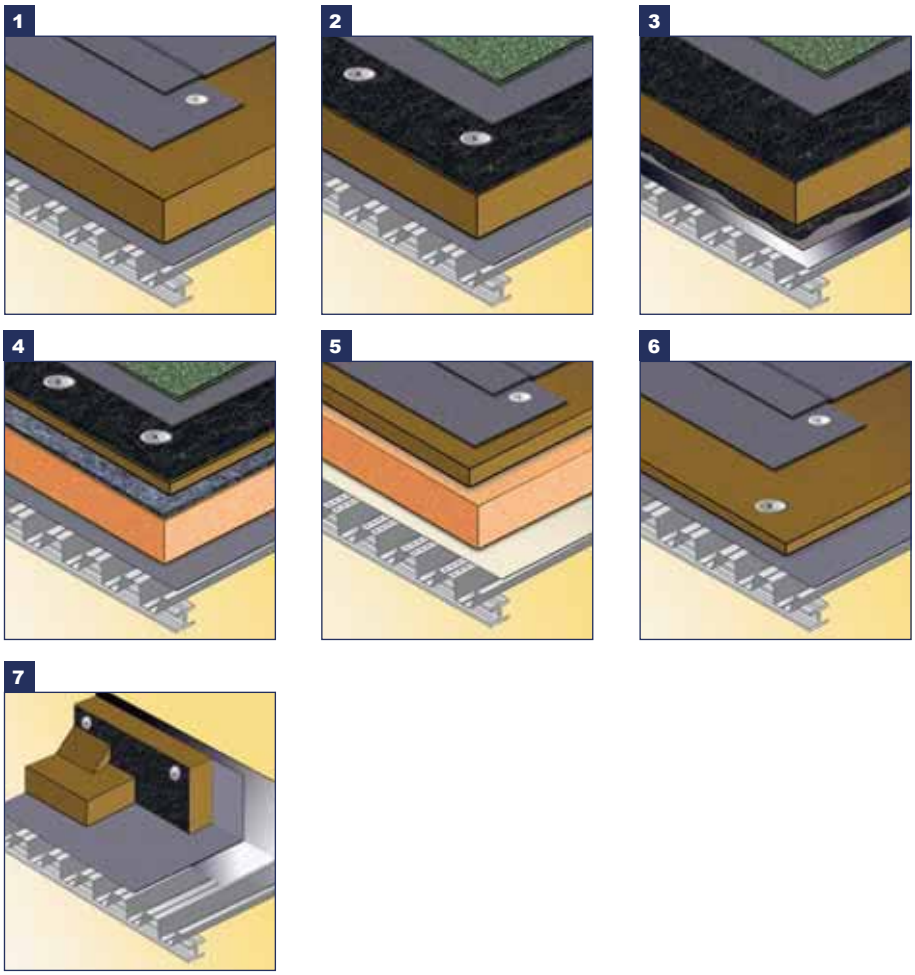
Sitek Insulation

BUILT-UP ROOFING SOLUTIONS WITH RIGID INSULATION BOARDS ON PROFILED-METAL DECKS FOR NEW-BUILD AND REFURBISHMENT

FESCO B, FESCO C, FESCO C-S,
RETROFIT, RETROFIT S, FESCO FILLET

Solutions

1. *Beneath mechanically-fixed waterproofing systems*
2. *Beneath fully-bonded waterproofing systems*
3. *For buildings with high relative humidity conditions*
4. *Refurbishment over existing built-up roofing*
5. *Acoustic insulation on perforated metal decks*
6. *For canopies, unheated premises, etc..*
7. *Upstand insulation*



Long term members of:

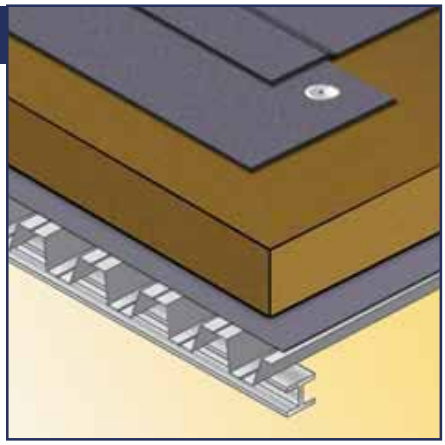
bga Beratungsstelle für Gussasphaltanwendung e.V.
AGguss
FIW
IVAD

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SOLUTIONS

1

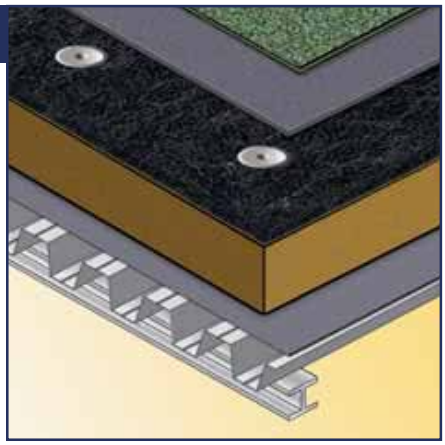
Beneath mechanicallyfixed waterproofing systems



- Contributes to fire safety
- Resists frequent foot traffic
- Strengthens the roof
- Increases the service life of the waterproofing

2

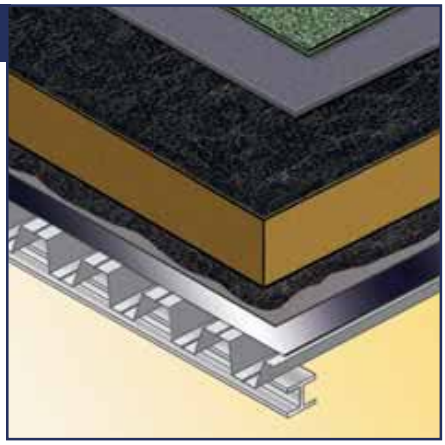
Beneath fully-bonded waterproofing systems



- Contributes to fire safety
- Resists frequent foot traffic
- Strengthens the roof
- Increases the service life of the waterproofing

3

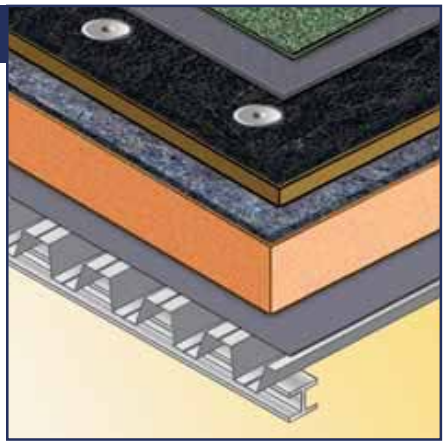
For buildings with high relative humidity conditions



- No condensation risk in the insulation
- Resists frequent foot traffic
- Strengthens the roof
- Increases the service life of the waterproofing

4

Refurbishment over existing built-up roofing



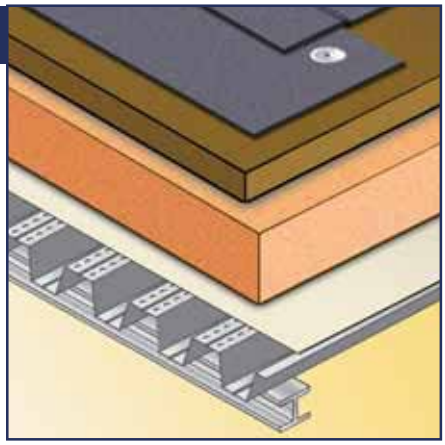
- Flat, even, surface for the new waterproofing
- Fits into limited height of existing upstands
- Resists frequent foot traffic
- Protects the waterproofing from perforation by mechanical fixings
- Increases the service life of the waterproofing

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SOLUTIONS

5

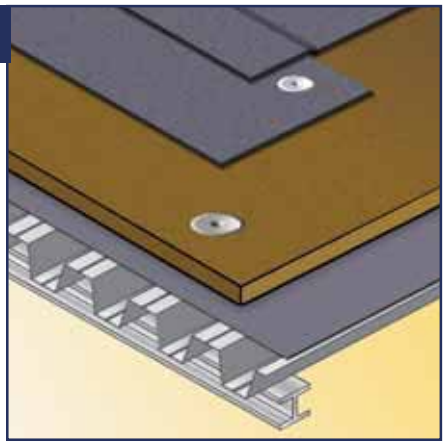
Acoustic insulation on perforated metal decks



- Protection from damage to the lower layer of insulation
- Resists frequent foot traffic
- Strengthens the roof
- Contributes to fire safety increases the service life of the waterproofing

6

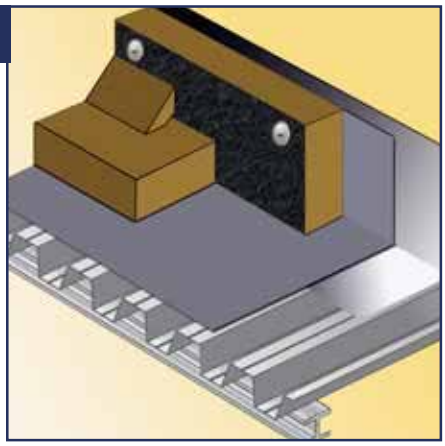
For canopies, unheated premises, etc.



- Resists frequent foot traffic
- Increases the service life of the waterproofing
- Suitable for mechanical fixing or fully bonded application

7

Upstand insulation



- Reduces thermal bridging
- Rigid support board
- Use of torch-applied bituminous membranes possible
- Dimensional stability

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DESIGN CONSIDERATIONS

Codes of Practice

The design considerations to be taken into account for a built-up roofing system must be assessed with reference to local Codes of Practice and Building Regulations.

Fire Protection

Fesco B, Fesco C, Fesco B-DO and **Fesco C-DO** insulation boards are suitable for application on metal decks whatever the use of the building.
The fire rating of a roof containing these boards will depend on the type and nature of the roof deck, the waterproofing system, and/or the surface finish used. Reference should be made to local Building Regulations:
Fesco C-S insulation boards (the torch-receivable version of **Fesco C** insulation board) can be used under the same conditions as **Fesco B** and **Fesco C** insulation boards.

Roof build-up

Decking
Decks should be designed in accordance with the relevant clauses of local Building Regulations.
For an aesthetic internal finish, pre-painted galvanised metal decking can be used with pre-painted rivets instead of screws.

Water vapour control
The need for, and the installation of, a separate vapour control layer in the roof construction should be assessed in accordance with local Building Regulations.
Care should be taken to ensure continuity at joints, upstands and roof penetrations.

Mechanical fixing
Boards should be fixed using screws complying with Class 1 UEAtc resistance to corrosion, in conjunction with square or circular galvanised steel washers (64 x 64 mm or 70 mm diameter). For perforated metal decks the screws should have a minimum thickness of 6.3 mm.

The mechanical fixing of insulation boards in constructions where high relative humidity conditions prevail, i.e. swimming pools, paper mills etc. is not advised (see Solution 3 below for more details).

Waterproofing
Fesco insulation boards are suitable for use with mastic asphalt, bitumen-based felts, and single-ply non bituminous membranes.

Roof loading

The solutions presented in this brochure are suitable for all types of roof accessibility e.g. the maintenance of the waterproofing element or roof-top equipment. Roof constructions using **Fesco** insulation boards will resist the effects of regular and heavy foot traffic both during and after the installation of a built-up roof system.

In addition, the combination of a **Fesco** insulation board as a protective layer to mineral fibre or high performance insulation products, reinforces their ability to resist heavy foot traffic, especially during installation.

The table below indicates the optimal choice of insulation in relation to the expected intensity of foot traffic and the level of thermal insulation required.

Optimal choice of insulation		**Heavy traffic** [1]	**Low traffic** [2]
Thermal insulation requirements	low [3]	Fesco	Fesco
	high [4]	Fesco 20 mm + high performance insulant	Fesco 30 mm + mineral fibre

1 Heavy traffic can usually be expected on large area roofs, or where repeated foot traffic occurs during installation because of insufficient roof access, or where technical equipment has been installed.

2 Moderate-to-light traffic can be considered in all other conditions, as long as roof-top equipment, rooflights, signs etc. are not subsequently added.

3 Low thermal insulation is considered as being up to a thermal resistance of 2 m2.K/W e.g. unheated or partially heated premises, power stations, etc.

4 High thermal insulation requirements apply principally to new building where building regulations must be followed.

Typical U-values

All the examples shown below use a two layer bitumen waterproofing system. The insulants are laid over a bitumen-based vapour control layer laid directly over the deck, under which there is no ceiling.These figures are for guidance only.

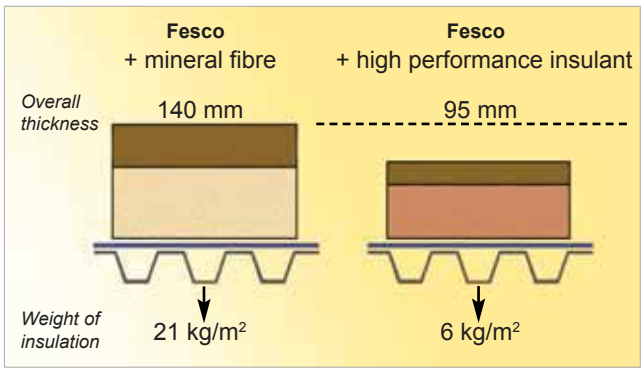
The figures below show the overall insulation thickness required for a given U-value, also taking into account the three solutions described in the preceding chapter “Roof loading”.

U-value W/m²/K	Fesco thickness mm	Fesco 30 mm + mineral fibre thickness mm	Fesco 20 mm + high performance insulant thickness mm
0,44	100	30+45	20+40
0,38	120	30+60	20+40
0,33	140	30+70	20+50
0,27	170	30+100	20+65
0,25	185	30+110	20+75

Where possible, reference should be made to local Building Regulations for minimum recommended U-values for roofs in NEW BUILDING WORK.

The use of **Fesco** insulation boards as a trafficable overlay to high performance insulants such as PUR, PIR, PF etc. presents the advantage not only of protecting the main insulant from physical damage, but also of reducing the weight and the thickness of the insulation.

Below is an example, using a U-value of **0,25 W/m²K**, to demonstrate the effect:



The reduction in weight of the insulation layers allows for a lighter support structure and, consequently, a saving in construction costs.

FOR NEW BUILDING in other types of construction or in TOTAL OR PARTIAL REFURBISHMENT projects, **Fesco** insulation boards, in thicknesses upwards of 40 mm, provide an ideal base to a built-up roofing system.

Spanning characteristics

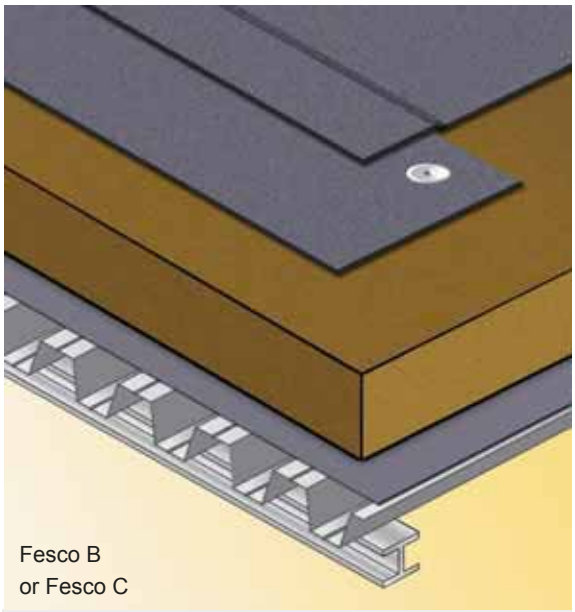
The table below gives the minimum thickness of **Fesco** insulation boards that can be used even if the board is not fully supported.

Minimum thickness Fesco mm	Maximum clear span (mm)	
	Frequent traffic	Infrequent traffic(*)
30	-	70
35	70	80
40	90	110
60	130	170
80	210	210
120	300	-

(*) roofs accessible only for maintenance of the waterproofing layer, water outlets etc.

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1 Application beneath mechanically-fixed waterproofing systems



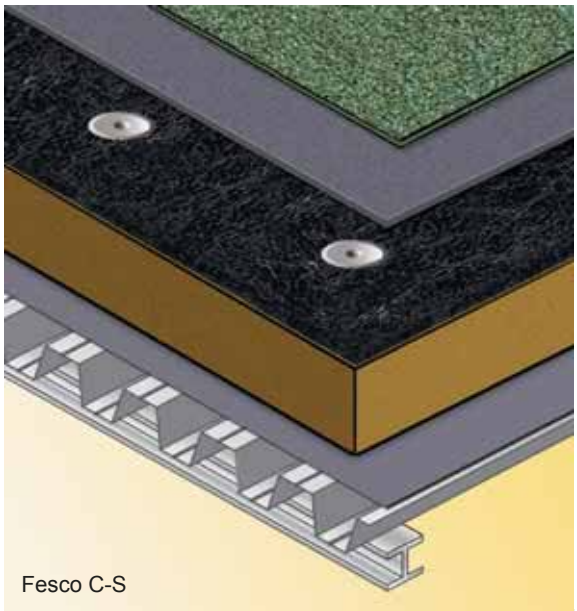
Fesco B
or Fesco C

SPECIFICATION CLAUSE
The roof insulation shall be **Fesco B** (or **Fesco C**) expanded perlite boards having UEAtc compressibility Class D rating … mm thick, mechanically fixed on the profiled metal deck.The waterproofing felts should be applied to the boards as soon as possible after fixing.The installation shall be in accordance with the Avis Techniques or Agrément Certificates covering both the insulation board and the waterproofing system to be applied.

Fesco B or **Fesco C** insulation boards under mechanically fixed waterproofing are generally used on buildings having low to medium internal relative humidity conditions. This method of fixing is not advised in constructions where high relative humidity conditions prevail, i.e. swimming pools, paper mills etc. (see Solution 3 below for more details).
Each board is maintained in place by a central fixing until the waterproofing element is installed.

The waterproofing should be installed in accordance with the appropriate Avis Techniques or Agrément Certificates. The number and spacing of the specially adapted fasteners for the waterproofing felts are calculated in relation to the geographical location, the height and width of the building and the weather conditions; reference should be made to local Codes of Practice for wind loads.
No separation layer is required between **Fesco** insulation boards and non-bituminous single layer roofing membranes.

2 Application beneath fully-bonded waterproofing systems



Fesco C-S

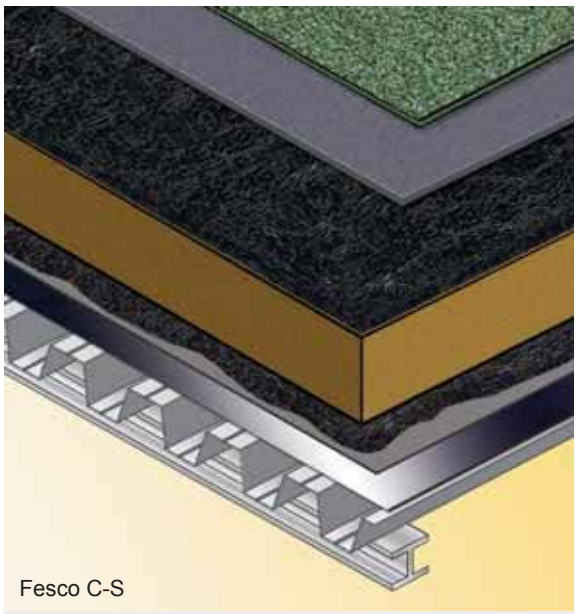
SPECIFICATION CLAUSE
The roof insulation shall be Fesco C-S expanded perlite boards having UEAtc compressibility Class D rating … mm thick, mechanically fixed on the profiled metal deck.
The waterproofing felts should be torch-applied to the boards as soon as possible after fixing.The installation shall be in accordance with the Avis Techniques or Agrément Certificates covering both the insulation board and the waterproofing system to be applied.

Fesco C-S insulation boards are mechanically fixed to the roof deck. The number of fixings required is calculated in relation to the geographical location of the building, the topographical data and the height and width of the roof concerned; reference should be made to local Codes of Practice for wind loads. The current Avis Technique and Agrément Certificate for **Fesco** insulation boards details the number of mechanical fixings required per board, in relation to weather conditions, roof zones (corner, edge or central) and building height.

The waterproofing can be torch-applied built-up felt or torchapplied, single-layer waterproofing membranes. Their installation should be in accordance with the relevant Avis Techniques or Agrément Certificates.

Alternative: **Fesco B** or **Fesco C** insulation boards can be substituted for use with bituminous felts that are fully bonded either with hot bitumen or approved cold adhesives in accordance with the manufacturers' recommendations.

3 Application for buildings with high relative humidity conditions

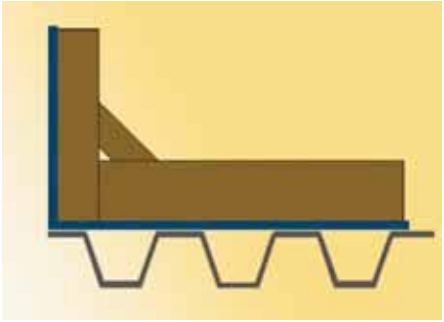


Fesco C-S

SPECIFICATION CLAUSE

The roof insulation shall be Fesco C-S expanded perlite boards having UEAtc compressibility Class D rating … mm thick.The profiled metal sheets are protected on both sides with a corrosion-resistant coating in accordance with the manufacturers' recommendations and covered with a flat, pre-painted, corrosion resistant galvanised steel sheet.The vapour barrier is fully bonded in hot bitumen to this sheet and the upstands. Fesco C-S insulation boards are applied fully bonded in hot bitumen and the waterproofing felts will be torch-applied to the boards as soon as possible after fixing.The installation shall be in accordance with the Avis Techniques or Agrément Certificates covering both the insulation board and the waterproofing system to be applied.

The roofing support consists of profiled metal sheets protected on both sides with a corrosion-resistant coating and covered with a flat, pre-painted, corrosion-resistant, galvanised steel sheet which is mechanically fixed to the support.The fixings required, either watertight rivets or flat-headed screws, must be in stainless steel.



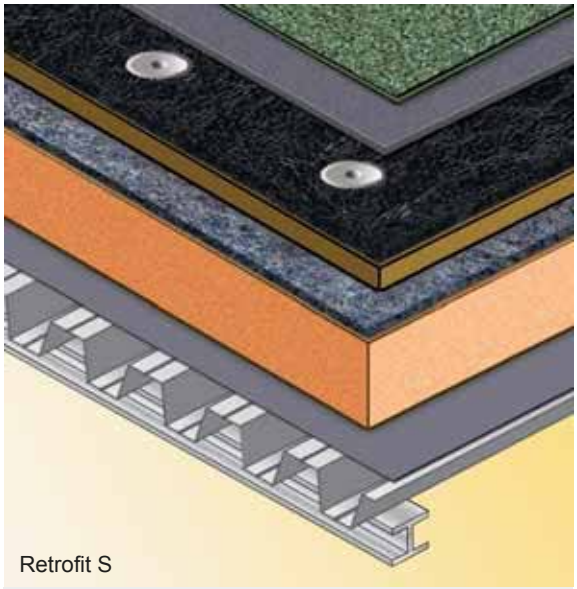
The vapour barrier should be of reinforced bitumen felt, aluminium faced, which is fully bonded in hot bitumen to the metal sheet and the upstands, the joints being bonded or welded together.

Fesco C-S insulation boards are fully bonded to the vapour barrier in hot bitumen.Additional precautions for insulation and air-tightness should be taken at detailing and expansion joints.

The waterproofing can either be torch-applied built-up felts or a singlelayer membrane.Their installation should be in accordance with the relevant Avis Techniques or Agrément Certificates. Care should be taken to melt the sacrificial polypropylene film on the surface of the board to ensure an adequate bond with the waterproofing layer.

Alternative: **Fesco B** or **Fesco C** insulation boards can be substituted for use with fully bonded bituminous felts.

4 Refurbishment over existing built-up roofing



Retrofit S

SPECIFICATION CLAUSE

After making good the existing waterproofing layer , the overlay board shall be **Retrofit S** expanded perlite boards having UEAtc compressibility Class D rating … mm thick, mechanically fixed to the profiled-metal deck.The waterproofing felts should be torch-applied to the boards as soon as possible after fixing.The installation shall be in accordance with the Avis Techniques or Agrément Certificates covering both the insulation board and the waterproofing system to be applied.

An initial evaluation of the existing waterproofing system should be carried out to ensure that it can be kept as a base for a new waterproofing membrane.
Preparatory work for the refurbishment of a built-up flat roof usually involves cutting out degraded/blistered areas and removing chippings which can leave the roof surface unsuitable for the application of a new waterproofing membrane. By using high laminar strength **Retrofit S** overlay boards, preparatory work is kept to a minimum by covering imperfections in the existing roof surface and simplifying the application of new waterproofing.

Overlay boards are used in thicknesses 13, 15 or 20 mm, depending on substrate consistency, in order to obtain a suitable surface (i.e. sufficiently sound and flat) for applying the waterproofing membrane on top of **Retrofit**.

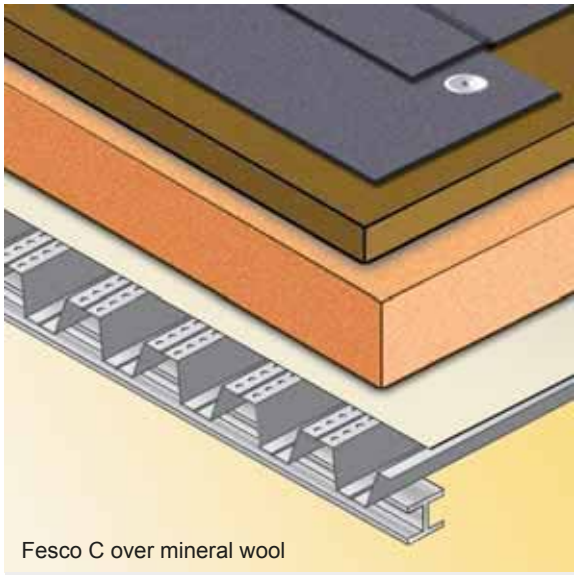
Boards are fixed with a single mechanical fastener in each of the four corners for board dimensions 1200 x 600 mm, with a fifth fixing in the centre for board sizes 1200 x 1000 mm.Any additional fixings needed to comply with wind uplift calculations should be evenly distributed over the boards.

The waterproofing can either be torch-applied built-up felts or a singlelayer membrane.

Alternative: **Retrofit** or **Fesco C** boards can be substituted for use with mechanically-fixed or fully-bonded bituminous felts.

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5 Acoustic insulation on perforated metal decks


Fesco C over mineral wool

SPECIFICATION CLAUSE
The thermal and acoustic roof insulation will consist of a first layer of a mineral fibre board … mm thick and a top layer of Fesco C expanded perlite boards with a minimum thickness of 30 mm, both layers being mechanically fixed to the profiled metal deck.The insulation boards are installed over an aluminium-faced glass fleece vapour barrier. The installation shall be in accordance with the Avis Techniques or Agrément Certificates covering both the insulation board and the waterproofing system to be applied.

The roofing support consists of profiled-metal sheets having regular perforations either in the deck crowns, in the side walls of the troughs, or both.

The roof insulation consists of two layers. The first layer of mineral fibre board is maintained in place with a centrally-placed fixing and the second layer of **Fesco C** insulation board is fixed as in Solution 1 above, taking care to use fixings which are suitable for use on a perforated deck.

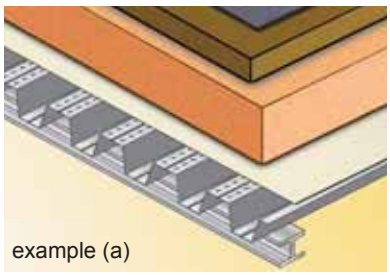
The waterproofing is mechanically fixed in the same way as in Solution 1 above.

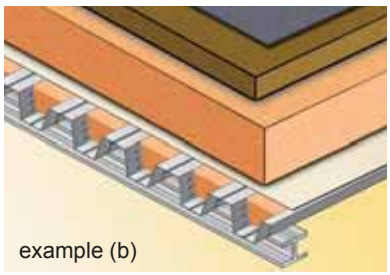
Alternative: **Fesco C-S** insulation boards can be substituted for use with torch-applied bituminous felts, improving the finished aspect of the roof.

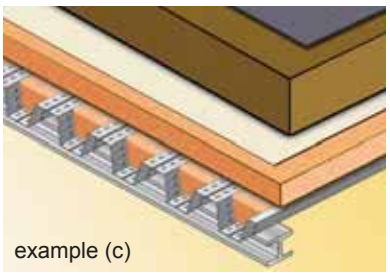
ACOUSTIC PERFORMANCE

Roofing systems using profiled-metal decking can bring improvements to both ***sound absorption*** by reducing the sound level inside a building and to ***insulation*** by limiting the transmission of sound from the outside.

Different degrees of ***sound absorption*** can be obtained by using metal decking either with perforations in the crowns of the profile with mineral fibre boards (example a), or in the trough walls (example b), or in both (example c). Mineral fibre products can be placed in the troughs. In example (c), the thin roll of mineral fibre placed under the vapour barrier provides increased sound absorption values.


example (a)


example (b)

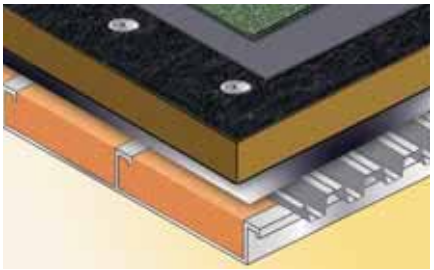

example (c)

Depending on the different examples (a), (b) or (c), indicative α coefficients are as follows:

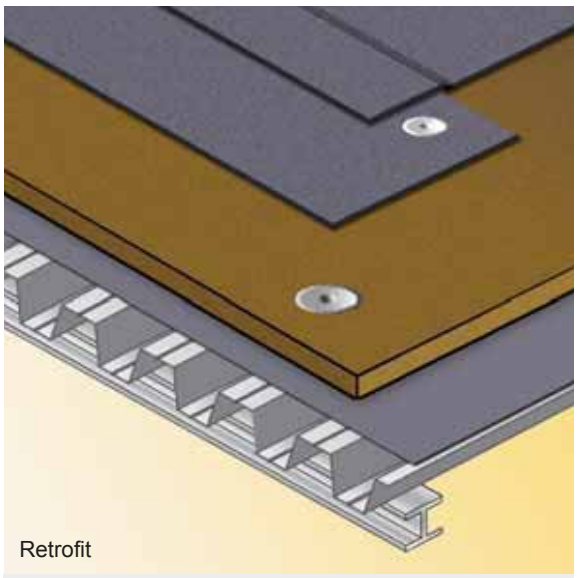
Frequency, Hz		**125**	**250**	**500**	**1000**	**2000**	**4000**
Coefficient, α	example (a)	0,40	0,80	0,80	0,60	0,55	0,60
	example (b)	0,60	0,80	0,85	0,80	0,65	0,70
	example (c)	0,60	0,90	0,85	0,80	0,80	0,70

The degree of ***acoustic insulation*** depends on the nature and weight of each layer in a given system. For high insulation values (R_w) i.e. from 45 to 55 dB, a composite system integrating two profiles can be used. The first “cassette” profile is filled with a mineral fibre blanket and the second, profiled-metal decking is insulated with **Fesco C-S** insulation board and a torch-applied built-up roofing complex (or alternatively with **Fesco C** insulation board and a mechanically fixed waterproofing system).

Typical build-up for high acoustic insulation values (R_w)



6 Application for canopies, unheated premises, etc.



Retrofit

SPECIFICATION CLAUSE
The overlay board shall be Retrofit expanded perlite boards having UEAtc compressibility Class D rating … mm thick, mechanically fixed on the profiled metal deck.The waterproofing felts should be applied to the boards as soon as possible after fixing.The installation shall be in accordance with the Avis Techniques or Agrément Certificates covering both the insulation board and the waterproofing system to be applied.

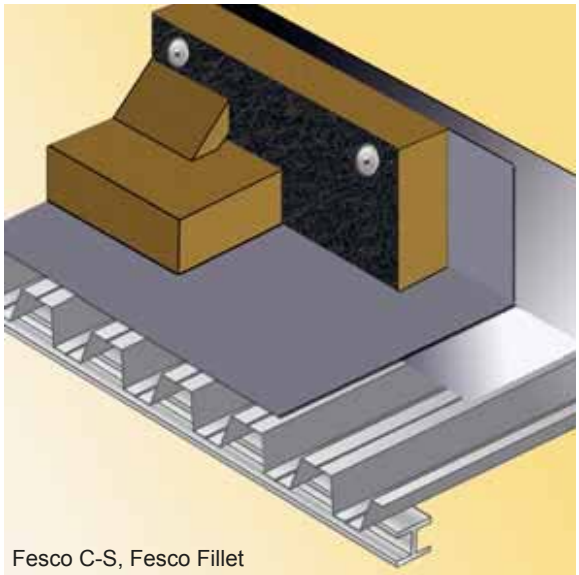
Retrofit overlay boards are used in a thickness of 20 mm where the clear span over deck troughs does not exceed 70 mm, or in 13 mm thickness if span is no greater than 60 mm.

Boards are fixed with a single mechanical fixing in each of the four corners for board dimensions 1200 x 600 mm, with a fifth fixing in the centre for board sizes 1200 x 1000 mm. Any additional fixings needed to comply with wind uplift calculations should be evenly distributed over the boards.

The waterproofing is mechanically fixed in the same way as in Solution 1 above.

*Alternative: **Retrofit S** overlay boards can be substituted for use, with certain precautions, with torch-applied bituminous felts (see the chapter on site work).*

7 Upstand insulation



Fesco C-S, Fesco Fillet

SPECIFICATION CLAUSE
The upstand insulation shall be Fesco C-S expanded perlite boards having UEAtc compressibility Class D rating … mm thick, fixed to the upstands.The waterproofing flashing will be applied to the boards as soon as possible after fixing.The installation shall be in accordance with the Avis Techniques or Agrément Certificates covering both the insulation board and the waterproofing system to be applied.
Option: to break the sharp angle between horizontal and vertical surfaces, angle fillets of expanded perlite, Fesco Fillet in dimensions …x…. , should be used.

If **Fesco C-S** insulation boards are to be mechanically fixed, such fixings should be placed at centres no greater than 50 cm with a minimum of 3 fixings per board.A Fesco Fillet should be installed in the angle formed between the horizontal and vertical surfaces before the application of the flashing.

The torch-applied waterproofing is to be applied taking care to melt the sacrificial polypropylene film on the surface of Fesco C-S insulation board to ensure an adequate bond with the waterproofing layer.

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SITEWORK

Profiled-metal decking

The metal decking is adapted to the structure, laid dry, and all upstands, rooflights etc. installed before application of the insulation.

Vapour control layer

The specified vapour control layer should be installed to the manufacturers' instructions.

Insulation boards

Fesco and **Retrofit** insulation boards should be stored clear of the ground on a clean level surface, under cover, to protect them from moisture or mechanical damage.
Boards should be installed dry and any boards that have been allowed to get wet should be put to one side to dry out before use.
Boards should be laid break-bonded with their long edges at right angles to the trough openings and all joints lightly butted.
Where **Fesco** insulation boards in 30 and 35 mm are to be used, it is recommended to install them with the long edges parallel to the corrugations.

Roof waterproofing

The roof waterproofing should be applied in accordance with the manufacturer's recommendations and relevant Avis Technique or Agrément Certificate.
The waterproofing should be applied to the boards as soon as possible after fixing. At the end of each day's work, or whenever work is interrupted, a night joint must be made to avoid water penetration.
When installing torch-receivable **Fesco S** or **Fesco C-S** insulation boards, the roofing felts are torched directly on to the specially coated upper surface of the insulation board, by elting the sacrificial polypropylene facing with the gas-torch.
When using **Retrofit S**, it is recommended to melt the polypropylene layer first and then direct the flame on to the waterproofing roll to effect the welding of the two elements.

Health and Safety

Fesco and **Retrofit** insulation boards are chemically inert and safe to use.A Material Safety Data Sheet for each product is available on request.

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PRODUCT INFORMATION

Fire Safety

When tested to EN 13823 Fesco B insulation board achieves reaction to fire classification of Bs1d0, and Fesco C insulation boards Cs1d0.
When tested to EN ISO 1716 both **Fesco B** and **Fesco C** insulation boards obtain a Gross Calorific Potential (PCS) of 5.1 MJ/kg.
Full scale fire resistance tests have been carried out by TNO laboratories in Delft (NL) on a complete roof buildup with an internal fire simulation following the ISO temperature curve. The profiled-metal deck insulated with **Fesco C** insulation board resisted the fire for over 30 minutes and the waterproofing layer remained intact right up to the end of the test.

Fesco C insulation board is certified by Factory Mutual Research for Class 1 insulated steel deck roofs.

Resistance to roof traffic

Expanded perlite insulation boards, with D classification to UEAtc test methods, are highly resistant to compression and point loading.
Fesco and **Retrofit** insulation boards contribute significantly to strengthening the roofing system, limiting the risks of damage to the roofing felts. Rigid roof insulation boards contribute to the service life of the built-up roofing system by limiting the risk of perforation, especially by the unthreading upwards of screws, and the possibility of the felts splitting or tearing at the joints in the insulation layer.

Environment

Expanded perlite insulation boards are manufactured from both natural and recycled products, have zero ODP (Ozone Depletion Potential) and are chemically neutral. In recognition of its work for a clean environment, the manufacturing facility in Wissembourg has been awarded the “clean technology” Diploma from the French Ministry of the Environment.

Standards and Approvals

Fesco and Retrofit insulation boards are manufactured under a quality control system approved to ISO 9002.The high quality of all products is continuously monitored, not only internally, but also by external audits by the different European Agrément Boards that certify the production process. These boards also meet the requirements of EN 13169 and are CE marked.
All products in the Fesco range of insulating boards are certified under the Acermi thermal conductivity procedures, and the principal applications are covered by current Avis Techniques or Agrément Certificates.

Product description

A technical data sheet is available, on request, for each product in the range.

Other applications

- Fire protection layer under expanded polystyrene insulation boards on profiled-metal roof decks
- High performance roof insulation boards for waterproofing systems on profiled-metal roof decks
- Transformation of standing seam cold roofs into waterproofed warm roofs
- Built-up roofing solutions over rigid insulation boards on solid roof decks (concrete, wood, etc.)
- Tapered insulation roofing systems
- Insulated car park decks for light and heavy vehicular traffic
- Thermal insulation under asphalt concrete for roof decks with pedestrian access, car parks for light vehicles and roof gardens

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