. Wall 2. Expanded cork board - ICB 3. Roughtcast 4. Fibre net 5. Primer 6. Final finish

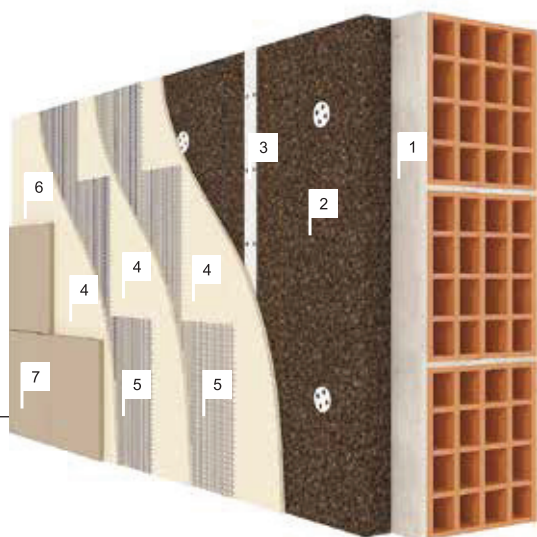
Facade insulation

VENTILATED FACADE



- 1. Expanded Cork board - ICB
- 2. Risers
- 3. Stone lining

POLYSTERM SOLUTION



- 1. Wall
- 2. Expanded Cork board - ICB
- 3. Polyethylene profile
- 4. Bar
- 5. Fibre glass net
- 6. Primer
- 7. Final finish (ceramic or paint)

Benefits

Usage temperature: -180°C to + 140°C

Overhead noise insulation (wall 22 cm + 5 cm cork) = 50 dB (LNEC test)

Excellent thermal delay

Good dimensional stability

Fire resistance

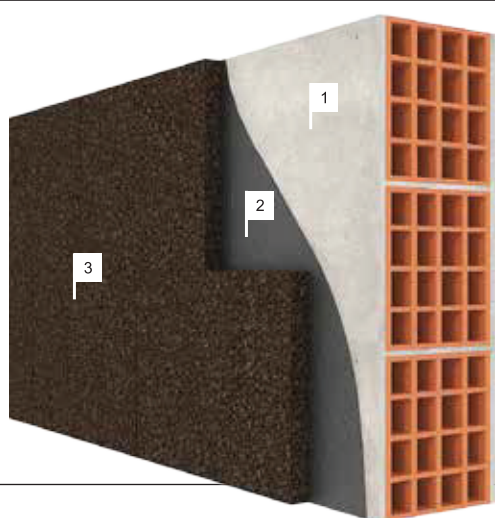
Resistance to impact/drilling

Facade insulation

EXTERIOR FACADE COATING WITH CORK AS EXTERNAL FINISHING – TYPE REV

The Expanded Cork Board slabs of the REV type, for exterior facade coatings with cork as external finishing, are made from a careful selection of raw materials, with the right density, as a way of improving its mechanical resistance, as

well as reducing the water absorption. Its unique characteristics allow an excellent behavior, even when submitted to the most adverse weather conditions.



CHARACTERISTICS	
Density	140 to 160 Kgs/m ³
Thermal Conductivity Coefficient	0,042 to 0,046 W/mK
Water absorption	< 0,3 Kg/m ²
Dimensions	1000x500mm
Thicknesses	from 40mm to 240mm

- 1. Wall
- 2. Bonding
- 3. Expanded Cork Board (REV type)

Benefits

Facade insulation

Natural and ecological product

Thermal and acoustic isolation

Wall insulation

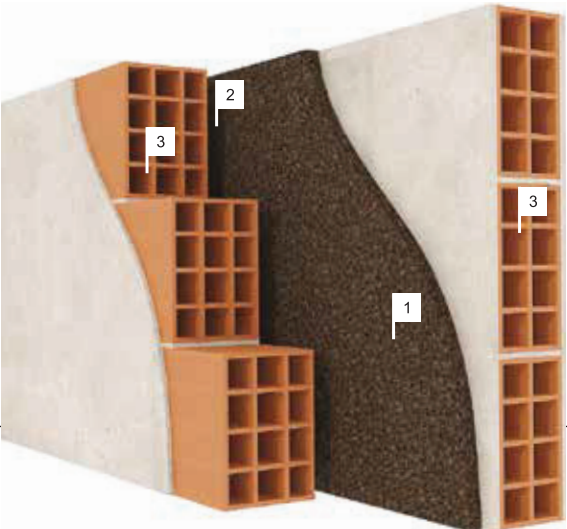
REAL THERMAL AND ACOUSTIC COMFORT

The application of Expanded Cork Board in the insulation of double walls (air gap) provides excellent thermal insulation for a long time period plus suitable acoustic comfort. Double walls with an air gap tend to create serious problems with dampness which is why it is of paramount importance to create a groove

at the bottom of the air gap, on the slab, with an outlet to the exterior, thereby creating ventilation of the air gap which, along with the barrier caused by the Expanded Cork Board, eliminates any dampness problems.



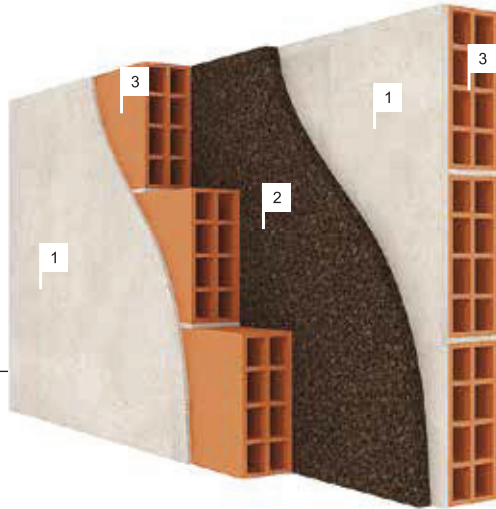
INSULATION OF EXTERIOR WALLS (AIR GAP)



- 1. Expanded cork board - ICB
- 2. Ventilated Air Gap
- 3. Double wall

Wall Insulation

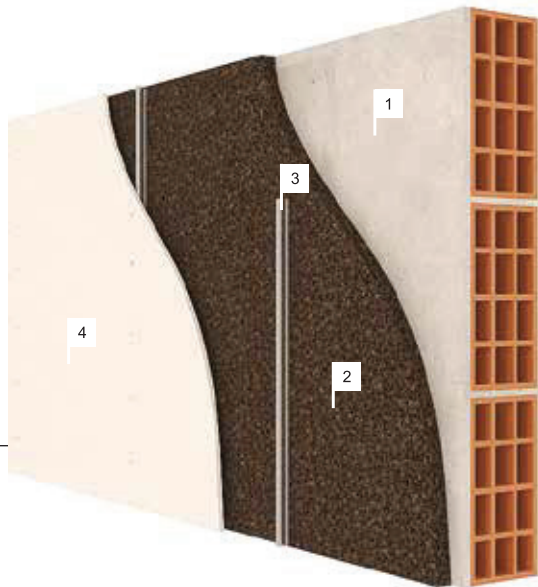
INTERIOR WALL INSULATION (IN MASONRY)



OVERHEAD SOUNDPROOFING
11cm dual wall
4 cm expanded cork
+ agglomerate - ICB in air gap
RW=53 dB (LNEC test)

1. Plaster
2. Expanded Cork Board - ICB
3. Double wall

INNER WALL INSULATION (MADE OF PLASTERBOARD)



1. Plaster
2. Expanded Cork Board - ICB
3. Risers
4. Plasterboard

Benefits

Comfort - thermal insulation and soundproofing

Dimensional stability of the material

Natural product (healthier)

Excellent transpiration capacity

Energy savings

Effectiveness without time limit

Flat Roof Insulation Tradicional System

ROOFS ARE EXPOSED TO GREAT THERMAL AMPLITUDES

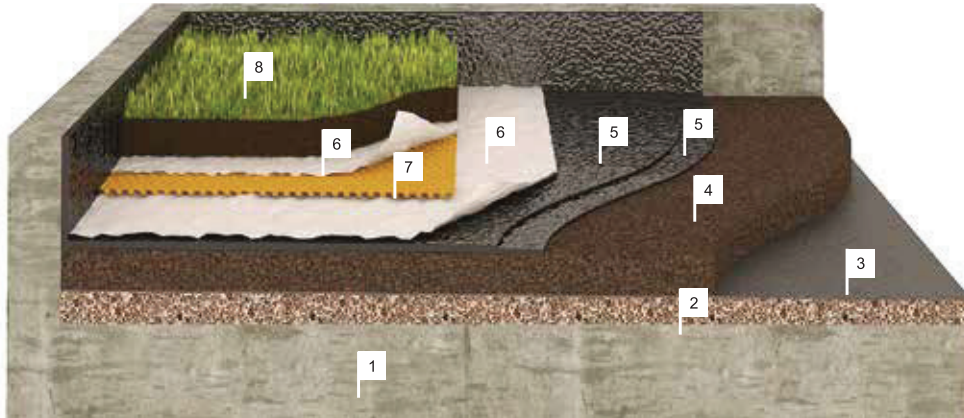
On a traditional roof, the insulation serves to support the waterproofing and there is a need to place a barrier to the steam under the insulating material owing to the permeability of this solution to steam. The protection layer (light or heavy) depends on accessibility to the roof. Expanded Cork Board are practically inert and wholly compatible with most of the materials deployed in civil construction, thereby accepting the application of the waterproofing system (asphaltic membrane, waterproofing mortars, membranes etc.), avoiding the car-

rying out of screeds, namely on roofs with limited accessibility when restoring buildings.

Traditional roofing types:

- Insulation with light protection (self-protected)
 - Insulation with heavy protection (gravel, slab surfaces etc.).
- ICB is the most ecological solution, maintaining its characteristics over time, simultaneously satisfying thermal insulation and soundproofing requirements when faced by the most varied thermal amplitudes.

GREEN ROOF



1. Slab 2. Light concrete with cork/formation of slope 3. Steam barrier 4. Expanded Cork Board - ICB 5. Waterproofing 6. Geotextile layer 7. Drainage layer 8. Vegetal layer

Benefits

Stability to waterproofing

Usage temperature: -180°C to +140°C

Safe installation

Excellent soundproofing

Resistant to wind strength

Durability

Excellent thermal delay

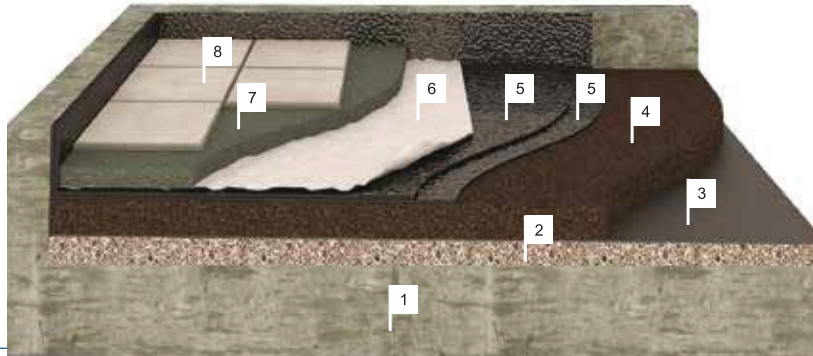
Excellent properties

THERMAL DELAY - The thermal calculation is based on the thermal conductivity value of the insulating materials and the exterior temperature differences are deemed to be negligible. However, the temperatures of the exterior surfaces (for example, on the roofs) are subject to thermal amplitudes 24 hours a day. This temperature variation, typical of Mediterranean countries, leads us to consider not only thermal conductivity, but also the thermal inertia of the materials, resulting in a delay in

the propagation of heat flow from the exterior to the interior. This thermal delay will be greater, the larger the heat capacity and the lower the thermal diffusivity of the materials going to make up the roof. The economic thickness calculations of the thermal insulations should bear in mind not only the thermal conductivity value but also its thermal diffusivity. The Expanded Cork Board - ICB has the edge in the latter aspect compared with the thermal insulations usually used.

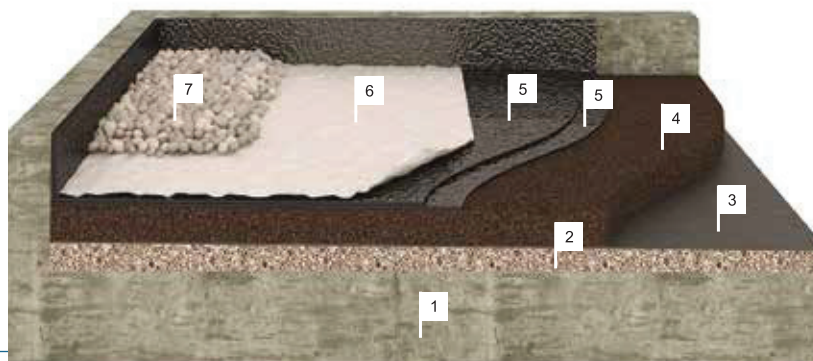
Flat Roof Insulation Traditional System

THERMAL INSULATION AND SOUNDPROOFING - ROOFS WITH UNLIMITED ACCESSIBILITY



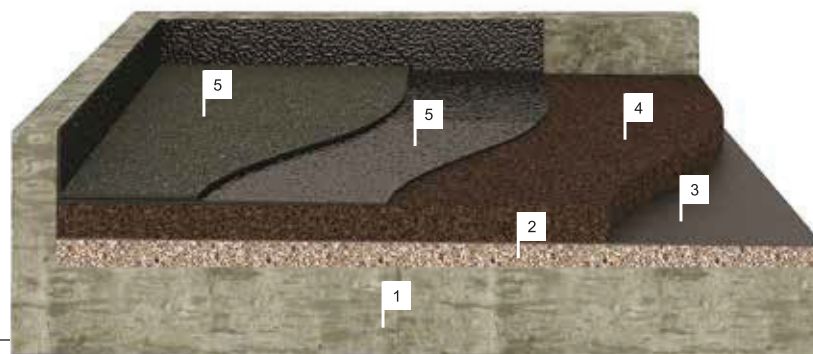
1. Slab
2. Light concrete with cork/formation of slope
3. Steam barrier
4. Expanded Cork Board - ICB
5. Waterproofing
6. Geotextile layer
7. Screed
8. Final finish

THERMAL INSULATION AND SOUNDPROOFING - REFLECTIVITY SOLUTION



1. Slab
2. Light concrete with cork/formation of slope
3. Steam barrier
4. Expanded Cork Board - ICB
5. Waterproofing
6. Geotextile layer
7. Rolled pebble

THERMAL INSULATION AND SOUNDPROOFING - ROOFS WITH LIMITED ACCESSIBILITY



1. Slab
2. Light concrete with cork/formation of slope
3. Steam barrier
4. Expanded Cork Board - ICB
5. Waterproofing with schist granulate finish

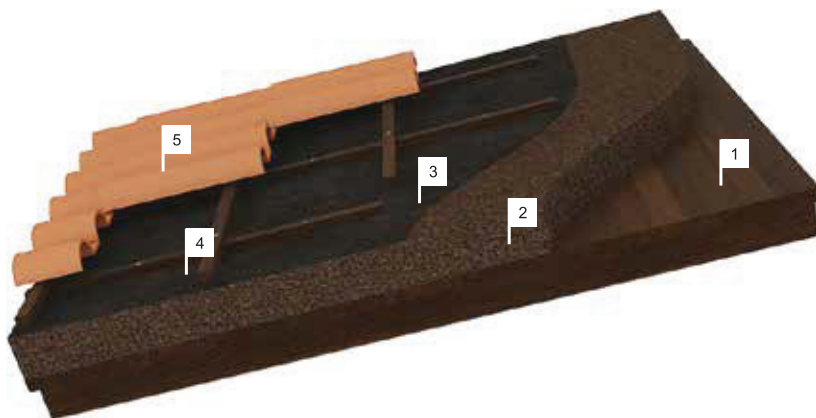
Sloping roof insulation

Owing to its properties, Expanded Cork Board – ICB is the appropriate insulating material for this system as it corrects, if not all, at least most of said thermal amplitudes. The use of

Expanded Cork Board is ideal thanks to its long durability and the fact that it represents an economical solution which meets all the necessary requirements.



THERMAL INSULATION AND SOUNDPROOFING OF SLOPING ROOFS



1. Ceiling 2. Expanded Cork Board – ICB 3. Transpiring ply and steam control 4. Lath and counter lath 5. Tile

Sloping roof insulation

Benefits

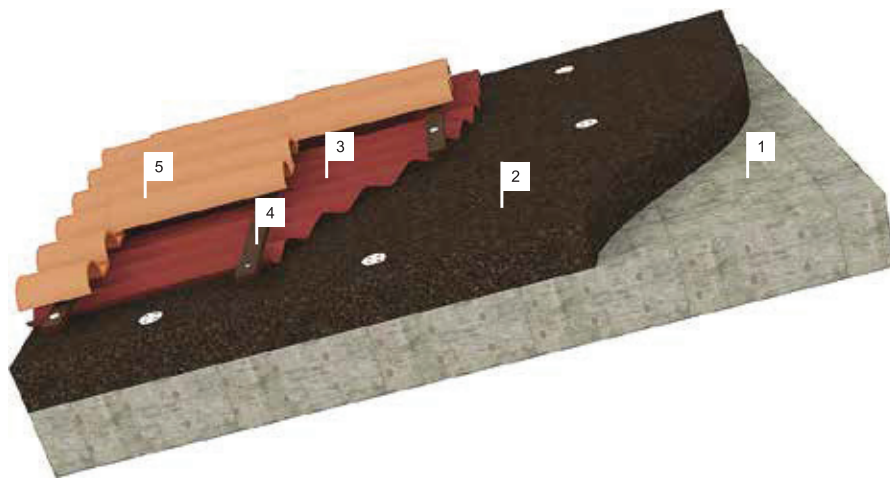
Effective thermal insulation and soundproofing, resulting in energy savings

Besides being a good insulator, it has unlimited durability

Its characteristics remain unchanged and it is easily recyclable

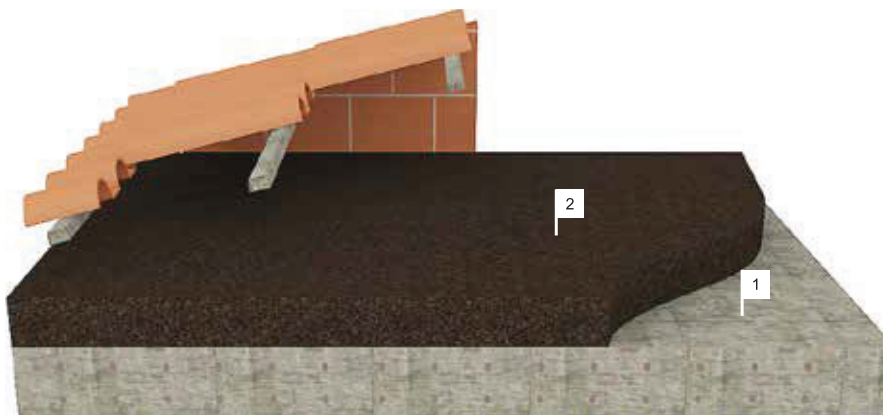
High transpiration capacity

THERMAL INSULATION AND SOUNDPROOFING ON THE CONCRETE SLAB



1. Slab or beams 2. Expanded Cork Board – ICB 3. Underlay 4. Lathing 5. Tile

THERMAL INSULATION AND SOUNDPROOFING – FLAGSTONES (unvisitable attics)



1. Slab 2. Expanded Cork Board – Reggranulate of Expanded Cork

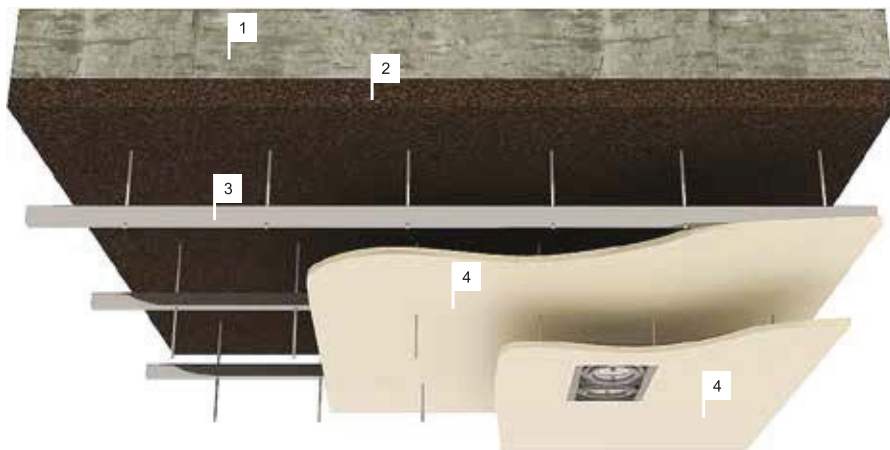
Acoustic Insulation

ACOUSTIC INSULATION IS CHARACTERIZED BY THREE DIFFERENT TYPES OF INSULATION:



1. INSULATION FROM OVERHEAD NOISE

INSULATION FROM OVERHEAD NOISE consists of reducing the transmission of noise produced outside or in adjoining rooms which is propagated via the structure of the buildings (walls, flooring, doors and windows).



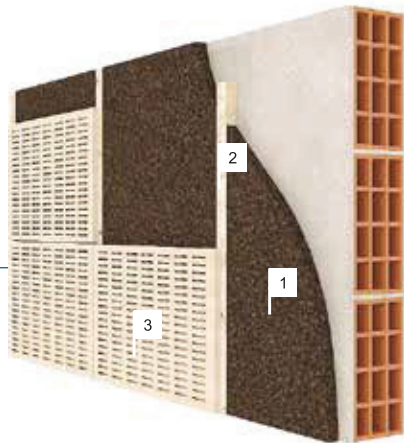
1. Slab 2. Expanded Cork Board – ICB 3. Risers 4. Plasterboard

Acoustic Insulation

2. ACOUSTIC CORRECTION

ACOUSTIC CORRECTION consists of reducing the sound level in dB (decibels) of a certain environment as well as reducing its reverberation time. Expanded Cork Board proves to be an excellent material for the acoustic correction of certain

environments such as theatres, classrooms, concert halls, meeting rooms etc. Expanded Cork Board reduces the sound level through absorption effects, allowing a reduction in reverberation times.



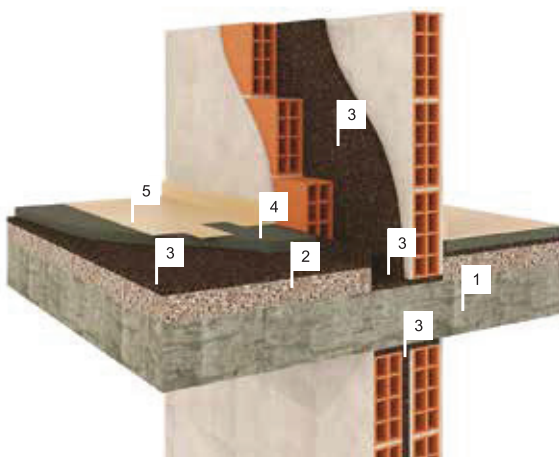
ABSORPTION COEFFICIENT P/500HZ
ICB 25mm=0,33

- | |
|------------------------------|
| 1. Expanded Cork Board – ICB |
| 2. Lathing |
| 3. Perforated panels |

3. INSULATION FROM PERCUSSION NOISES

The INSULATION OF PERCUSSION NOISE consists of reducing the noise sound level of impacts on the slabs, transmitted to the immediately lower storey. For effective reduction, total independence must be ensured between the property's flooring and structure. The interposition of an elastic element, the Expanded

Cork Board, between the flooring and the slab, brings about a reduction in the transmission of vibrations and noises resulting from impacts. It will also be important to maintain the discontinuity between the flooring screed and the adjoining walls, thereby eliminating marginal transmissions.



LNEC OVERHEAD NOISE TESTS
11 cm dual wall
+ 4 cm cork - ICB in air gap
RW=53 dB (LNEC test)

LNEC IMPACT NOISE TESTS
14 cm concrete slab
7cm light weight concrete with Regranulate of Expanded Cork
2cm Expanded Cork Board - ICB
4cm screed
+ final flooring
Ln,r,w = 55 dB (LNEC test)

1. Slab 2. Light concrete with cork 3. Expanded cork agglomerate - ICB 4. Screed 5. Final Flooring

Benefits

Excellent acoustic correction effectiveness

Avoids propagation of existing vibrations

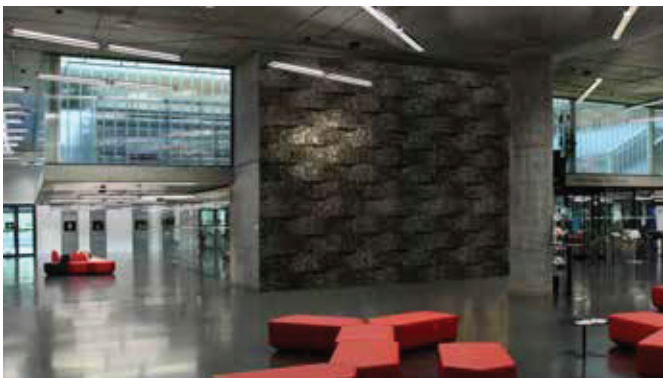
Major reduction in overhead and percussive noises

Acoustic Insulation

CUSTOMIZED INSULATION SOLUTIONS FOR ARCHITECTURE AND CONSTRUCTION

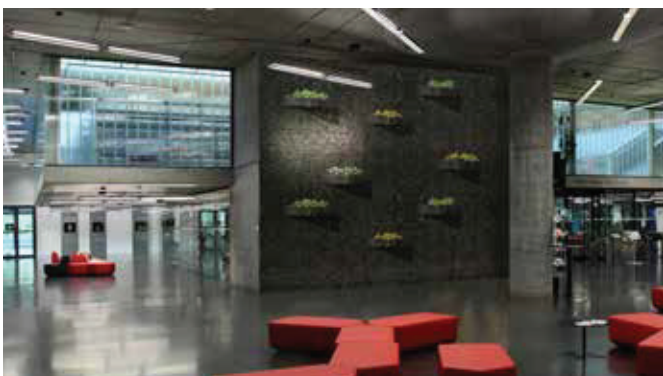


CORKWAVE ACOUSTIC



CorkWave system is the most recent creation from Sofalca, which consists of an acoustic and thermal insulation system, created from the waves present in the expanded cork sheet. Very pleasant to the eye, the CorkWave system allows the creation of interior and exterior facades and walls adjustable to the personal taste. This idea came up as a complement to architecture, combining the thermal and acoustic insulation properties of cork to its esthetic effect. Cork's ecological character and the new wavy look of CorkWave make it a very innovative solution, where originality and acoustic performance stand out.

CORKWAVE GREEN



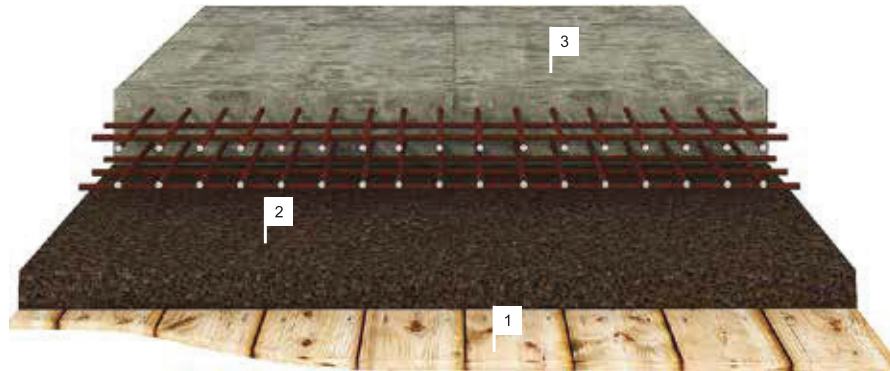
CorkWave Green system is born from CorkWave, producing interior or exterior vertical gardens. The desire of having a vertical garden combined with the insulating characteristics of cork made it possible for the creation of this harmonious piece of design. The curves of the CorkWave sheets are the basis for the plants' vases, which will look as if suspended in mid air coming out of the wall. With this symbiosis it is possible to have an indoor garden in perfect harmony, at the same time it improves the acoustic conditions, thanks to the CorkWave system.

Insulation of concrete structures

THERMAL INSULATION AND SOUNDPROOFING IS VITAL FOR DWELLING COMFORT

Mainly light materials are deployed in thermal insulation whilst in soundproofing heavy, absorbent and elastic materials are used. The application of Expanded cork agglomerate

directly in the formwork allows a reduction in overhead noise between residential storeys as well as the structural discontinuity of interior walls.



1. Formwork 2. Expanded Cork Board - ICB 3. Concrete slab

Benefits

Reduction in sound level of percussive noise

Reduction in thermal losses between adjoining floors

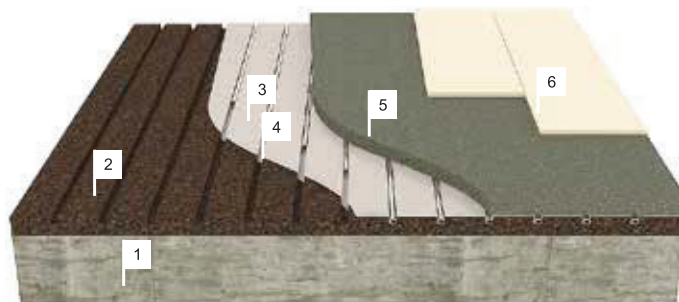
Reduction in sound level of noise transmitted by air

Easy application - directly on formwork (does not require adhesion)

Reduction in vibration transmission

Easy lining and low cost

THE EXCELLENCE OF CORK ON HEATED FLOORS



1. Slab 2. Expanded Cork Board- ICB 3. Reflective sheet or retractable film 4. Heating pipe 5. Screed 6. Final flooring

Radiant flooring consists of a piping circuit placed below the floor and a thermal regulation system which allows the atmospheric temperature to be controlled at any time through the circulation of hot water or electricity. Grooved SOFAFLOOR Expanded Cork Board - ICB boards serve as the base for heating pipes, allowing the easy application owing to the design of the boards themselves, acting as thermal insulation and avoiding the propagation of the cold transmitted by the ground.

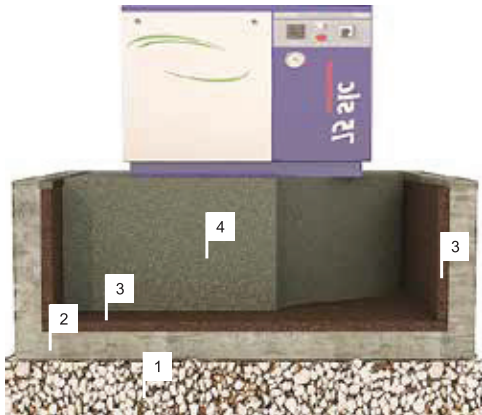
By contrast, the structural discontinuity between the flooring screed and the slab, obtained by applying Expanded Cork Board for thermal insulation, will bring about a major reduction in the transmission of vibrations and noise resulting from impacts on the flooring. Hence, the interposition of Expanded Cork Board - ICB on radiant flooring serves a dual purpose: Thermo-insulating and Phono-insulating.

Antivibration Insulation

IN VIEW OF THE FACT THAT ALL THE VIBRATIONS ARE TRANSMITTED TO THE STRUCTURE OF THE BUILDINGS, THIS FACT SHOULD NOT BE IGNORED

In view of its elasticity Expanded Cork Board is endowed with remarkable anti-seismic qualities, proving to be an excellent antivibration insulating material.

When applying it, due consideration should be given to the elements submitted in terms of the density and thickness of the Expanded Cork Board in line with the acting loads.



1. Riprap 2. Reinforced concrete slab 3. Expanded Cork Board - ICB High Density 4. Reinforced concrete affixation

RECOMMENDED PRESSURES AND THICKNESSES				
THICKNESS IN CM	2,5	5	7,5	10
Density of 145 to 160 Kg/m ³ - Recommended pressure in Kgf/cm ² – daN/cm ²	0,8-1,0	0,7-1,2	0,5-1,5	0,3-1,8
Density of 175 to 190 Kg/m ³ - Recommended pressure in Kgf/cm ² – daN/cm ²	1,0-1,5	0,8-1,8	0,6-2,0	0,5-2,2

Benefits

Highly effective insulation from the transmission of vibrations, it withstands heavy loads and is resistant to oils, water and acids

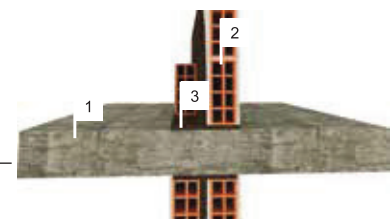
Unlimited durability and it is easy to transport and install

As its characteristics are not lost over time, it is considered to be ideal for this type of applications

STRUCTURAL DISCONTINUITY OF WALLS

In order to achieve the greatest possible elimination of resonance (vibration of a rigid body when hit by a sound wave of a specific frequency close to its own), it must firstly be sought to implement structures which are as heavy as possible and that will not vibrate as easily, simultaneously using structural discontinuities which can be carried out through the interposition of Expanded Cork Board strips.

- 1. Slab
- 2. Brick
- 3. Expanded Cork Board - ICB

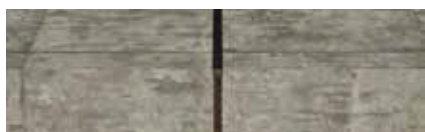


EXPANSION JOINTS

Thermal type Expanded Cork Board agglomerate is an appropriate material for expansion joints in view of the fact that, because of its elasticity, it can perfectly accompany the expan-

sions and contractions of the structural elements, allowing its application in construction without any danger of settlements as the normal loads are around 300 kg/m².

Continuous expansion joints



Discontinuous expansion joints



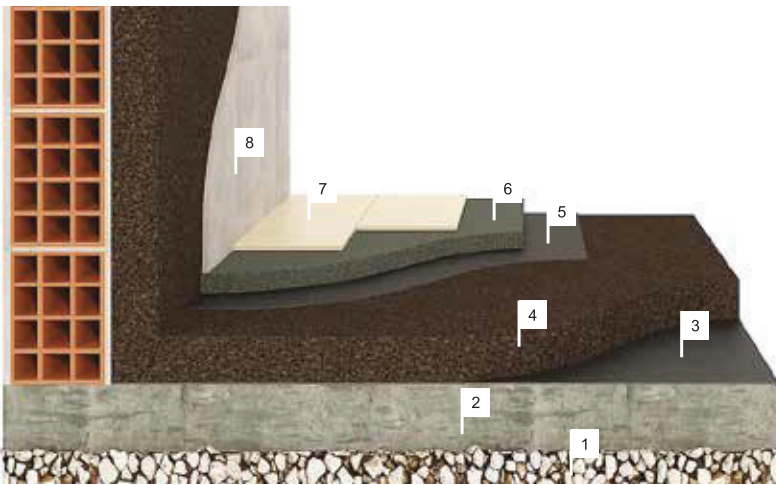
Natural insulation for cold stores

COLD STORE INSULATION

Expanded Cork Board is the ideal insulating material for cold stores (upkeep, freezing and controlled atmospheres). The low thermal conductivity coefficient, affording high thermal resistance with low thicknesses, appropriate specific weight, associated with notable bending and compressive strength, elastic deformation for pressures of 2000 kg/m², ease of application, perfect integration in structures and unlimited du-

ration, proven by works carried out over half a century ago, all go to make up a series of characteristics that no other material can offer. Duly calculated cold store insulation constitutes an excellent investment with high dividends receivable in the short-term as not only energy is saved in the maintenance of the required temperatures, the power of the apparatus to be installed is also reduced and hence its cost.

STORAGE CHAMBERS

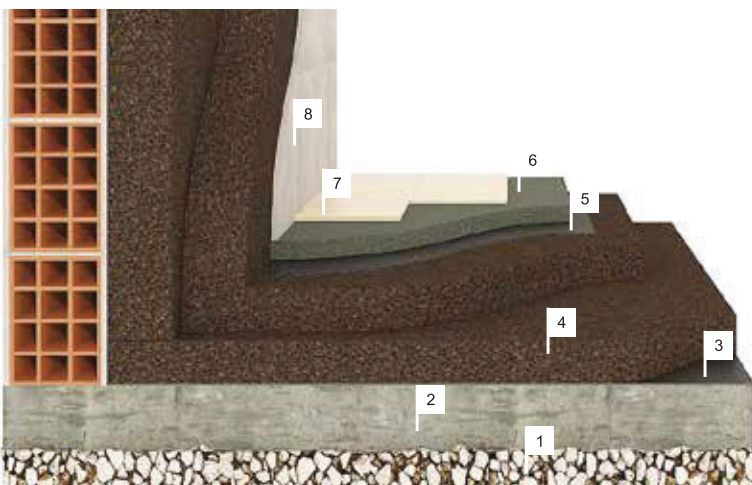


Application in Cold Stores

A technique which is usually deployed for storing fruit, vegetable products and flowers. It consists of storing products at very low - but above zero - temperatures, generally at between 0°C and 12°C.

1. Riprap
2. Slab
3. Steam barrier
4. Expanded Cork Board - ICB 50/100 mm
5. Waterproofing
6. Screed
7. Final flooring
8. Plaster

FREEZING CHAMBERS



Application in Freezing Chambers

The freezing technique extends to meat, fish, butters, cheeses and many other perishable products, to wit, certain fruits. It consists of storing products below zero, usually under the micro-organism development limits and temperatures of up to -40°C are standard.

1. Riprap
2. Slab
3. Steam barrier
4. Layers of Expanded Cork Board - ICB 100/150 mm
5. Waterproofing
6. Screed
7. Final Flooring
8. Plaster

Regranulate

RECYCLED ECOLOGICAL PRODUCT

One of the characteristics which makes Expanded Cork Board an ecological product is its capacity to be recycled.

The result of this recycling is Granulate of Expanded Cork which is obtained by crushing the Expanded Cork Board.

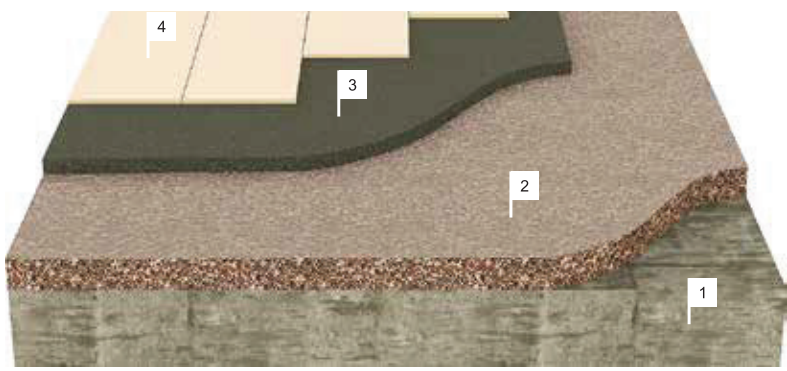
USE / BENEFITS

- Direct incorporation into concrete (light concrete) makes residential floors more lightweight with thermal and acoustic advantages
- The filling of air gaps on flooring allows acoustic and thermal correction

Technical characteristics	
Density	From 65 to 80 Kg/m ³
Thermal conductivity coefficient	0,045 to 0,050 W/mK
Granulometry	0-2, 2-4, 4-8, 4-10, 2-9, 3-15

Trace Volume			Weight/m ³	Compr. strength Kg/cm ²	Thermal cond. W/mk	Acoustic absorption		
Cement	Sand	Regr.				Serious	Medium	Acute
1	0	4	500	6	0,18	0,22	0,70	0,84
1	2	6	900	11	0,24	0,16	0,20	0,48

DIRECT INCORPORATION INTO CONCRETE (LIGHT CONCRETE)



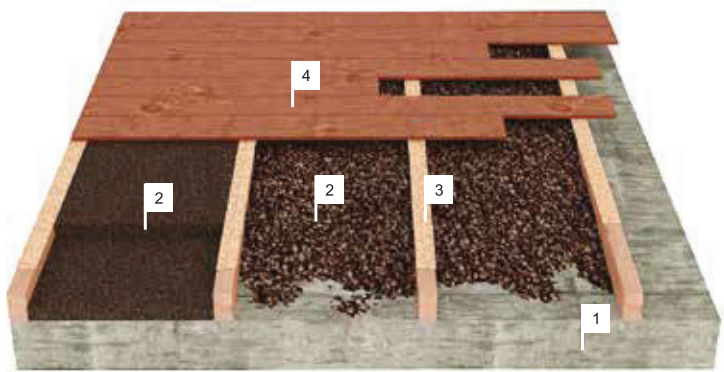
ACOUSTIC TEST - LIGHT CONCRETE WITH EXPANDED CORK (Reduction in transmission as regards percussive sounds)

14cm concrete slab
7cm light concrete with expanded cork
4cm screed
+ final flooring

Ln,r,w = 62 dB

- 1. Slab
- 2. Light concrete with cork/formation of slope
- 3. Screed
- 4. Final flooring

FILLING OF AIR GAP ON FLOORING



- 1. Slab
- 2. Expanded Cork Board - ICB or Regranulate of Expanded Cork
- 3. Strips of compound cork agglomerate 3 to 5 mm (white cork)
- 4. Wooden flooring

Portfolio

Golegã Sports' Training Centre - Golegã, PORTUGAL (Sloping roof insulation)



Residential Building - Santarém, PORTUGAL (System FACADES)



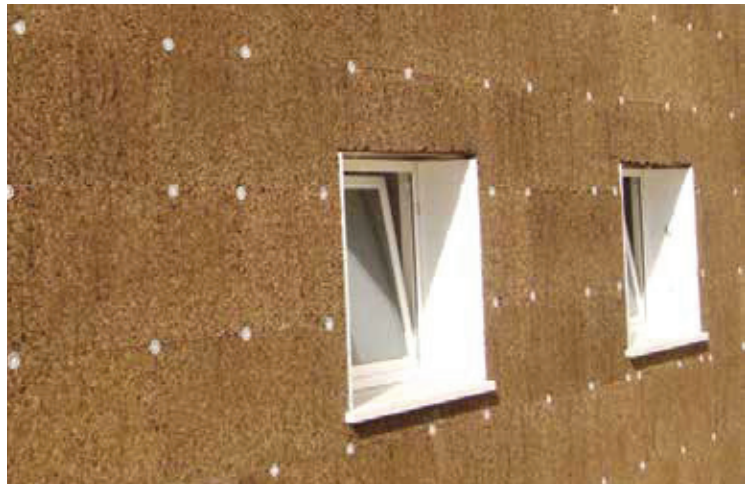
Bar - Estoril, PORTUGAL (System ETICS with cork at sight)



Tágides Car Park - Lisbon, PORTUGAL (Light weight concrete)



Villa - Torres Vedras, PORTUGAL (System FACADES)



Portfolio

Garducho Biological Station - Mourão, PORTUGAL (Systems ETICS and FacadeS with cork at sight)



Hotel Penhas Douradas - Serra da Estrela, PORTUGAL (System ETICS with cork at sight)



Medical Clinic - Mirandela, PORTUGAL (System POLYSTERM)



Hotel Penhas Douradas - Serra da Estrela, PORTUGAL (System ETICS with cork at sight)

