technical specification 3

RE-ROOFING

Re-roofing procedures. INDEX Renovation Systems. Details

Re-roofing methods depend on a number of different factors all of which cannot be covered completely in this publication. Whilst covering the more usual situations, it should be recognised that every re-roofing contract must be assessed individually. It is however, possible to summarize the most frequent conditions and to offer general indications about recommended roofing methods. This publication covers re-roofing with bituminous high performance water-proof membranes. A roof covering may be in unsuitable condition for the following reasons:

- ageing of the waterproof covering.
- use of poor quality materials or improper installation.
- design errors with regard to choice of materials, the way in which the material was used, climatic conditions, entrapped moisture or mechanical forces, etc...

Whenever possible, re-roofing should exploit the existing covering and therefore it is important to establish its conditions.
An erroneous evaluation of this problem may lead to unpleasant inconveniences.

RE-ROOFING PROCEDURES

The main factors determining the choice of procedure are:

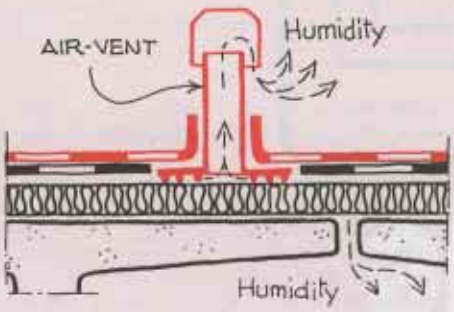
- the build-up and nature of the strata which makes up the covering layers, especially with reference to:
- the presence of thermal insulation
- the existing roof package and how this relates in the widest sense to the roof slope, the use to be made of the existing covering, and the mechanical stresses generated by its expansion.
- condensation problems, especially if these have resulted from an erroneous evaluation of these conditions.
- external climatic conditions: attack by chemical agents, pollution from surrounding industry, wind, hail storms, etc.
- the protection placed on the waterproof covering: paving, gravel protection, painting, self-protected covering (slate grit or metal foil).
- type of degradation the waterproof covering has undergone.

1 ANALYSIS OF EXISTING C

THE NUMBER OF LAYERS AND NATURE OF STRATA MAKING UP THE OLD SYSTEM AND THEIR INFLUENCE ON METHODS OF RENOVATION

When thermal insulation is present.

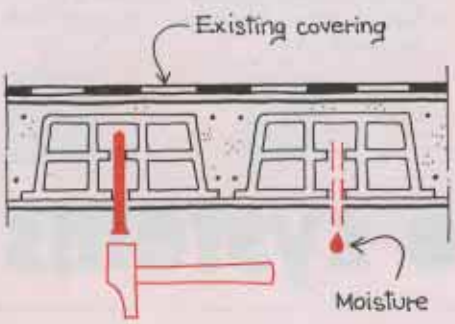
The first task is an inspection of the roof to determine whether the insulation can continue its function without undermining the results of any restoration.
Badly soaked insulation which has undergone variations in size or surface defacement, pitting or cracking in the presence of humidity must without doubt be removed.
The same applies to warped insulation which would prevent the correct sealing of the laps of waterproof covering. When judging whether or not to remove insulation, due consideration must be given to roof structure and the position of the insulation itself.
Insulation that is extremely soaked but placed under and open to view waterproof covering or, an industrial covering compound of prefabricated concrete elements with good internal ventilation, these can be left alone since they dry from the inside; furthermore the elimination of humidity will be even easier if a breather vent is used during re-roofing and spaced at intervals of 40 to 50 square metres.



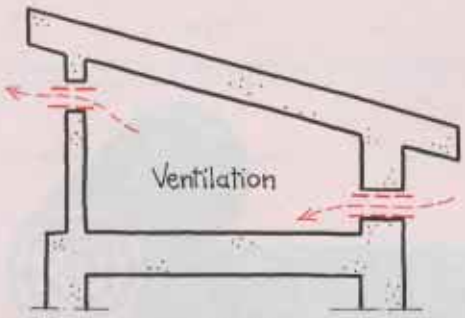
In case of insulation without a vapour barrier placed under paving on residential roofing, where the deck is on site cast concrete with hollow pot construction it is often better to strip off the complete covering in order to avoid the risk of trapping large quantities of moisture, between the insulation and the surface of the deck.

Type of covering

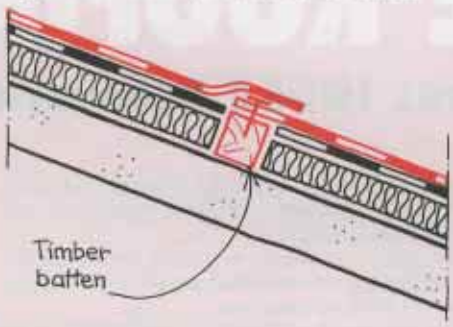
When determining re-roofing procedure the type of surface covering must be taken into account, hollow pot construction floors retain much water so that often, holes are bored through the interior part of the floor to allow moisture to escape.



Double roof with non-ventilated interspace can be the seat of condensation which is at times mistaken for leaks in the waterproof covering; in this case as well, it is a good idea to bore air holes.

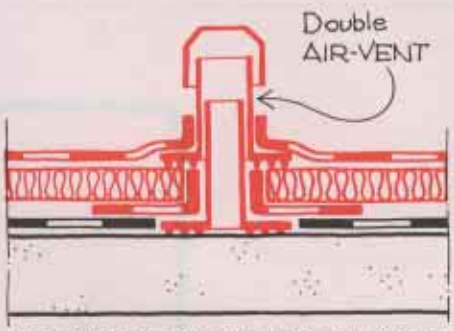


On floors composed of split elements, where the prefabricated panels are place side by side, fatigue caused by movement is the cause of breakdown so that while restoring the covering it is important to use the semi-bonded technique. The use of a stress resistant material as an expansion joint should take place wherever possible.
The same holds true in the case of incorrect laying of elements which make up the roof covering, as in the case of a slope block set on thermal insulation; the block breaks because of the high range of temperatures and the cracks spread to the waterproof covering. In this situation the semi attached method should again be used leaving unbonded sections to take up any movement. On coverings with extreme slopes, slipping of the insulation and slump due to softening of the old materials could occur in these circumstances. To sustain the old system, timber battens should be inserted into the insulation and nailed to the deck every two metres. The new waterproofing can then be applied, ensuring that the underlap is nailed to the batten.



Hygrothermic implications

Often restoration operations must resolve problems which stem from lack of accuracy in evaluation of moisture. Insufficient thermal resistance due to a lack of insulation will lead to condensation, an erroneous laying or the lack of certain layers such as the vapour barrier, can effect the use of an insulation layer in re-roofing operations.
Where it is possible, one should try to use the old covering as the vapour barrier (after ensuring that it is water tight) then place the insulation layer on to the existing surface and cover the whole surface with the new waterproofing layer. Even here, double air vents should be pre-set every 40 to 50 square metres to eliminate vapour both from under the vapour barrier and from over the insulation. Careful consideration should be given to the resistance to dispersal of water va-



pour both in the existing layers and the new materials used. Often removal of any aluminium sheet from an old covering is recommended prior to restoration so that the water trapped under it can vent without difficulty and for the same reason one should not make of coverings with metal sheet in re-roofing operations.

CLIMATIC CONDITIONS - ONE ASPECT WHICH MUST BE CONSIDERED IN RE-ROOFING

Areas which are subject to strong winds and violent hail storms require strong covering systems.
Too little attention paid to these problems can result in considerable damage, so any repairing of waterproofing systems must necessarily take these conditions into account.
In areas of high wind, it is vital that a good bond is achieved by removing all parts of the old system which show poor adhesion and re-making the covering in the correct way, or by mechanically fastening the old covering with nails bearing large washers.
On this surface a waterproof layer can now be reconstructed and wherever weight capacity permits, a layer of gravel should be used as additional insurance against wind forces.
In case of zones subject to violent hail storms, the covering can be protected by a layer of gravel or reinforced with a force resistant sheet of **MINERAL HELASTA P** which is completely adhered to the old system.

PROTECTION IS THE FINAL LAYER

The final covering layer protects the underlying elements from atmospheric agents, and mechanical forces etc.
This surface can be composed of a painted surface on the waterproof coating, by slate grit or some other mineral or by bituminous sheets covered with metal foil (copper, aluminium). The above mentioned types are called light protection while protection made of gravel or paving are called heavy protection. The presence and condition of these strata require preliminary operations prior to applying the new covering.
– When the new covering must be bonded to an old one on:

Bituminous covering protected by varnish

Before applying the new covering insulate any surface finish with a coat of bituminous primer brushed on at 250 gr/m²

Coverings protected by slate blasted or grit blasted bituminous sheets

Before applying the new membrane, sweep up the loose slate with a broom or vacuum cleaner and bond any remaining slate with a coat of bituminous primer **INDEVER** at 400 to 500 gr/m².

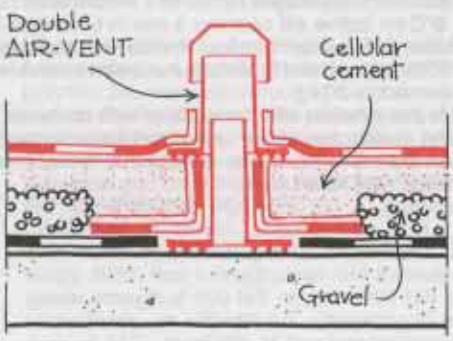
Coverings protected by bituminous sheets covered with metal foil

- If the foil is in the process of separating, it is necessary to remove it by heating with a propane gas burner.
- If the foil is firmly attached and leaving it there does not lead to trapping of moisture, paint the foil with a coat of bituminous primer at 250 gr/m². and apply a heated bituminous smear coat. Use only primer for slopes that are in excess of 15% but while flame bonding one should work carefully, heating only the roll and not the foil.

In cases where the covering has a heavy protection and where this protection was laid on a separation strata (sand bed or sand-blasted felt paper, and not directly on the covering itself) you can remove it without difficulty and repair the old covering. In cases where both the protection and the covering are so strongly adhered that no matter what system is used, both the protection and the waterproof layer would be destroyed, always providing the structure will bear the extra load, proceed as follows:

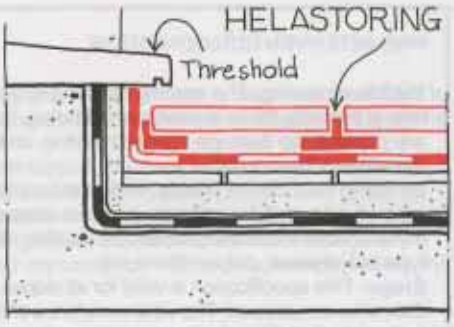
Coverings protected by gravel

If it is convenient to leave it on site, it is possible to fix the gravel by flooding with hot bitumen or with cellular cement, giving a smooth surface by applying two coats up to 20 mm above gravel level. With gravel strata which are 40 mm thick, the cellular load has been established at 25 kg/m². In order to dry the underlying and cellular layers, bore a hole in the old covering and insert the first element of a double air vent, place the second element of the double air vent on the cellular surface (one vent every 30 to 40 m²). This solution should be adopted only when the water-proof covering can be semiattached.



Water-proof below paving

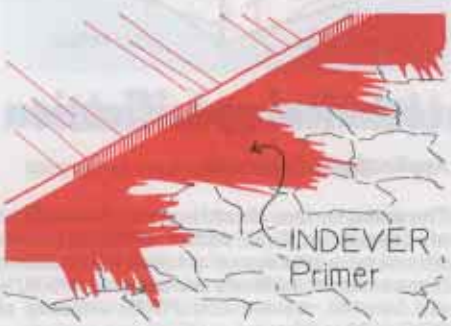
When restoring the walking surface of a terrace and the level of the threshold or damp course permits, a **FLEXTER TESTUDO** is loose laid over the existing waterproofing, paving is then laid using the **HELASTORING** system. The **HELASTORING** system is composed of concrete blocks set on plastic supports without sealants, this allows water to pass between the slabs to the water-proof membrane, thus draining the walking area. This keeps the water at the membrane level and not on the walking surface. Around the thresholds completely and carefully fully bond the water-proof membrane to a distance of 200 mm on both the flat and vertical areas.



TYPE OF DEGRADATION EVIDENT IN EXISTING WATERPROOFING AND PRELIMINARY PREPARATION

More often than not, the bituminous waterproof covering is directly exposed to atmospheric agents and, therefore, undergoes a generalized degradation. This is identified by multiple surface cracks (crocodile skin effect) and drying out of material which results in a loss of elasticity and flexibility.

When the covering is still solid and compact, even if dried out, it is possible to set the new system directly on top of it simply by first painting the surface with a coat of primer **INDEVER** at 250 gr/m².



When a few breaks are present on the covering due to concrete shrinkage or to broken slope blocks, it is possible to repair the old covering in the following way before applying the new membrane.

- Apply a bituminous primer over cracks making sure to cover 200-250 mm past the edges.
- A strip of roofing glass mat 10 cm wide and 50 gr/m² is placed over the crack.
- A 250 mm strip of **FLEXTER TESTUDO** is flame welded over the crak.

When cracks are present over the entire surface of the covering (generally this occurs with coverings applied on insulated panels) it is better not to repair the old covering but to proceed directly to laying the new membrane.

When there are blisters (usually multilayer coverings composed of bituminized felt paper), these should be cross cut and flattened, the area then painted with a coat of bituminous primer and a strip of **FLEXTER TESTUDO** fully welded which overlaps 100 mm beyond the surface cut.

Where there are many bubbles or non-adhered zones it is necessary to totally remove the covering.

SPECIAL POINTS

Very often, even on a relatively recently installed waterproof covering, cracks begin to appear and this is because not enough care was taken in choosing the material and systems to connect horizontal and vertical elements. In fact, these are the points where mechanical stress and tension is most strongly imposed on the waterproof membrane.

Frequently there are breaks at the bottom of peripheral walls and at the corners of skylights and stacks. Repairs of these particular points should be done with strips of **FLEXTER TESTUDO** flame welded after the area to be repaired has been painted with a coat of bituminous primer.

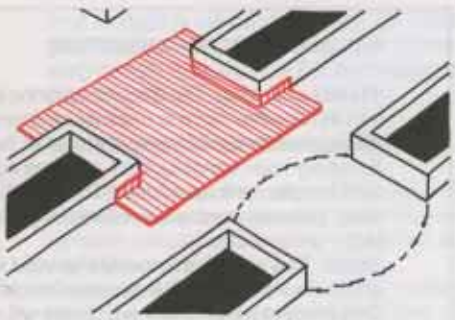
Examples:

1 Damage to the upstand and corners of skylights set upon thermal insulation with the flat areas still in good condition.

Repair: strips of **FLEXTER TESTUDO** to reinforce the upstand.

2 Cracks along the short sides of skylights set on thermal insulation with the flat section in good condition.

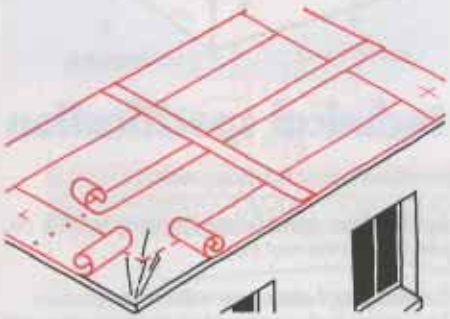
Repair: 2 strips of **FLEXTER TESTUDO** in form of a T section are laid between the rooflights on the flat area and then turned and flame welded



on the vertical part of the edge of the skylight.

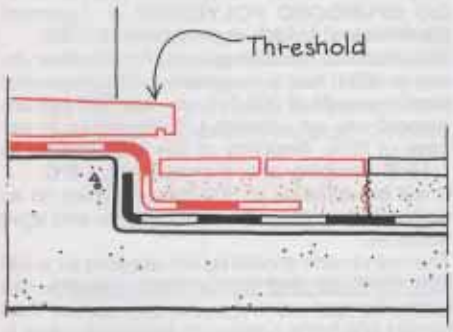
3 Folds and cracks at the corners of a flat roof and where a loose laid waterproof covering on the corner has separated at the relief, due to action of wind.

Repair: Remove a 2 metres strip of the old covering along the entire perimeter and replace with **FLEXTER TESTUDO** flame bonded on the roof surface up to the base of the elevations and overlapping the old covering by 500 mm mechanically cross fasten with expansion nails, and cover with two flame bonded strips of **FLEXTER TESTUDO**.



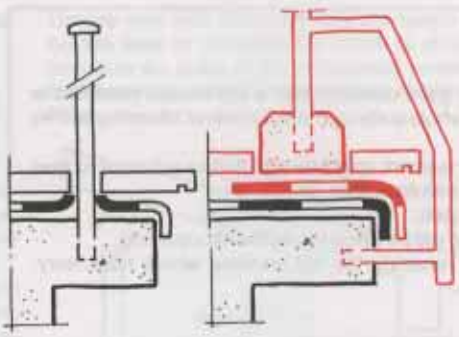
4 Waterproofing beneath a paved area of flat roof which is below threshould level.

Repair: after having removed the paving stone and demolished part of the floor (200 mm) adjacent to the threshold, coat the area with bituminous primer and flame bond a strip of **FLEXTER TESTUDO** so that the new waterproofing connects ans overlaps the old covering.



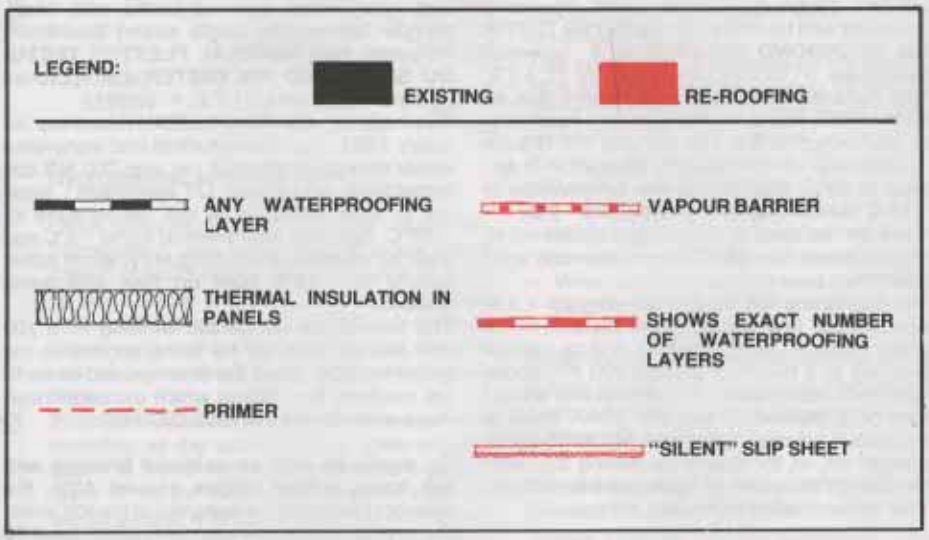
5 Railing colums which pass through the waterproof covering.

Repair: Demolish floor along a st of at least 300 mm and repair coverings with **FLEXTER TESTUDO**; replace with new railings which are set on a concrete seam.



6 Breakage of waterproof covering caused by movement due to a lack of expansion joint.

Repair: creation of a correctly constructed expansion joint using **HELASTA P** and **MINERAL HELASTA P**.

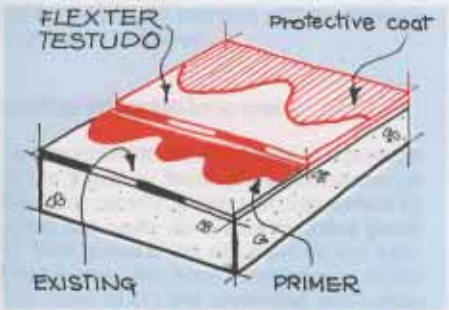


This publication deals with restoration where it is possible to renovate an existing built-up roof. Where total demolition and re-building of the old system is needed, the relevant INDEX publication relating to the proposed specification should be consulted.

2 INDEX RE-ROOFING SYSTEMS
RENOVATION OF THE WA

PRE-INTERVENTION CONDITION

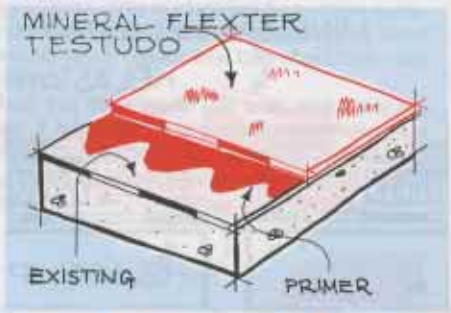
Visible covering: The surface is in reasonably good condition with a few breaks restricted to particular points. Cracks are not visible over the whole surface, there is minimal blistering and no damage caused by hail or wind.
Existing roof construction: pre-cast concrete support, concrete with hollow pot construction site, mineral fibre insulation, expanded pearlite, cellulous fibre, cork.
Slope: This restoration solution is valid on all slopes.
Climatic situation: wind resistance of re-roofing will be the same as the old covering.
Aftr properly cleaning the whole surface and repairing the old covering where necessary, proceed as follows:



technical specification

Method of application: fully bonded.

The whole surface should be treated with a bituminous primer **INDEVER**, this should be a solution comprising an oxidized bitumen base, additives and solvents with 50% dry bitumen residue and FORD n. 4 viscosity at 25°C 20 - 25 sec.
When the primer is completely dry it will be fully welded a 4 mm thick elasto-plastomeric polymer bitumen waterproofing membrane based on distilled bitumen with added plastomers and elastomers and reinforced with a "non-woven" continuous single strand Spunbond polyester and be of the type **FLEXTER TESTUDO SPUNBOND POLYESTER 4**, Agrement Certificate n° 371/91 approved by I.C.I.T.E. This material, according to UEAtc directive January 1984, has a longitudinal and transverse tensile strength of 800 N/5 cm, and 700 N/5 cm respectively, an ultimate L/T elongation in excess of 50%, flexibility at low temperature to **−15°C**, flexibility after thermal aging **−5°C**.
It will be resistant to 500 fatigue cycles on an active fissure at **−10°C** both on new and aged material.
The membrane will be laid allowing for a 100 mm overlap and will be flame bonded to the entire surface, along overlaps and on vertical sections to a height of at least 200 mm above maximum water level. The membrane should then be protected by two 150 gr/m². coats of aluminous bitumen paint type SOLARIS either sprayed on, or, for slopes exceeding 3%, with two 200 gr/m². coats of hydropaint for bituminous waterproofing indecolor.



technical specification

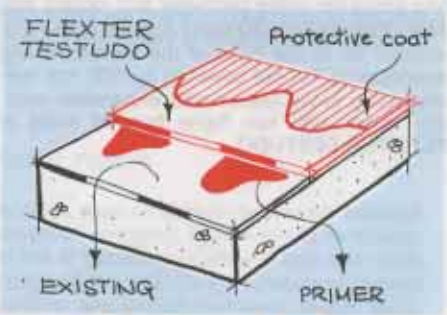
Method of application: fully bonded.

The entire surface should be treated with a bituminous primer **INDEVER**. This should be a bituminous solution with oxidized bitumen base, additives and solvents with 50° dry bitumen base, additives and solvents with 50° dry bitumen residue and FORD n. 4 viscosity at 25°C of 20 to 25 sec.
When the primer is completely dry it will be applied a 4,5 kg/m² elasto-plastomeric polymer bitumen waterproofing membrane, based on distilled bitumen with added plastomers and elastomers, and reinforced with "non-woven" continuous single strand Spunbond Polyester type **MINERAL FLEXTER TESTUDO SPUNBOND POLYESTER 4,5**, approved by Agrement from I.C.I.T.E. n° 371/91 .
The material, according to UEAtc Directives January 1984, has a longitudinal and transverse tensile strength of 800 N/5 cm, and 700 N/5 cm respectively, an ultimate L/T elongation superior to 50%, flexibility at low temperature of **−10°C**, flexibility after thermal aging **−5°C** and it will be resisting to 500 fatigue cycles on active fissure at **−10°C** both on new and aging material.
The membrane will be laid allowing for a 100 mm overlap and will be flame bonded to the entire surface, along the overlaps and on vertical sections to a height which exceeds maximum water level by at least 200 mm.

On surfaces with an oxidized bitumen and felt base, where slopes exceed 40%, the membrane should be fastened at the top under the overlap with expansion nails which have 80 mm washers.

PRE-INTERVENTION CONDITION

Visible covering: The existing covering is cra
mm in breadth, there is minimal blistering, nc
waterproofing would cause damage to the ins
Existing roof construction: pre-cast concre
cast on site, cellular cement, mineral fibre in
fibre, pre-cast concrete sections, organic foa
etc.
Slope: This specification would be valid for 0°
Climatic condition: This proposal would not
Only blisters will be flattened, cracks will not b
Care should be taken to ensure that the roof s



technical specification

(on coverings without insulation)

Application: semi-bonded by 20% to 50% depending on the roof slope.

Existing roof structure without insulation.
The entire surface should be treated with a coat of bituminous primer type **INDEVER**. This should be a bituminous solution with oxidized bitumen base, additives and solvents with 50% dry bitumen residue and FORD viscosity at 25°C of 20 to 25 sec.
When the primer is completely dry it will be fully welded a 4 mm thick elasto-plastomeric polymer bitumen waterproofing membrane based on distilled bitumen with added plastomers and elastomers and reinforced with a "non-woven" continuous singles strand Spunbond Polyester and be of the type **FLEXTER TESTUDO SPUNBOND POLYESTER 4**, Agrement Certificate n°311/91 approved by I.C.I.T.E.
This material, according to UEAtc directive January 1984, has a longitudinal and transverse tensile strength of 800 N/5 cm, and 700 N/5 cm respectively, an ultimate L/T elongation in excess of 50%, flexibility at low temperature to **−15°C**, flexibility after thermal aging **−5°C**.
It will be resistant to 500 fatigue cycles on an active fissure at **−10°C** both on new and aged material.
The membrane should be laid allowing for a 100 mm overlaps and should then, using a gas torch, be spot welded to the roof surface then turned and flame bonded on the vertical parts to a height of 200 mm above the maximum water level. The membrane should then be protected by two, 150 gr/m². coat of aluminous bitumen paint type SOLARIS which is either sprayed on, or, for slopes exceeding 3% with two 200 gr/m². coat of water based paint for bituminous water proofing type **INDEVER** wich is rolled on.

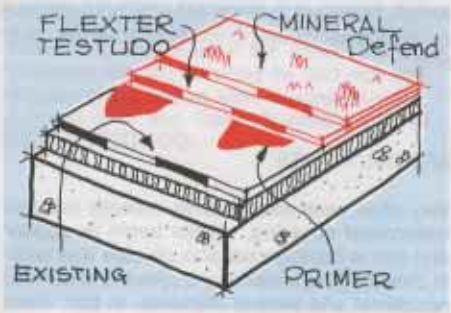
ATER-PROOF COVERING ONLY

cked over the whole surface with active fissures 2
damage caused by wind or hail, removal of the
ulation.
te, concrete and hollow pot construction cast on
sulation, expanded pearlite mixed with cellulous
m insulation such as polystyrene, polyurethane,

% to 40% slopes.
be valid where strong winds are present.
e repaired.
urface is properly cleaned.

PRE-INTERVENTION CONDITION

Visible covering: The existing covering is cracked over the entire surface with active fissures 2 mm in breadth, there is minimum blistering, but punctures caused by hail or maintenance traffic are present, no damage caused by wind, and removal of the waterproof covering would cause damage to the insulation.
Existing roof construction: Pre-cast concrete support, concrete with hollow pot construction cast on site, cellular cement, pre-cast concrete sections, fretted plates with panel insulation, mineral fibre insulation, expanded pearlite mixed with cellulous fibre, organic foam insulation type polystyrene, polyurethane, etc.
Slope: This specification is valid for all slopes.
Climatic conditions: The wind resistance of the roofing will be the same as the old covering. If it is thought that delamination may occur, fasten mechanically to the old covering with expansion nails which have 80 mm washers (5 nails / m²). This re-roofing solution is extremely reistant to hail but should only be used as an alternative where it is impossible to apply heavy protection. Only the blisters will be flattened, the cracks will not be repaired. Care should be taken to ensure that the roof surface is properly cleaned.

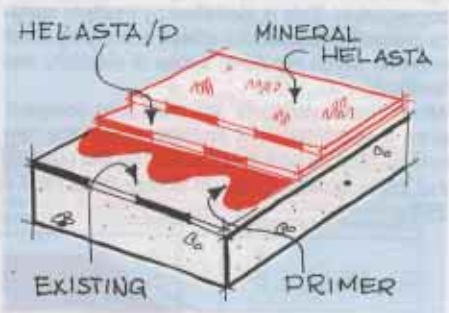


technical specification

(On coverings with insulation panels)

Proceed as previously described using **FLEXTER TESTUDO** but instead of painting carry on as follows:
Astride and parallel the overlaps of preceding layer, it will be fully flame welwed a 3,5 kg/m² of weight, elasto-plastomeric polymer bitumen waterproofing membrane, self protected by slat granules, based on distilled bitumen, atactic polypropylene and elastomers, reinforced by glass felt, type **MINERAL DEFEND 3,5.** The membrane will be laid allowing for 100 mm overlaps and will be fully flame bonded using an approved gas torch. At the vertical the material will be turned and flame bonded to a height of at least 200 mm above the maximum water level.

Note: On surfaces with an oxidized bitumen and felt base for 15% to 50% slopes the **FLEXTER TESTUDO** sheets will be fastened at the head edge with expansion nails which have 80 mm washers.



technical specification

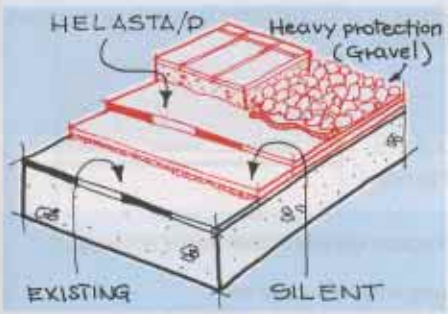
Application: fully bonded.

The entire surface should be treated with a coat of bituminous type primer **INDEVER**. This should be a bituminous solution with oxidized bitumen base, additives and solvents with 50% dry bitumen residue and FORD viscosity at 25°C of 20 to 25 sec.
When the primer is completely dry, it will be applied an elastomeric polymer-bitumen membrane 4 mm thick based on distilled bitumen modified by the addition of Radial butadiene-Styrene thermoplastic rubber type **HELASTA P 4** approved by I.C.I.T.E. Agrement Certificate no 400/93. This type of compound has elastic qualities and has an alongation of 2000%.
The membrane is reinforced with a "non-woven" continuous single strand Spunbond Polyester. This material has a longitudinal and transverse tensile strength of **800 N/ 5 cm** and **700 N/5 cm** respectively, an ultimate L/T elongation in excess of **50%** and it is flexible at temperature below **−25°C** when tested to UNI 8202. It is resistant to fatigue on **10.000** cycles at a temperature of **0**°C on an active fissure which opens 3 mm in each direction and to static puncture; resistance on asbestos cement 20 kg.
The membrane will be laid allowing for a 100 mm overlap and will be flame bonded to the whole surface. Along overlaps and on vertical sections to a height of at least 200 mm above the maximum water level.
Astride and parallel with the previous layer it will be fully flame welded a **MINERAL HELASTA V** Membrane 3,5 kg/m² of weight. This elastomeric polymer bitumen waterproofing membrane will have the upper surface self protected by slate granules, it will be based on radial butadiene-styrene thermoplastic elastomers, which have an ultimate elongation of 2000% and be reinforced with fibre glass.
The membrane will be flexible at a temperature below **−25°C** according to UNI 8202 and resistant to 1000 fatigue cycles at a temperature of **0°C** on active slit opening 3 mm in both directions with a maximum loss in thickness equal to 50% approx. and to static puncture on asbestos cement > 20 kg.
At the junction with the walls or with upstands, the membrane will be turned and flame bonded on the vertical parts for at least 200 mm above maximum water level.

When choosing the INDEX re-roofing system, you must carefully evaluate the problems before proceeding with any work and compare them with the conditions discussed in each technical re-roofing chapter. If in any doubt, refer to the technical department of your TESTUDO Distributor. These chapters cover both reinforcing of existing built-up roofs and re-roofing without demolition, given the fact that all other supplementary operations such as height of skylight, kerbs, metal flashings, expansion joints, valleys etc.; have been repaired if necessary or re-arranged so that can adequately accept the re-roofing system. For correct arrangement of supplementary operations and for technical waterproofing specifications the reader must see publications relative to each covering type.

PRE-INTERVENTION CONDITIONS

Covering under heavy protection: A cracked covering under heavy protection upon which you wish to restore the surface of the existing covering. There is bad visible cracking and active fissures 3 to 5 mm in breadth spread throughout the surface, it is not necessary to demolish as the heavy protection can be removed and reset on the new waterproof covering.
Existing roof structure: pre-cast concrete support, concrete with hollow pot construction cast on site, cellular cement, pre-cast concrete sections, mineral fibre insulation, expanded pearlite mixed with cellulous fibres, organic foam insulation type polystyrene, polyurethane etc.
Slope: This specification is valid for slopes of between 0 to 5%.
Climatic condition: This solution would be both wind and hail resistant.
Only the blisters will be flattened, the cracks will not be repaired. Care should be taken to ensure that the roof surface is properly cleaned.

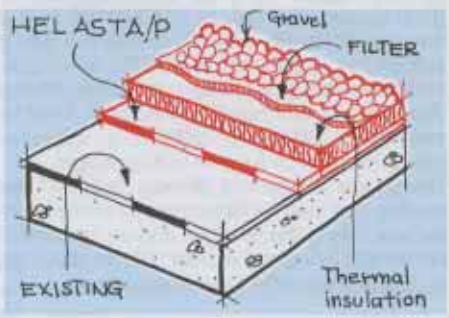


technical specification

Application: loose laid.
The surfaces on which the waterproof sheet will be attached (elevations, drain outlets, joints etc.) will be treated with a coat of bituminous primer **INDEVER**.
This will be a solution comprising an oxidized bitumen base, additives and solvents with 50% dry bitumen residue and FORD n. 4 viscosity at 25°C of 20 to 25 sec. A bituminized mono-cork blasted felt paper will be loose laid with the cork surface face downwards.
Astride and parallel the overlaps of preceding layer, it will be loose laid an elastomeric polymer-bitumen membrane 4 mm thick based on distilled bitumen modified by the addition of Radial butadiene-Styrene thermoplastic rubber type **HELASTA P 4** approved by I.C.I.T.E. Agrement Certificate no 400/93. This type of compound has elastic qualities and has an alongation of 2000%.
The membrane is reinforced with a "non-woven" continuous single strand Spunbond Polyester. This material has a longitudinal and transverse tensile strength of **800 N/ 5 cm** and **700 N/5 cm** respectively, an ultimate L/T elongation in excess of **50%** and it is flexible at temperature below **−25°C** when tested to UNI 8202. It is resistant to fatigue on **10.000** cycles at a temperature of **0°C** on an active fissure which opens 3 mm in each direction and to static puncture; resistance on asbestos cement 20 kg.
The membrane will be loose laid allowing for 100 mm overlaps which will be flame welded and then turned and flame bonded on all vertical parts for at least 10 cm above heavy protection level.

Heavy Protection

- **Flooring**: follow the method of application described in Technical chapter 1 - paved flat roof.
- **Gravel Stratum**: a layer of non-woven polyester, 200 gr/m² type filtro with unbonded 100 mm overlaps will be loose laid on he membrane, then a washed gravel layer (granulometry 16/32 mm) 40 to 50 mm thick should be spread over the whole surface.



INSERTION OF THERMAL INSULATION (INVERTED ROOF)

This re-roofing system provides for the introduction of thermal insulation after the waterproofing membrane has been applied. In this instance **HELASTA P4** should be used, on top of which the insulations should be laid. This could be one of the many insulation panels available, suitable for inverted roof system. The insulation panels will be cold set on the waterproof covering and protected by a layer of non-woven polyester mat 200 gr/sq.m. upon which the gravel is then spread. Thickness of gravel shall be determined by insulation panels used. (See technical specification n. 2 - FLAT ROOF WITHOUT ACCESS.

PRODUCTS

INDEX manufactures a wide range of polymer bitumen waterproofing membrane to solve different waterproofing problems.
From the most simple to the more difficult such as bridges and viaducts, roof gardens, parkings, hydraulic works, foundation etc.
INDEX has developed the **HELASTA P 4** bitumen-elastomeric waterproofing membrane which consists of an elastomer which has an elongation to break of 2000% and remain flexible down to **-25°C HELASTA P 4** got the Agrement by I.C.I.T.E.
In addition to **HELASTA**, **INDEX** markets also **FLEXTER TESTUDO**: a product of proven quality which has achieved the "**AGREMENT TECHNIQUE**" awarded by I.C.I.T.E. and by other European Institutes.
This is an award which is only obtained after having passed severe tests which **FLEXTER TESTUDO** has been subjected to over a period of some years in addition to inspection visits to check production and the basic material used for the membranes.
INDEX membranes are also supplied with the weathering surface self protected with slate granules of different colours.
In the **INDEX** range there are also products used for the preparation and finishing. **INDEVER** primer is a black liquid based on oxidized bitumen and, quick drying solvents for the preparation of all surface where the waterproofing membranes are applied.
For finishing, **SOLARIS** is an aluminium paint while **INDECOLOR** is an acrilic paint supplied in different colours.

index

3 RE-ROOFING WITH INSER

VAPOUR BARRIER

Visible covering: In good condition, a few breaks localized at particular points, there are very few other cracks visible, there is minimal blistering, no damage due to wind or hail.

Existing roof structure: pre-cast concrete support, concrete with hollow pot construction cast on site, stable insulation even in the presence of moisture (polystyrene, mineral fibres).

Slope: This solution is valid on all slopes.

Visible covering: Breaks diffused throughout the surface with active fissures 2 mm in breadth, minimum blistering.

Existing roof structure: pre-cast concrete support, concrete with hollow pot construction cast on site, cellular cement, mineral fibre insulation, expanded pearlite mixed with cellulous fibre, pre-cast concrete sections, organic foam insulation, type polystyrene, polyurethane, etc.

Slope: This re-roofing is valid on all slopes. Care must be taken to ensure that the roof surface is properly cleaned.

Covering under heavy protection: Cracked covering under heavy protection on which either, protection must be restored or re-roofing performed without causing damage to the existing surface, or very badly damaged visible covering which it is not convenient to demolish since it is possible to cover with heavy protection.

Existing roof structure: pre-cast concrete support, concrete with hollow pot construction cast on site, cellular cement, pre-cast concrete sections, mineral fibre insulation, expanded pearlite mixed with cellulous fibre, organic foam insulation type polystyrene, polyurethane, etc.

Slope: This re-roofing solution is valid for slopes between 0 to 5%. Only blisters will be flattened, the cracks will not be repaired. Care must be taken to ensure that the roof surface is properly cleaned.

Vapour Barrier

It is sufficient when making repairs, to use the old covering as a vapour barrier.

Vapour Barrier

Application: Fully bonded.
The entire surface should be treated with a coat of bituminous type primer. This should be a bituminous solution composed of oxidized bitumen additives and solvents with 50% dry bitumen residue and FORD n. 4 viscosity at 25°C of 20 to 25 sec. When the primer is completely dry a **TESTUDO SPUNBOND 16/4** water-proof membrane 4 mm thick will be applied. This will be manufactured using bitumen modified with atactic polypropylene and elastomers reinforced with a continuously extruded non-woven polyester fabric. The sheet will have a longitudinal tensile strength of 750 N/5 cm and a transversal tensile strength of 650 N/5 cm, a percentage elongation L/T of 50%, a hydraulic pressure resistance to explosion on free moving discs for 177 cm^2 equal to ; Kg/cm^2. It will be resistant to 1000 stress cycles on an active fissure that opens by 3 mm in both directions.
The sheets will be laid allowing for a 100 mm overlap and then be flame bonded on the entire surface, along the overlaps and on the vertical sections to a height of at least 100 mm above the expected level of the thermal insulation.

Vapour Barrier Under Heavy Protection

Application: Loose laid.
The surfaces upon which the water-proof covering will be attached (elevations, outlets, joints etc.) will be treated with a coat of bituminous primer. This will be a solution of oxidized bitumen, additives and solvents with 50% dry bitumen residue and FORD n. 4 viscosity at 25°C of 20 to 25 sec.
On the roof surface a cork blasted bituminized felt paper (type **SILENT**) will be applied with the face spread with granulated cork facing down. Op top of and astride the overlaps of the preceding layer, a 3 mm thick elasto-plastomeric bitumen polymer, based of distilled bitumen, atactic polypropylene and elastomers, fiber glass reinforcement, type **DEFEND 3 FLAMINA**. The membrane will be laid allowing 100 mm overlaps and these will be flame welded. The sheet will then be turned at the vertical section and be flame bonded to at least 100 mm above the expected level of the thermal insulation.

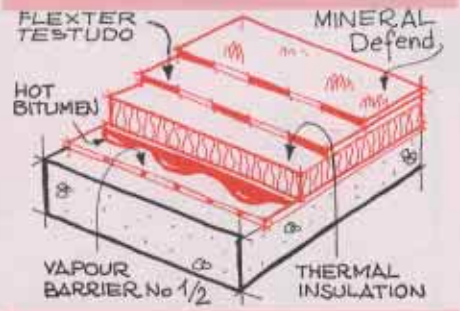
TION OF THERMAL INSULATION

THERMAL INSULATION OF VARIOUS TYPES

VISIBLE COVERING

Slope: This re-roofing system is valid on all slopes but on those slopes which exceed 20° the insulation must be mechanically fixed.
Climatic condition: This system is wind resistant when the insulation has been mechanically fixed.

technical specification



VAPOUR BARRIER

(See solutions 1 and 2)

THERMAL INSULATION

FOAMGLASS, cellulose aggregates type FESCOBOARD, PERMALITE, mineral fibre panels, cork 100 to 200 Kg/m³, expanded polyurethane 35 Kg/m³. In order to avoid thermal gaps the panels must be properly aligned and if the thickness is greater than 6 cm, 2 staggered layers will be set.
Ex. 3 + 3 cm. or 4 + 2 cm.
The panels will be attached to the vapour barrier with hot bitumen.

Visible waterproof covering

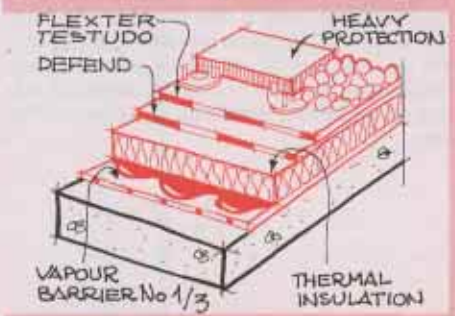
Waterproofing will consist of a 4 mm thick elasto-plastomeric polymer bitumen waterproofing membrane based on distilled bitumen with added plastomers and elastomers and reinforced with a "non-woven" continuous single strand Spunbond polyester and be of the type **FLEXTER TESTUDO SPUNBOND POLYESTER 4**, Agrement Certificate n° 371/91 approved by I.C.I.T.E. This material, according to UEAtc directive January 1984, has a longitudinal and transverse tensile strength of 800 N/5 cm and 700 N/5 cm respectively, an ultimate L/T elongation in excess of 50%, flexibility at low temperature to **-15°C**, flexibility after thermal aging **-5°C**.
It will be resistant to **500** fatigue cycles on an active fissure at **−10°C** both on new and aged material.

- In areas with little wind, where the roof slope does not exceed 5% and on flame resistant insulation the sheets can be spot welded to the laying surface.
- On FESCOBOARD, ISOLBAC, PERMALITE and cork in windy zones and for slopes above 5% the **TESTUDO** sheets will be flame welded on to bituminized paper-felt (1,5 Kg/m².) which has been bonded with hot bitumen to the insulation panel. For slopes over 20% the impregnated paper-felt will be fixed through the insulation panel with 5 nails per m² the nails having 80 mm washers. For slopes above 40% the **TESTUDO** sheets will also be mechanically fastened at the head edge of the sheet.
- On polyurethane and polystyrene with bituminized paper-felt, in areas with little wind and on slopes ut to 20% the **TESTUDO** sheets will be spot welded to the panels. For greater than 20% slopes and in windy areas, **TESTUDO** sheets should be flame welded onto a **DEFEND 3 FLAMINA** sheet, which has previously been applied and 70% flame bonded onto the insulation panels and then nailed using 5 nails m² across the insulation. Subsequently on top of and astride the overlaps of the proceding stratum a cap sheet of **MINERAL DEFEND 3.5** self-protected with slate grit a 3.5 Kg/m² will be applied. This is a membrane of bitumen modified with atactic polypropylene and elastomers reinforced with glass felt. This will be fully bonded and flame welded allowing 100 mm overlaps and on the vertical sections the sheet will be turned and flame bonded to at least 200 mm above the maximum water level.

HEAVY PROTECTION

Slope: This re-roofing system is valid for slopes between 0 - 5%.

technical specification



VAPOUR BARRIER
(See solution 1 and 3)

Thermal insulation
FOAMGLASS, mineral cellulous aggregates FESCOBOARD, PERMALITE, mineral fibre panels, cork 100 to 200 Kg/m³, expanded polyurethane 35 Kg/m³, expanded polystyrene 25 Kg/m³. In order to avoid thermal gaps the panels must be properly aligned and if the thickness is greater than 60 mm, 2 staggered layers should be set.
Es. 3 + 3 cm or 4 + 2 cm.

WATERPROOF COVERING
Waterproofing will be composed of a 3 mm thick elasto-plastomeric bitumen polymer waterproofing membrane, based of distilled bitumen, atactic polypropylene and elastomers, reinforced with glass fiber felt, type **DEFEND 3 FLAMINA**.
The sheet will be loose laid and then, allowing 10 cm laps, be bonded only at the overlaps. At the vertical sections the sheet will be turned and flame bonded to at least 10 cm above the heavy protection level.
Astride and parallel with the previous layer overlaps it will be fully welded a 4 mm thick elasto-plastomeric polymer bitumen waterproofing membrane based on distilled bitumen with added plastomers and elastomers and reinforced with a "non-woven" continuous single starnd Spunbond polyester and be of the type **FLEXTER TESTUDO SPUNBOND POLYESTER 4**, Agrement Certificate n° 371/91 approved by I.C.I.T.E. This material, according to UEAtc directive January 1984, has a longitudinal and transverse tensile strength of 800 N/5 cm and 700 N/5 cm respectively, an ultimate L/T elongation in excess of 50%, flexibility at low temperature to **-15°C**, flexibility after thermal aging **-5°C**.
It will be resistant to **500** fatigue cycles on an active fissure at **−10°C** both on new and aged material. The sheet will be applied allowing for 100 mm flame bonded overlaps and be turned and flame welded on the vertical parts at least 100 mm above the heavy protection level.

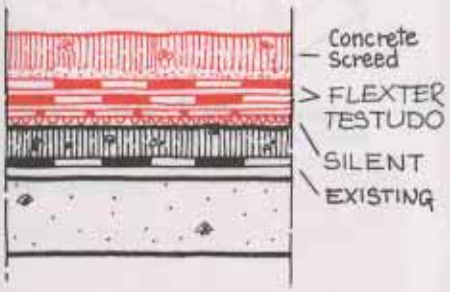
4 PARTICULAR TYPES OF R

Where height levels permit on parking areas, it is better to apply new waterproofing on top of the old system.

The re-flooring will be composed of two **FLEXTER TESTUDO** membranes fully bonded to each other.

In the case of protection with pre-cast concrete deck and up to 5% slope.

The first **TESTUDO** stratum will be loose laid on a stratum composed of one sheet of bituminized, cork-blasted felt paper with the cork face facing down type **SILENT**. The water proof covering will be insulated from the deck by a 20 mm layer of sand protected by a polyethylene sheet.

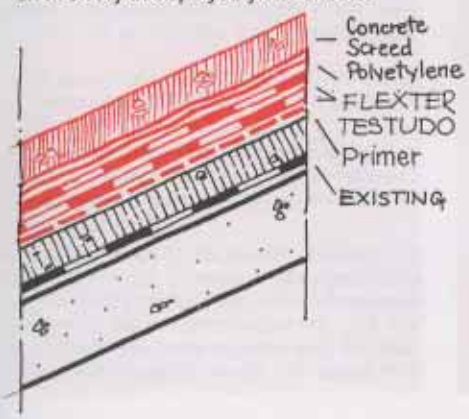


In case of protection with hot applied street asphalt (maximum slope 20%)

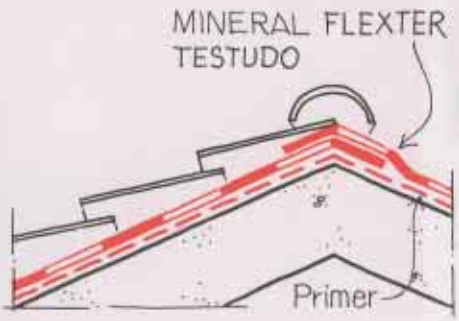
The first stratum will be totally flame welded on to the floor surface having first applied one coat of primer (bituminous solution composed of oxidized bitumen and solvents). The road bed asphalt will then be poured directly on to the waterproof covering.

On the ramps

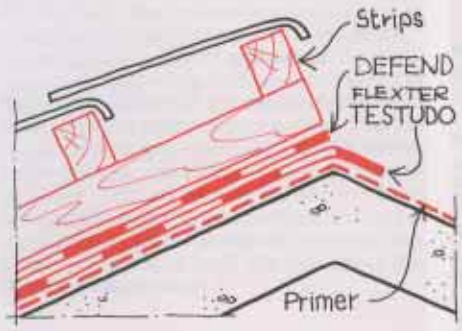
The waterproofing system will be totally flame bonded onto the surface which has been coated with a bituminous primer and the protection will be composed of a pre-cast concrete deck cast on two very thick polyethylene sheets.



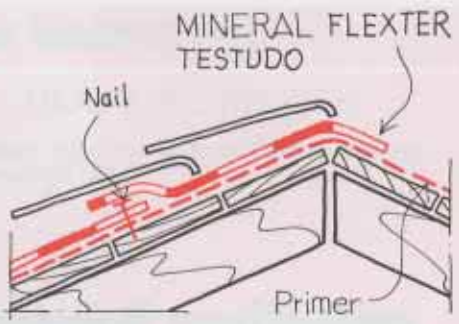
In re-making tiled roofs it is better to insert waterproofing and insulation before setting the new tile layer. The surface should be carefully cleaned and made level.



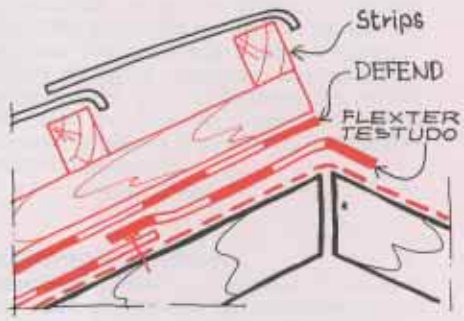
On cement surface with less than 40% slope, apply one coat of quick drying bituminous solution made of oxidized bitumen and solvents. Starting from the bottom and overlapping sheets by 100 mm, flame weld a **MINERAL FLEXTER TESTUDO 4** membrane placed at right angle to the slope (as tiles). When applying the membrane at the ridge ensure that a 20 cm strip is allowed to go over the top of the ridge. At the eaves the membrane should be taken right into the gutter and used as a liner. This will allow water to flow straight off the roof into the gutter. The tiles are subsequently set and then fixed with mortar seams on the mineralized surface of the waterproof sheet.



On a cement surface with more than 40% slope, apply one coat of primer (bituminous solution made of oxidized bitumen and solvents). Starting from the bottom and overlapping sheets by 100 mm totally flame bond a **FLEXTER TESTUDO** membrane placed at right angles to the slope (as tiles). The sheets will be folded at the edges by 20 cm and attached to the connecting wing of the gutter. Timber battening strips will then be nailed to the roof structure parallel down the roof slope. In order to stop moisture entering around the nails, the battens will be laid onto strips of **DEFEND 5** which are 20 mm wider than the battens and flame welded on the water-proof covering. Bituminous jointing compound will be used to fill in on both sides of the strips to ensure a complete weather-tight connection to the membrane. Subsequently further timbers will be set at right angles on which tiles will be placed.



On timber roof structures with less than 40% slope, apply a coat of primer (bituminous solution made of oxidized bitumen and solvents). Starting from the bottom and overlapping the sheets by 100 mm spot weld a **MINERAL FLEXTER TESTUDO 4** membrane at right angles to the slope (as tiles). The sheets will be nailed every 20 cm along the lap edge and this will be covered when applying the next sheet, at the edges they will be folded by 20 cm and attached to the connecting wing of the gutter. Subsequently the tiles are set in place and fixed with mortar seams on the mineralized surface of the water proof sheet.



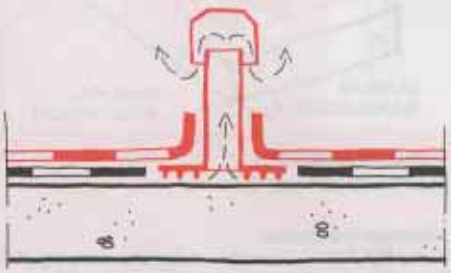
On timber roof structures more than 40% slope, apply a coat of primer on the areas where the covering must be adhered. Starting from the bottom and overlapping the sheets by 100 mm set a **FLEXTER TESTUDO** membrane at right angles to the slope (as tiles). The sheet will be spot welded where primed and nailed every 200 mm along the lap edge and this will be covered when applying the next sheets. At the edges they will be folded by 200 mm and attached to the connecting wing of the gutter. The tiles will be fixed to timber battening strips as described in the preceding chapters.

RE-ROOFING

A re-roofing system may need to be applied to a surface which is impregnated with moisture, this reduces the thermal resistance of the material and can cause blistering on the new water proof covering. In order to avoid this situation, it is vital that air-vents set at maximum intervals of 1 per 30 to 40 m². Both double and single types may be used to achieve the best results, but it would depend on whether layer of insulation is present.

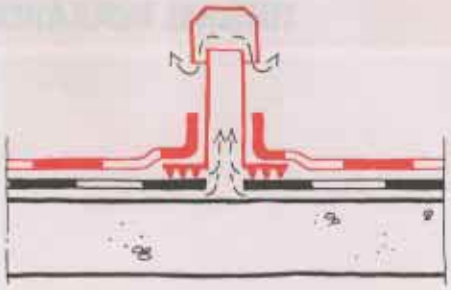
Covering or vapour barrier set on old waterproofing

On the old covering a hole (circular) will be cut (with a knife) to the same diameter as the base of the air-vent. Having set the air-vent into place made ready in the old covering, the new covering will be flame bonded over the flat base of the vent.



Covering or vapour barrier either semi-attached or loose laid on the old waterproofing.

A circular hole, equal in diameter to the air-vent will be cut in the old covering. In this way once the air-vent is set into place, the moisture can either be released from the old covering or from new roofing. The new roofing will be flame bonded onto the air-vent taking care not to close the interspace formed by the bottom surface of the vent.

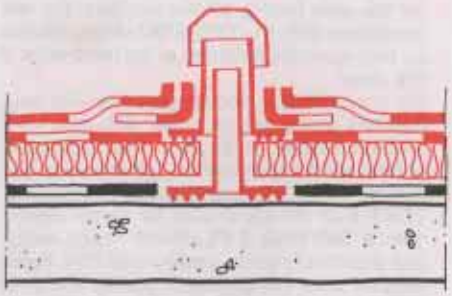


WITH INSULATION

In case of thermal insulation, the double air-vent is used. The first element is applied on the vapour barrier in the same way as the preceding cases.

The second element of the air-vent will be set on top of the insulation panel and all layers of the waterproofing will be fixed over the base and moulded round the stem of the air-vent.

The air-vent will be set on the insulation panel and all layers of the waterproof covering will be fixed on top.



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