technical specification 7

UNDER TILES

Waterproofing and thermal insulation of pitched roofs

The pitched roof is the most common covering for domestic residential buildings. However, conditions can make this type of roof the most vulnerable ensuring only a minimum degree of waterproofing.
There are varying types and sizes of products which can be used but this publication will only consider those of small dimension such as clay tiles either flat or curved, concrete tiles, bituminous tiles, natural stone and slate.
Consideration will be given to roofs with habitable attic rooms directly below which have thermal insulation but which are not ventilated and to roofs above non habitable attic rooms which are ventilated but which may or may not have thermal insulation.
The roof pitch will be determined by the type of tile used and the weather conditions of the area where the building is situated.
Now that the attic in buildings is increasingly being used for living space, the need for a good waterproofing system is of great importance, particularly in view of the high cost of repair of roofs in this situation.
The replacement of old materials with poor waterproofing characteristics on historical buildings, requires a good waterproofing layer to protect the fabric of these old building. Furthermore, thermal insulation is often introduced into the roof and saturation by water will seriously reduce the insulation value.
There are many conditions which can trigger the passage of water even if no damage or alteration has taken place. The combination of just strong wind and rain is sufficient to cause water penetration.
In order to solve these kind of problems, INDEX S.p.A. has manufactured **MINERAL TESTUDO**. This waterproofing membrane is polymer modified bitume reinforce with a single strand continuous extruded polyester fabric. The upper face of the material has an anti-slip mineral surface which prevents slippage of the mortar used to fix the tiles. A special insulation THERMOBASE TEGOLA, manufactured from panels of orientated glass fibre or expanded polystyrene protected by waterproofing membranes as described above, will also assist in problem solving.
This publication is intended to provide the specialist contractor with some complete waterproofing and insulation systems and suggestions for associated works and standard details. The proposed systems constitute a continuous and self sufficient waterproofing which is able to provide resistance to water penetration even when tiles have been subjected to damage or movement.

1 PROBLEMS

Waterproofing under tiles of sloped roofs — when is it necessary?
Common practice suggests that all pitched roofs will require some form of additional waterproofing but particulary on pitches below 35-40%.
This will compensate for imperfect and porous materials.
Other negative conditions may result from:
- incorrent construction of the roof resulting in wrong spacing between supports, insufficient smoothing of the laying surface, reduction in the roof slope, etc..
- wrong application of tiles, insufficient overlap in relation to the roof slope
- dimensional defects of the tiles such as excessive tolerances, imperfections at jointing points, etc.

Other problems of waterproofing result from:

PHYSICAL PROBLEMS

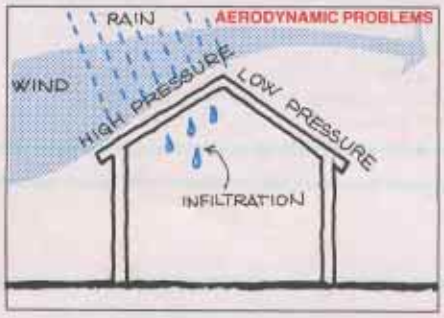
Walking on tiles, especially when wet, is one

of the most frequent causes of damage resulting in water penetration (e.g. careless installation of a TV aerial).

Nesting by some species of birds beneath tiles, where access is available to them, can cause movement allowing water to enter.
Where tiles have internal cavities or holes caused during manufacture, there is always the danger of large flakes breaking away where the imperfection occurs.
Humidity can penetrate tiles and when temperatures fall this can condense and freeze causing the tile to "explode".

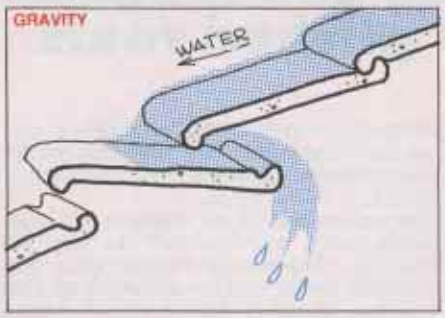
AERODYNAMIC PROBLEMS

Winds of a certain strength may result in water penetration through existing cracks and gaps.

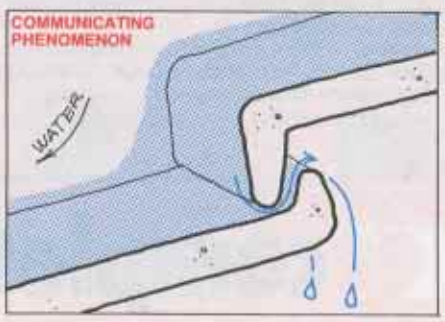


INFILTRATION CAUSED BY GRAVITY

Tiles which have been laid incorrectly or which may have been cracked or moved by being walked upon or through wind movement and which are not properly in place, can allow passage of water.



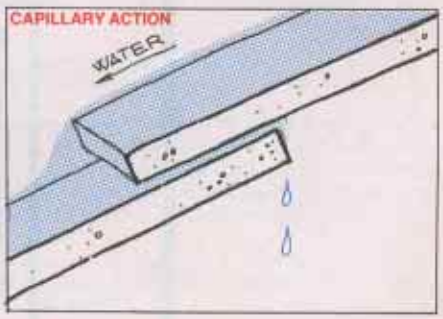
WATER BUILD UP - Communicating Phenomenon



Where persistent heavy rain is falling, a build up on the roof can result in the passage of water between the two elements of the tiles.

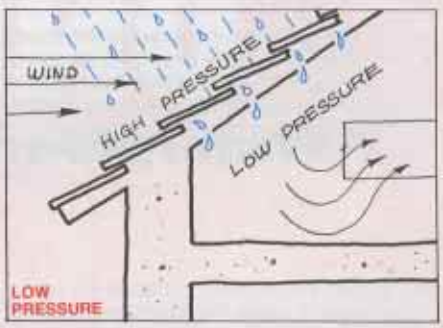
INFILTRATION CAUSED BY CAPILLARY ACTION

Capillary action can take place where tiles overlap causing water to be drawn up between the tiles.



INFILTRATION CAUSED BY LOW PRESSURE

This is easily created when the air pressure in attics is lower than the outside air pressure.



All these phenomena are connected with wind. Laboratory experiments carried out on clay tile roof have verified that, contrary to what is believed, wind speed in itself has very little influence. In fact it is the creation of different internal-external pressure which contributes most significantly to water penetration. In fact with a wind speed of 30-60 Km/H it is possible to create serious infiltration over the whole roof.

Starting from the experimental hypothesis of two areas with different pressures divided by a tiled pitched roof with flowing water and heavy rain, some tile manufacturers, in collaboration with C.N.R., have carried out some specific performance tests on tiled roofs.

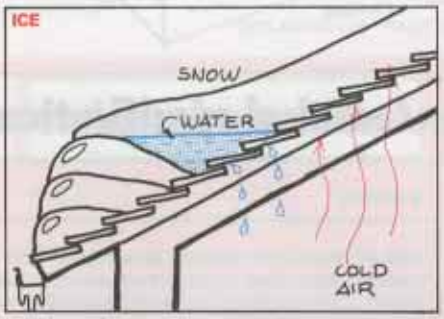
Under the same water load and with given gradients, the critical values of air pressure which can cause water infiltration have been measured.
Penetration resulting was of two kinds:
— the first being infiltration localised in one area only whilst no others are created even when internal pressure is reduced

— the second is one that can be described as "widespread" with lowering of internal pressure on several points of the roof.

Localised infiltration is often caused by defective, chipped or distorted tiles. Where widespread infiltration is evident, this is often due to insufficient overlap relative to the given slope.

In any analysis of aggressive elements resulting in water penetration, we must consider the joint action of SNOW & ICE.

The absence of thermal insulation will result in snow melting on those areas of the roof where heat rises from lower rooms but leaving the upper layers of the snow unmelted. The water from the melted snow will travel down the roof and freeze again at the eaves creating an obstacle to the water flow. This could allow water to find its way under the tiles and into the building.



The ice which builds up could lift tiles allowing considerable water infiltration.

Thermal insulation in these situations can prevent damage to the roof and should not be seen only as a means to create a more comfortable habitat or to save energy.

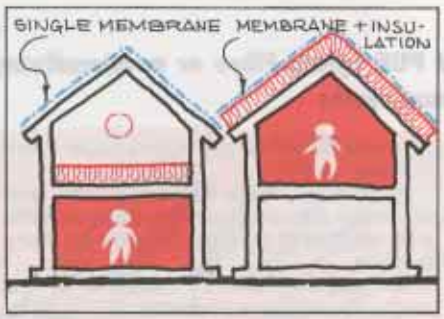
The growth of moss on the surface of the tiles can form at the gaps and overlaps which could eventually lead to water infiltration.

WARNING

It must be remembered that TESTUDO membranes have a high vapour resistance and should only be used where water vapour can be eliminated by adeguate ventilation. THERMOBASE TEGOLA insulation will be used for the insulation of roofs over inhabited rooms (attics) and should always be coupled with an efficient vapour barrier.

The use of a vapour barrier will ensure that vapour rising from inhabited rooms will not penetrate into the insulation and condense. This can happen if the dew point occurs within the insulation, the water causing loss of insulation properties.

Where the attic is not used as living space, it is better to place the insulation at floor level allowing the roof space to be fully ventilated. This will also allow considerable cost saving as less material required and cheaper insulation, which does not require high mechanical strength, can be used. It must be remembered



that where warm surfaces are subjected to cold air or cold surfaces are subjected to warm air, condensation can form. Therefore great care must be taken to ensure correct thicknesses of insulation and the presence of adequate ventilation where necessary.

When insulating a tile-concrete structure the Glaser method should be used to calculate where the dew point will fall. This allows the insulation thickness to be increased to ensure that the dew point will be moved above the vapour barrier.

Where an attic with irregular heating and where a rapid temperature is required, it is suggested that where external insulation is installed, additional internal insulation equal to 25% of that external side should be used. This will prevent the dew point from falling inside the building.

With under tile insulation the area beneath should never be ventilated with external air as this will result in heat loss and negate the benefit of insulation.

A waterproofing membrane should never be applied on its own under tiles on attic rooms which are unventilated. The membrane will stop the escape of vapour and condensation could occur.

If an air chamber associated with the waterproofing cannot be ventilated, insulation coupled with a vapour barrier should be employed.

VENTILATION

It has been mentioned in other chapters how important it is to ventilate uninhabited attics or under roof space. In order to ensure ventilation opening to the outside air must be provided. The entry point for outside air will be located in the lower part of the roof, whilst the exit points should be positioned in the upper area of the roof.

On roof slopes in excess of 15% and where relative humidity of the internal rooms is expected to be under 65%, the ventilated sections should be 1/800 for the exit with open sections of about 20 mm.

INDEX MATERIALS

THERMOBASE TEGOLA
PSE - PSE/E
PUR - FV/80

Thermobase tegola is the THERMOBASE product designed to solve the problems associated with under-tile waterproofing and thermal insulation. It can be produced with four types of insulating material: water-repellent orientated fibre glass, self-extinguishing expanded polystyrene, self-extinguishing extruded polystyrene and self-extinguishing expanded polyurethane.

The upper waterproofing membrane surface is a polymer modified bitumen material reinforced with a non woven polyester fabric. The visible surface of the membrane is coated with a slate granule layer which has been bonded at a temperature of 180°C, leaving an 80 mm wide strip on each side, free from granules act as an anti-slide surface which allows the anchoring of the cement mortar into which the tiles are laid.

Immediately the side laps have been flame sealed, a strong resilient waterproofing surface is created which will protect the work from rain and allows the tiles to be laid at later stage. Thermobase tegola provides an efficient thermal insulation with waterproofing protection which retains its integrity even when tiles are broken or moved.
IT IS FLEXIBLE - STABLE - QUICK TO APPLY - PROVIDES IMMEDIATE WATERPROOFING.
For further information regarding the characteristics of the four types of Thermobase tegola, please read the specific publication.

MINERAL TESTUDO

A mineralised polymer modified bitumen with excellent performance characteristics. IT IS FLEXIBLE - RESISTANT TO PUNCTURE AND TEAR - DOES NOT ROT - IT IS STABLE AND RESISTANT TO AGEING.
It is applied using a propane gas torch. For further information, consult the relevant technical specification.

DEFEND ALU

A polymer modified bitumen membrane with an aluminium foil, ideal for use as a vapour barrier. It is applied with a propane gas torch. For further information consult the relevant technical specification.

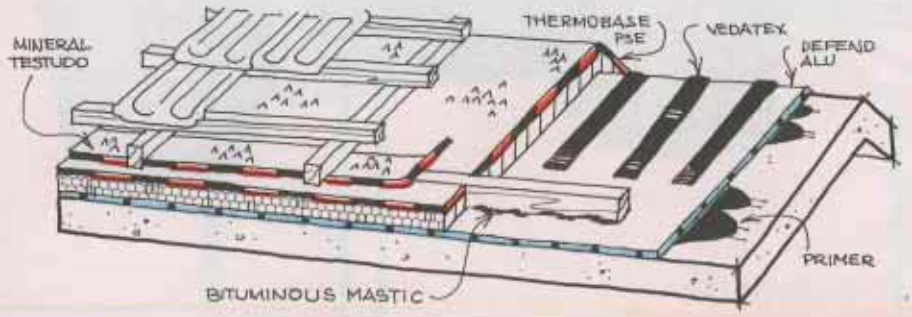
INDEVER PRIMER

A bituminous solution containing quick drying solvents which adheres to all kind of surfaces. It fills and seals porous decks and elements in preparation for the application of the membrane; it is also used to protect metal parts. Primer is applied using a paint brush or on bigger areas a large brush or spray is used for application.
For further information refer to the relative technical leaflet.

2 WATERPROOFING A

A) TILES FIXED ON BRICK & CEMENT OR TIMBER DECK

- **Slope: dependent on type of tile**
- **Valid for THERMOBASE PSE (polystyrene)**



technical specification

PRIMER

The complete surface of the deck should be coated with INDEVER bituminous primer, a solution containing oxydised bitumen, additives and solvents which has 50% bituminous solids and an overall Ford viscosity No. 4 at 25°C from 20 to 25 sec.

VAPOUR BARRIER

A vapour barrier consisting of a 3 mm thick waterproofing membrane which has been manufactured from distilled bitumen modified with atactic polypropylene. The membrane, DEFEND ALU 3 FLAMINA, will be reinforced with a glass fibre mat and contain a 6/100 mm thick aluminium foil.
The membrane should conform to UNI 8202-23 and be completely impermeable to water vapour. The complete deck and all reliefs should be covered by flame bonding using a propane gas torch; all laps should be 10 cm. The membrane should be turned at upstands and vertical sections and be flame bonded to a height of a least 10 cm above the expected thermal insulation level.

TIMBER BATTENS

Timber battens 40 cm wide and with a thickness of 4 mm smaller than the insulation should be mechanically fixed across the roof slope. Fixings should be at a minimum 2 metre centres. A bituminous mastic should be use to seal both sides of the batten where it rests against the vapour barrier.

THERMAL INSULATION & WATERPROOF COVERING

THERMOBASE TEGOLA PSE should be applied on top of the vapour barrier using a cold adhesive such as VEDATEX applied at a rate of three strips per square metre.
THERMOBASE TEGOLA is available using various insulants, expanded polystyrene panels of λ = 0.033 Kcal/mh°C. Strips of insulant are continuously bonded to a polymer-bitumen waterproofing membrane which has a maximum flow of 0.2 mm at 100°C (conforms to Achimici-Igiae). The membrane is reinforced with a single strand non-woven polyester fabric and one surface has been coated with mineral granules although strips along each side have been left clean to allow for bonding at laps.
The insulation should be of a type and thickness "s" with sufficient thermal resistance R = $\frac{s}{\lambda}$ to ensure that the dew point does not end up below the vapour barrier.
In alternative it will be possible to apply **THERMOBASE PSE/E** (extruded High density) bonded by melted oxydized bitumen.
The insulation will be laid down the slope between the timber battens which are 2 metres apart, fixing will be by cold adhesive using three strips of adhesive. A 200 mm wide strip of **MINERAL TESTUDO 4.5** will be flame bonded along the area where the insulation butts up against the timber batten. The joints of insulation panels will be sealed using 140 mm strip of **MINERAL TESTUDO 4.5** which will be fully bonded. Flashings or coverings of **MINERAL TESTUDO** at reliefs will be 100 mm above the maximum water level.

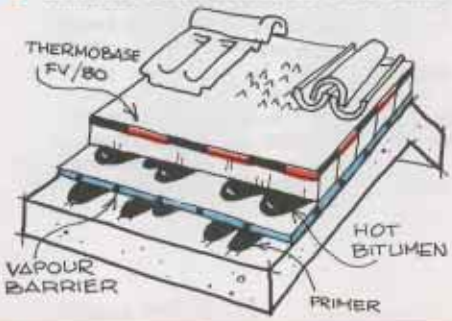
TIMBER BATTENING FOR TILES

Timber battens should be fixed every metre, running down the roof slope.
The battens will be 40x40 mm and be mechanically fixed to the main timber battens. Prior to fixing the battens a small blob of bituminous mastic should be placed where nailing will take place.
Finally, further 40x40 mm battens should be fixed for support of the tiles. If curved tiles are to be used, it may be sufficient to use only one set of battens, those which are placed running down the roof.

ND THERMAL INSULATION (IN

B) CONCRETE OR PRECAST BRICK & CEMENT SURFACES

- **Slope: ⩽ 35%**
- **Valid for THERMOBASE FV/90 and PUR (glass Fibre or polyurethane)**
- **Climatic conditions: no Frost and thaw cycles**



technical specification

(should not be used in areas with heavy or frequent snow fall)

PRIMER

The whole surface should be covered with a coat of bituminous primer, a solution containing oxydized bitumen, additives and solvents, which has 50% bituminous solids and an overall Ford viscosity No. 4 at 25% from 20 to 25 sec.

VAPOUR BARRIER

A vapour barrier of DEFEND ALU 3 mm thick which is manufactured using distilled bitumen, modified with atactic polypropylene and elastomers with a 6/100 mm thick aluminium foil and a glass fibre mat core. The vapour barrier should be fully flame bonded to all surfaces. The membrane which has been manufactured to conform to UNI 8202-23 is impermeable to water vapour. The membrane should be fully flame bonded to all vertical surfaces to at least 10 mm above the expected height of the thermal insulation.

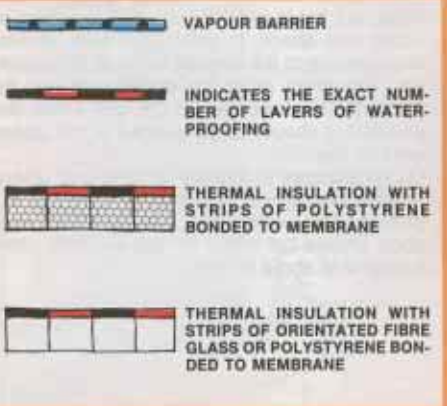
THERMAL INSULATION & WATERPROOFING LAYER

A layer of THERMOBASE TEGOLA material in 1 metre rolls should be laid on top of the vapour barrier and be fixed using hot oxydised bitumen.
THERMOBASE TEGOLA is made by pre-fixing a waterproofing membrane to strips of orientated fibre glass λ=0.032 Kcal/mh°C or strips of polyurethane λ=0.020 Kcal/mh°C. The membrane is of the polymer-bitumen type which has a maximum flow of 0.2 mm at 100°C (this conforms to the norm Aschimici-Iglae) and is reinforced with a non woven single strand polyester fabric.
The upper face of the membrane has a layer of mineral slate granules with strips on either side left free of granules to allow for flame bonding.
The insulation will have a thickness "s" and have sufficient thermal resistance R= s/λ to ensure that the dew point does not occur below the vapour barrier.
The insulating panels will be placed to run down the slope and the joints will be sealed using 140 mm wide strips of MINERAL TESTUDO 4.5 which will be flame welded. The waterproofing at the reliefs should be raised to 10 mm above the maximum water level and should be made of MINERAL TESTUDO strips.

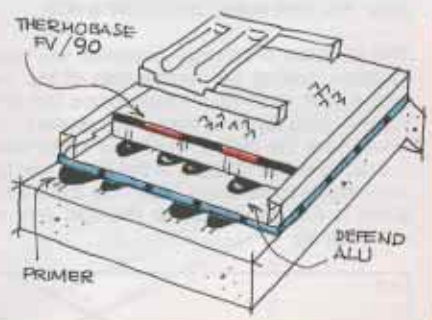
TILE COVERING

The tiles should be laid in strip of sand and cement mortar directly onto the surface of the THERMOBASE TEGOLA.
Slope: Dependent on the type of tile.

LEGEND:



- **Slope: dependent on the type of tile used.**



technical specification

PRIMER

The whole surface should be covered with a coat of bituminous primer, a solution containing oxydised bitumen, additives and solvents, which has 50% bituminous solids and an overall Ford viscosity No. 4 at 25°C from 20 to 25 sec.

VAPOUR BARRIER

A vapour barrier of DEFEND ALU 3 mm thick which is manufactured using distilled bitumen modified with atactic polypropylene and elastomers with a 6/100 mm thick aluminium foil and a glass fibre mat core. The vapour barrier should be fully flame bonded to all surfaces. The membrane, which has been manufactured to conform to UNI 8202-23, is impermeable to water vapour.
The membrane should be fully flame bonded to all vertical surfaces to at least 100 mm above the expected height of the thermal insulation.

TIMBER BATTENING FOR TILES (*)

Timber battens 40 mm wide should be placed at 1 metre intervals and be mechanically fixed to the deck and sealed at each side using a bituminous mastic. The thickness of the battens should be the same as the thermal insulation.

THERMAL INSULATION & WATERPROOFING LAYER

A layer of THERMOBASE TEGOLA material, in 1 metre wide rolls, should be laid on top of the vapour barrier and be fixed using hot oxydised bitumen.

THERMOBASE TEGOLA is made by prefixing a waterproofing membrane to strips of orientated fibre glass λ=0.032 Kcal/mh°C or strips of polyurethane λ=0.020 Kcal/mh°C. The membrane is of the bitumen-polymer type which has a maximum flow of 0.2 mm at 100°C (this conforms to the norm Aschimici-Iglae) and is reinforced with a non woven single strand polyester fabric.

The upper face of the membrane has a layer of mineral slate granules with strips on either side left free of granules to allow for flame bonding.
The insulation will have a thickness "s" and have sufficient thermal resistance R= S/λ to ensure that the dew point does not occur below the vapour barrier.
The insulation panels will be placed to run down the slope in the space between the timber battens and the joints should be sealed using 200 mm wide strips of MINERAL TESTUDO 4.5 which should be flame bonded.
The waterproofing of the reliefs should be raised to 100 mm above the maximum water level and should be made of MINERAL TESTUDO strips.

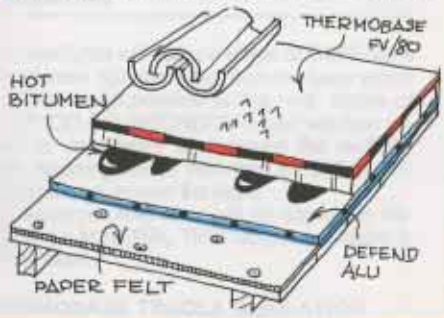
TIMBER BATTENING FOR TILES

Based on the dimension of the tiles, counter battens should be nailed to the battens to allow for anchoring of the tiles. All tiles should be fixed in accordance with the manufacturers instruction.
When fixing the battens apply a bead of mastic where nail will pass through the waterproof layer.

(*) If curved tiles are to be used, the main battens should be fixed across the roof slope as in exemple A

C) TIMBEI

- **Slope: ⩽ 35%**
- **Valid for THERMOBASE FV/90 and PUR (glass Fibre or poliuretane)**
- **Climatic conditions: no Frost and thaw cycles**



technical specification

(Should not be used in areas with heavy or frequent snow fall)

PRIMER

A coating of bituminous primer should be applied to all the reliefs and upstand. The primer should be a solution containing oxydised biutmen solids content and an overall Ford viscosity No. 4 at 25°C from 20 to 25 sec.

Commencing from the bottom of the slope, a bitumen impregnated paper felt should be loose laid along the length of the slope (UNI 3838 R/450).
All laps should be a minimum of 150 mm and the whole area, including the laps should be fixed using large head nails at 300 mm centres.

VAPOUR BARRIER

A DEFEND ALU modified bitumen vapour barrier 3 mm thick consisting of distilled bitumen modified with atactic polypropylene and selected elastomers reinforced with a 6/100 mm thick aluminium foil and glass fibre should be laid over the complete surface.

The membrane which conforms with UNI 8202-23 is completely impermeable to water vapour.
Again, commencing at the bottom of the slope the vapour barrier should be laid along the slope and astride the laps of the nailed felt. The vapour barrier should be fully flame bonded using a propane gas torch and be turned up at vertical sections and fixed to a heigth of at least 100 mm above the expected level of the thermal insulation. All laps should be a minimum of 100 mm and these should be nailed using large head nails at 100 mm centres prior to the application of the next membrane which will cover the nail heads.

THERMAL INSULATION & WATERPROOFING LAYER

A pre-fabricated insulated waterproofing membrane THERMOBASE TEGOLA should be laid on top of the vapour barrier. This material, 1 metre wide, consists of insulation of orientated glass fibre panels of λ=0.032 Kcal/mh°C or polyurethane panels of λ=0.020 Kcal/mh°C as previously described, fixed in strips to a polymer-bitumen membrane which has a maximum flow of 0.2 mm at 100°C (conforms to norm Aschimici-Iglae). The membrane should be reinforced with a single strand non woven polyester fabric; the weathering face should be coated with a slate granule mineral finish with both side laps left clean and free from granules to allow for flame welding.

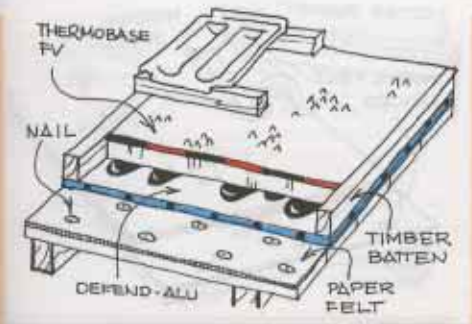
The insulation should have a thickness "s" sufficient to allow therminal resistance R = S/λ to ensure that the dew point does not fall below the vapour barrier. The insulating panels should be placed parallel with the slope with the edges pushed tightly together and sealed using a 140 mm wide strip of Mineral Testudo 4.5.
At all reliefs, upstand, etc. flashings will be fixed to at least 100 mm above the expected water level. Flashings will be Mineral Testudo 4.5.

TILE COVERING

The tiles will be laid directly onto the THERMOBASE TEGOLA and fixed using sand and cement mortar.

R DECK

- **Slope: dependent on the type of tile used.**



technical specification

(For areas subjects to snowfall)

PRIMER

A coating of bituminous primer should be applied to all the reliefs and upstand. The primer should be a solution containing oxydised bitumen solids content and an overall Ford viscosity No. 4 at 25°C from 20 to 25 sec.
Commencing from the bottom of the slope, a bitumen impregnated paper felt should be loose laid along the length of the slope (UNI 3838 R/450).
All laps should be fixed using large head nails at 300 mm centres.

VAPOUR BARRIER

A 3 mm thick Defend ALU vapour barrier should be fully bonded using a propane gas torch. The membrane is of the polymer-bitumen type reinforced with glas fibre together with a 6/100 mm thick aluminium foil. The membrane which conforms to UNI 8202-23 is impermeable to water vapour.
The membrane should be fully flame bonded to the deck and then turned at vertical insulation level. Overlaps of a minimum 100 mm should be flame welded.

TIMBERS BATTENS (*)

Timber battens 40 mm wide should be mechanically fixed along each side of the insulation and sealed with a bituminous mastic. The battens should be the same thickness as the insulation.

THERMAL INSULATION AND WATERPROOFING LAYER

A prefabricated insulated waterproofing membrane, THERMOBASE TEGOLA, should be fixed on top of the vapour barrier using hot melted bitumen. This material, 1 metre wide, consists of insulation of orientated glass fibre panels of λ=0.032 Kcal/mh°C or polyurethane panels λ= 0.020 Kcal/mh°C as previously described, fixed in strips to a polymer-bitumen membrane which has a maximum flow of 0.2 mm at 100°C (conforms to norm Aschimici-Iglae). The membrane should be reinforced with a single strand non woven polyester fabric, the weathering face should be coated with a slate granule mineral finish with both side laps left clean and free from granules to allow for flame welding.

The insulation should have a thickness "s" sufficient to allow thermal resistance $R = s/\lambda$ to ensure that the dew point does not fall below the vapour barrier. The insulating panels should be placed parallel with the slope, between the timber battens and then be sealed by flame welding 200 mm wide strips of TESTUDO MINERAL 4.5. across the laps including the battens.
At the reilefs, upstand, etc. flashings will be fixed to at least 100 mm above the expected water level. Flashings will be MINERAL TESTUDO 4.5.

BATTENS AND TILES

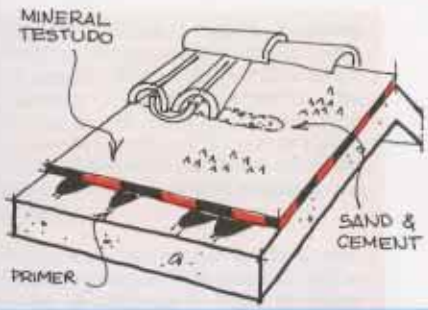
Based on the dimensions of the tiles additional timber battens should be fixed at right angles to the slope. These should be nailed to the battens already in position and will act as support for the tiles which should be fixed in accordance with the manufacturers instructions. Prior to nailing the battens, a small blob of mastic should be placed where the nail will enter.

(*) If curved tiles are to be used, the main battens should be fixed across the roof slope as in example A.

3 WATERPROOFING (ov

BRICK AND CEMENT SURFACE

- **Slope: ⩽ 35%**
- **Climatic conditions: without Frost & thaw cycles**



technical specification

(This specification should not be used in areas subjects to heavy snowfall)

PRIMER

The whole surface of the deck will be coated with a bituminous primer which is based on oxydised bitumen, additives and solvents having a 50% solids content and FORD viscosity No. 4 at 25°C from 20 to 25 sec.

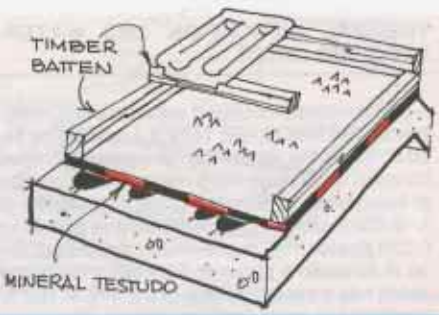
WATERPROOFING MATERIAL

The waterproofing shall consists of a MINERAL TESTUDO 4.5 polymer-bitumen membrane of distilled bitumen modified with atactic polypropylene and elastomer reinforced with a continuous single strand extruded "non-woven" isotropic polyester fabric. The weathering surface of the membrane will be coated with a mineral slate granule finish. The membrane will have an ultimate longitudinal and transverse tensile strength 800 N/5 cm and 700 N/5 cm respectively, a L/T elongation to break of 50%, a hydraulic pressure resistance to burst on free discs of 177 cm² equal 4 Kg/cm² and a high resistance to fatigue after 1000 cycles on an active split opening 3 mm in each direction.
The membrane should be placed parallel with the slope and laying should commence at the eaves, working up the slope. The membrane should be applied by fully flame bonding with a propane gas torch allowing fo minimum 100 mm overlaps. Flashings at upstand ad reliefs should be fixed at least 100 mm above the maximum water level.

TILE COVERING

The tiles will be laid directly onto the MINERAL TESTUDO and be fixed using sand and cement mortar.
Slope: Dependent on the type of tile used

- **Slope: dependent on the type of tile used**



technical specification

PRIMER

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BATTENS (*)

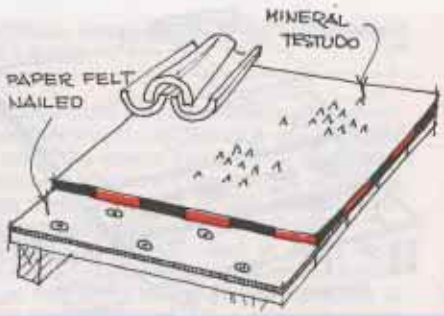
Battens will be positioned running down the slope and fixed on top of the waterproofing. Cross battens will then be placed and fixed to allow correct positioning of the tiles.

TILE COVERING

Tiles should be fixed in accordance with manufacturers recommendations.
Slope 35%
Climatic Conditions: Without frost and thaw cycles

TIMBER

- **Slope: ⩽ 35%**
- **Climatic conditions: without Frost & thaw cycles**



technical specification

(This specification should not be used in areas subjected to heavy snowfall)

PRIMER

All reliefs will be coated with a bituminous primer which is based on oxydised bitumen, additives and solvents having a 50% solids content and FORD viscosity No. 4 at 25°C from 20-25 sec. Commencing at the eaves and working up the roof a bituminised paper felt such as INDEFELT 2000 should be laid across the slope of the roof (UNI 3838 R/450) allowing for 150 mm overlaps. The felt will be mechanically fixed using large head nails at 300 mm centres with each line of fixings offset.

WATERPROOFING MATERIAL

Material and method of fixing the same as for concrete deck except that each membrane should be nailed under the overlaps at 300 mm centres.

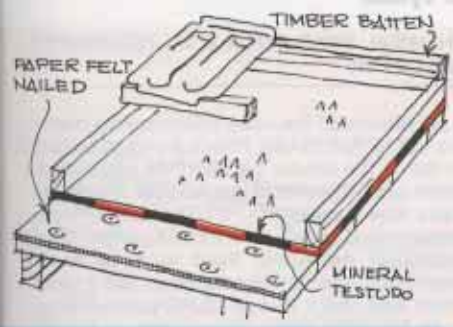
TILE COVERING

The tiles should be laid directly onto the MINERAL TESTUDO and be fixed using sand and cement mortar.

R UNINHABITED ROOF SPACE)

DECK

- **Slope: dependent on the type of tile used**



technical specification

PRIMER

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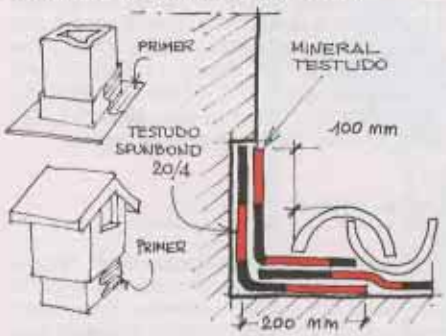
— Waterproofing
as for concrete
— Battening
as for concrete
— Tile covering
as for concrete

(*) If tiles are curved it may be sufficient to fix a single structure of battens parallel with the slope.

4 TECHNICAL DETAILS

CHIMNEYS

A pre-shape metal flashing may be used around the chimney, the flat base should be approximately 120 mm and should be primed before application of the membrane.



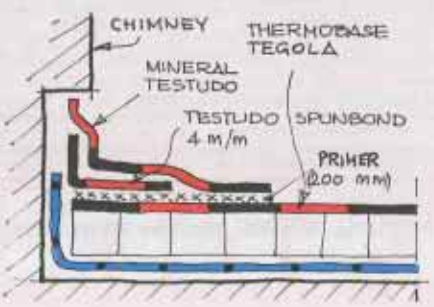
The alternative method is for a purpose made recess to be provided at the foot of the chimney which would be waterproofed as shown in the diagram.
Prior to application of the membrane, the recess should be primed.

MINERAL TESTUDO - WITHOUT INSULATION

The waterproofing flashing to the chimney will consist of a strip of TESTUDO SPUNBOND 20-4 mm bonded into the recess at the foot of the chimney and to the flat surface. The top of the recess should be 100 mm above the level of the tiles.
The roof waterproofing will then be laid and finally a MINERAL TESTUDO cover flashing will be applied as shown in the diagram.

THERMOBASE TEGOLA INSULATION

A vapour barrier should be applied which will be turned at the chimney and fixed on the vertical surface to at least 50 mm above the insulation thickness.
The insulating panels will be positioned on the roof and around the chimney. The mineral surface of the membrane should be given a coat of primer to a 200 mm wide area around the chimney.
Again, a strip of TESTUDO SPUNBOND 20-4 mm material should be welded into the recess and 100 mm onto the primed area around the chimney. Finally, a MINERAL TESTUDO cover flashing should be applied, as shown in the diagram, on the flat area for 200 mm around the chimney and on the vertical to a height of 100 mm above the tiles.



ROOFLIGHTS/SKYLIGHTS

The rooflight should have a 120 mm wide metal plate or wing to which the waterproofing will be bonded; this should be primed. If a lip is present around the edges of the base, this should be flattened.

MINERAL TESTUDO WITHOUT INSULATION

The rooflights will rest on strips of DEFEND 4 mm at least 100 mm wider than the base which will have been bonded to the roof. Strips of TESTUDO SPUNBOND 20-4 mm will then be used to completely seal around the rooflight base, bridging across from the DEFEND 4 mm and onto and up over the base.
The waterproofing layer will be applied to the roof and a MINERAL TESTUDO cover flashing will be fixed.

THERMOBASE TEGOLA INSULATION

The base of the rooflight will rest on top of the insulation and a strip of VEDATEX ADHESIVE or bituminous mastic will be applied between the base and the insulation. For a 200 mm wide area around the rooflight the mineral surface of the THERMOBASE will be coated with primer. A strip of TESTUDO SPUNBOND 20-4 mm will be bonded to make a waterproof connection between the base of the rooflight and the membrane. Finally, a TESTUDO MINERAL cover flashing will be bonded from the rooflight base to the edge of the primed area.

CIRCULAR CHIMNEYS WITH A DIAMETER UNDER ∅ 200 mm, TV AERIALS, ETC.

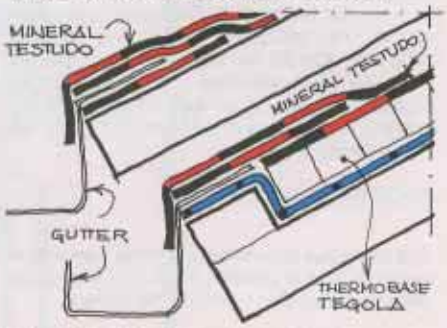
With metal, PVC or asbestos cement pipes a recess cannot be provided in the body of the pipe or chimney, In these cases pre-shaped metal or elastometric units resistant to the external conditions and consisting of a pipe and connecting ring at least 120 mm wide can be used. This will be primed and the membrane will be bonded; then, a metal flashing collar should be clamped on above the waterproofing.

MINERAL TESTUDO - WITHOUT INSULATION

The connecting ring should be flame welded to a 100 mm piece of DEFEND 4 which had previously been bonded to the roof surface. TESTUDO SPUNBOND 4 mm should then be bonded up the outer pipe and down onto the connecting ring. Finally, a MINERAL TESTUDO cover flashing should be applied.

EAVES LINE

The gutter may be provided with a flange for fixing to the roof edge to connect with the waterproofing membrane. Alternatively, the connection could be made with a pre-shaped metal drip which would be positioned over the gutter.
As it provides for easier maintenance, it is advisable to follow the alternative system.



MINERAL TESTUDO - WITHOUT INSULATION

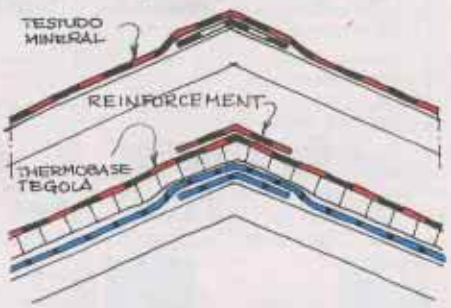
The fixing flange should be coated with bituminous primer and then fixed to a 100 mm wider strip of DEFEND 4 which has previously been bonded to the roof edge. Over this a strip of TESTUDO SPUNBOND 20-4 mm, 100 mm wider than the DEFEND shoul be bonded and finally the roof waterproofing, MINERAL TESTUDO, will be brought down to the roof edge having been fully bonded.

THERMOBASE TEGOLA INSULATION

The roof edge will be finished with a small upstand which will be equal to the thickness of the THERMOBASE insulation. The vapour barrier will be fixed and brought down over the upstand and to it the pre-shaped metal flashing will be fixed. A strip of VEDATEX ADHESIVE or bituminous mastic will be applied between the flashing and the insulation. A piece of TESTUDO SPUNBOND 20-4 mm at least 100 mm wider than the primed flanged will be bonded over and onto the waterproofing layer. Finally, a MINERAL TESTUDO cover flashing will be applied.

RIDGE DETAIL

The waterproofing will be reinforced along the line of the ridge.



MINERAL TESTUDO - WITHOUT INSULATION

A reinforcing piece of TESTUDO SPUNBOND 20-4 mm at least 330 mm wide should be bonded astride the ridge. The MINERAL TESTUDO will then be applied (see diagram).

4 TECHNICAL DETAILS

THERMOBASE TEGOLA INSULATION

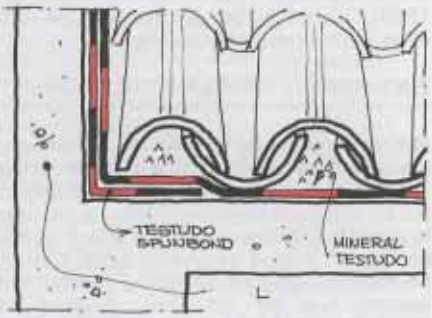
Before application of the vapour barrier a 330 mm wide strip of DEFEND ALU 3 should be bonded astride the ridge; the vapour barrier should then be applied. Following application of the THERMOBASE TEGOLA a 330 mm wide strip astride the ridge should be primed and a 330 mm wide piece of TESTUDO SPUNBOND 20-4 should be fully bonded over the bridge followed by a strip of MINERAL TESTUDO of similar width.

ROOF EDGE DETAIL

The roof edge should have a small concrete or brick upstand or profiled metal trim with a connecting plate which should be primed.

MINERAL TESTUDO - WITHOUT INSULATION CONCRETE/BRICK UPSTAND

The upstand should be primed followed by a flame welded strip o TESTUDO SPUNBOND 20-4. Finally a MINERAL TESTUDO cover flashing should be applied and if necessary the top of the wall could be protected by a metal cap flashing.

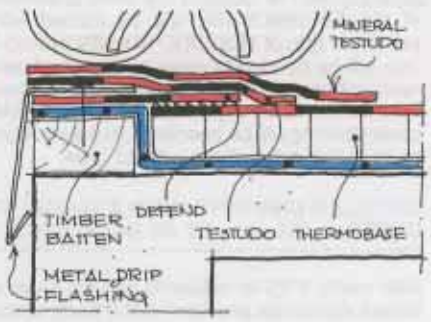


METAL PROFILED TRIM

At the roof edge a strip of DEFEND 4 at least 100 mm wider than the connecting flange should be flame bonded; the flange should then be bonded to the DEFEND and reinforced by a piece of TESTUDO SPUNBOND 20-4 which should also be fully bonded. Finally, a MINERAL TESTUDO cover flashing should be applied.

THERMOBASE TEGOLA INSULATION CONCRETE/BRICK UPSTAND

The vapour barrier should be turned and applied up the wall. The Mineral surface of the THERMOBASE at the foot of the upstand should be coated with a 100 mm wide coating of primer. A strip of TESTUDO SPUNBOND 20-4 should be bonded, a MINERAL TESTUDO cover flashing should be applied and if necessary the top of the upstand can be protected by a metal cap flashing.



METAL PROFILED TRIM

A timber upstand the same height as the insulation should be fixed at the roof edge. A vapour barrier should be taken over the upstand and THERMOBASE laid. The edge of the THERMOBASE should be primed and a piece of DEFEND 4 should be applied from the roof edge onto the pre-primed THERMOBASE. The metal profiled trim should be bonded and covered with a strip of TESTUDO SPUNBOND 20-4. Finally, a 100 mm wide MINERAL TESTUDO cover flashing should be applied.

CONNECTIONS TO WALLS

Connections to walls should be made by bonding the waterproofing membrane into 20-30 mm deep pre-shaped recesses. Pre-shaped metal flashings may be used following procedures set out in previous chapters.

MINERAL TESTUDO - WITHOUT INSULATION

The corner between the roofs and wall should be reinforced with flame welded strips of TESTUDO SPUNBOND 20-4 with a cover flashing of MINERAL TESTUDO.

THERMOBASE TEGOLA INSULATION

The corner between the insulation and the wall should be reinforced with flame welded strips of TESTUDO SPUNBOND 20-4 bonded to the wall and the pre-primed surface of the membrane. The cover flashing of MINERAL TESTUDO should be taken at least 500 mm onto the roof surface.

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