Technical specification 10

GREEN ROOFS

INTENSIVE GREEN ROOFS (ROOF GARDENS) AND EXTENSIVE GREEN ROOFS

index
member of GBC Italia

Waterproofing and root inhibitor barrier

Recovering vital areas within cities is a trend that has constantly become more firmly established over recent years and that is dictated not only by the requirement to recover areas that would otherwise be infertile, but also by the need to improve the environmental quality of building complexes.
The green area function of a roof garden fulfils a fundamental urban task since, as well as its private use, it can also bring back collective gathering places and transform the appearance of districts not only aesthetically but also in terms of living quality.
As for the implementation of new works, green roofs are an excellent way of solving many problems associated with garage and basement roofs.
They can also perform the important function of regulating stormwater flow. Progressive concreting of land reduces the drainage capacity of areas affected by the urban drift, quickly making the sewer networks obsolete. By making the roofs of new building settlements into roof gardens, which can absorb water in the event of heavy rain, any overflowing of the sewer networks is prevented.
Green roofs also have the role of reducing the phenomenon of urban “heat islands” and their use provides a significant economic advantage in the energy management of the building and the overall management of urban areas.
In the city of Chicago alone a Weston Design Consultant study estimates the annual energy saving due to the transformation of the city’s roofs to green roofs to be $ 100,000,000. Green roofs also: filter urban pollution and reduce carbon dioxide, filter polluting stormwater, cool the air via evapotranspiration of water vapour, promote the settlement of animal ecosystems and reduce noise transmission inside the building.
As well as the tried and tested waterproofing materials, such as DEFEND ANTIRADICE POLYESTER, FLEXTER TESTUDO, OSMOFLEX and ELASTOBIT S ANTIRADICE, INDEX S.p.A. can also provide laying systems for them, along with the correct application methods of the different products.
The cultivation of plants on flat surfaces therefore only remains a problem in terms of the choice of materials and careful use of the laying techniques.
For the sizing of green roofs please refer to the UNI 11235 legislation.

GREEN ROOFS AND SUSTAINABLE BUILDING

The use of the roofs of buildings as green roofs is one of the main strategies used in bio-architecture to limit the environmental impact of the construction.
Green roof gardens have very ancient origins, the hanging gardens of Babylonia built by King Nabucodonosor being one of the best known examples. In fact, they are recommended by all the associations who promote sustainable building, both because they contribute to the reduction of the building's energy requirements and therefore the reduction of CO_2 emissions, and because they lead to many other economic and ecological advantages:

- they temporarily absorb stormwater and release it again slowly hence preventing floods due to the sewer network overflowing and slow down overloading of the network when new urban settlements are built.
- they filter urban pollution and reduce carbon dioxide
- they filter polluted stormwater
- they cool the air by evapotranspiration of water vapour
- they reduce wind speed
- they promote the settlement of animal ecosystems
- they reduce the transmission of noise inside the building
- they reduce the effects of "urban heat islands"
- they increase the heat inertia of the roof
- they increase the heat resistance of the roof
- they protect the waterproof covering and increase its lifetime
- they are a tool of new architectural expression

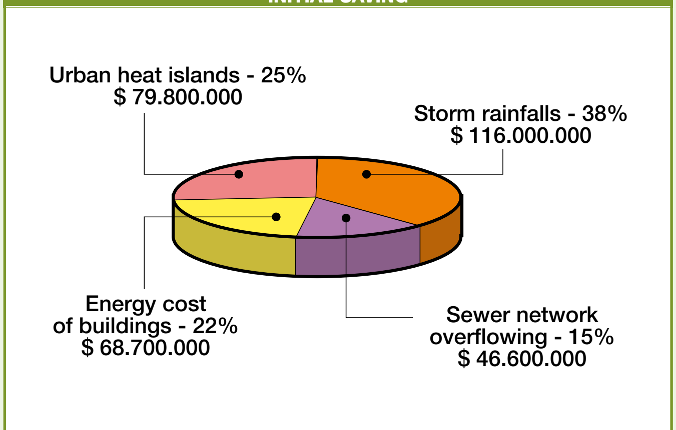
ENERGY SAVING IN BUILDINGS

In terms of energy saving only:

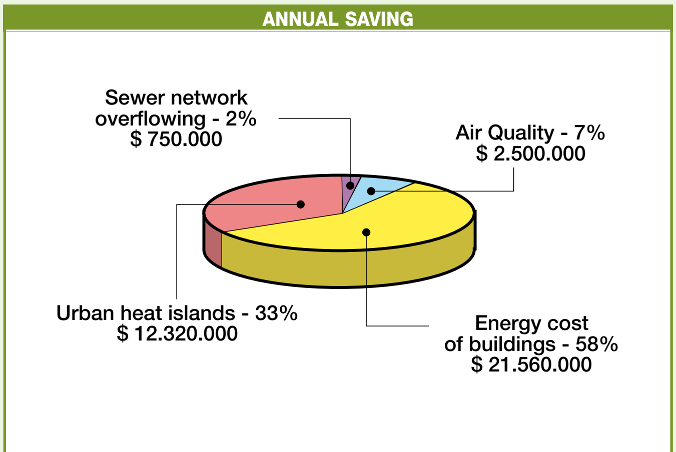
- Green roofs allow energy saving due to a reduction in summer air conditioning of 25%, let alone the fact that the heat resistance of green roofs is higher and benefits are also gained in terms of winter heating
- In Germany more than 10% of roofs are green roofs.
- In the city of Chicago alone a Weston Design Consultant study estimates the annual energy saving due to the transformation of the city's roofs to green roofs to be $ 100,000,000.

For the city of Toronto the overall result of using green roofs has been calculated, that is the potential economic benefits if 75% of the roofs of the city's buildings over 350 m² were green roofs.

INITIAL SAVING



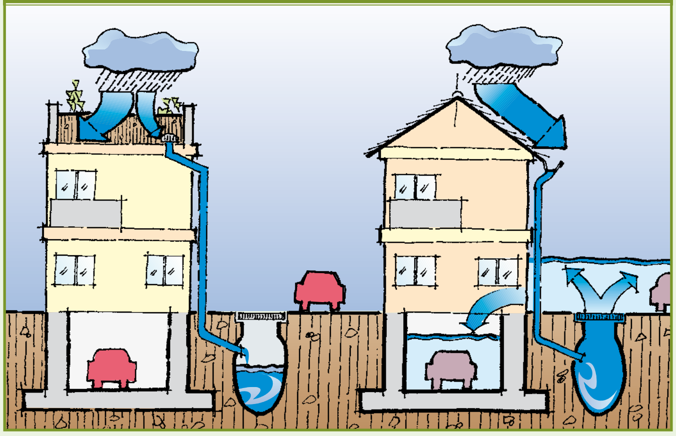
ANNUAL SAVING



WATER ABSORPTION

Also very important from an economic point of view is the control that green roofs can exert over stormwater. Who can forget that in summer 2007 the New York underground ground to a halt due to the overflowing caused by a heavy storm owing to the excessive speed of the stormwater? The following picture shows the "water absorption" effect that roof gardens can carry out, preventing the sewer network from overflowing.

VOLANO IDRAULICO

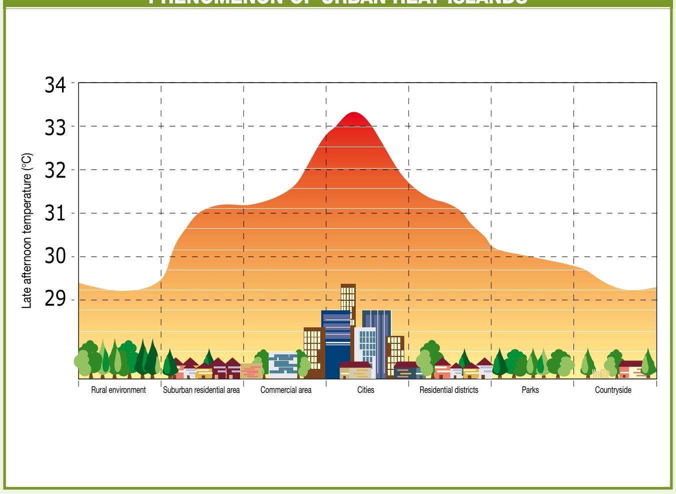


GREEN ROOFS AND HEAT ISLANDS

Another important benefit of green roofs regards the reduction of the effects of "heat islands".
The EPA (Environmental Protection Agency), the US agency for the protection of the environment, launched a campaign for the reduction of the "Heat Island Effect" a long time ago. This refers to the phenomenon of raised temperatures in urban areas compared to the temperature of rural areas, which can cause serious consequences in summer time.
These are real "Heat Islands" that tower over the cities, where the temperature difference can range from 1 to 6°C.
In summer a dangerous peak of electrical absorption occurs due to air conditioning, hence the risk of blackouts, along with an increase in pollution levels, diseases and deaths.
The strategies identified by the EPA to reduce urban overheating are:

- **Increasing green areas, including roofs (Green Roofs)**
- Cooling the roofs of buildings with reflecting paints or membranes (Cool Roofs)
- Cooling urban floors, including terraces (Cool Pavements)

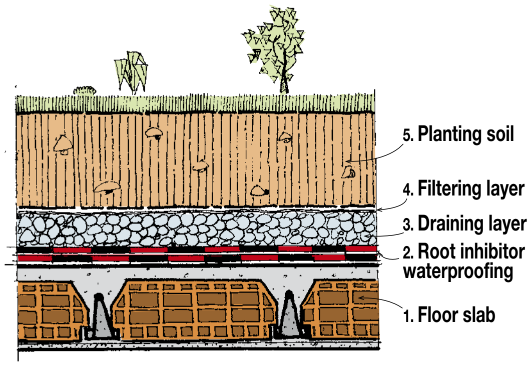
PHENOMENON OF URBAN HEAT ISLANDS



DESIGN CERTIFICATION

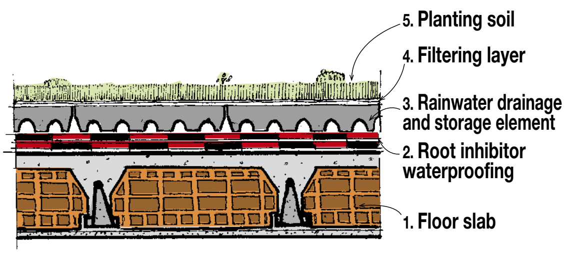
In Italy the legislation in force for the certification of the environmental quality of a construction is fragmentary and mainly refers to energy consumption, hence there is a lack of tools for a holistic evaluation of the building's environmental impact.
LEED (Leadership in Energy and Environmental Design) certification, which was devised in the USA, has now become widespread all over the world. It is promoted in Italy by the GBC, whose main aim is to encourage sustainable building on the Italian market through the LEED system, developed over more than 10 years' experience by USGBC. In this sense GBC Italia is aiming to make use of the result of the work carried out by USGBC in the USA and adapt the various aspects tackled by it to the Italian situation.

INTENSIVE GREEN ROOFS



STRATIFIED ELEMENTS
1. Floor slab
2. Root inhibitor waterproofing
3. Draining layer
4. Filtering layer
5. Planting soil

EXTENSIVE GREEN ROOFS



STRATIFIED ELEMENTS
1. Floor slab
2. Root inhibitor waterproofing
3. Rainwater drainage and storage element
4. Filtering layer
5. Planting soil

GBC ITALIA (Green Building Council) AND *LEED* CERTIFICATION

socio del GBC Italia

GBC Italia, which INDEX belongs to, has the task of using the common guidelines to everyone in the ***LEED*** international community to develop the characteristics of the ***LEED*** Italia system, which must take into consideration the specific climatic, building and legislative conditions in Italy.
LEED opts for a view of sustainability by making the most of all possibilities to reduce the various kinds of environmental impacts and harmful emissions of the buildings being built.
The ***LEED*** standards are parameters for sustainable building developed in the USA and applied in 40 countries throughout the world. They indicate the requirements for eco-compatible buildings, able to "work" sustainably and self-sufficiently energy-wise. It is essentially a rating system for the development of "green" buildings.
LEED is a certification, which may be obtained on a voluntary basis, where the actual designer deals with collecting the data for the assessment. The system is based on the award of credits for each of the requirements that characterise the sustainability of the building.

The certification level obtained comes from the sum of the credits.

The assessment criteria used by ***LEED*** (2009 version) are grouped into six categories (+1 only valid in the USA), which envisage one or more compulsory prerequisites and a number of environmental performances that attribute the building's final score:
- Sustainable sites
  (1 prerequisite, 26 points)
- Efficient water consumption
  (1 prerequisite, 10 points)
- Energy and atmosphere
  (3 prerequisites, 35 points)
- Materials and resources
  (1 prerequisite, 14 points)
- Indoor environmental quality
  (2 prerequisites, 15 points)
- Innovation and design process
  (6 points)
- Regional priority (4 points) only applicable in the USA

There are 4 rating levels:
- Certified: between 40 and 49 points
- Silver: between 50 and 59 points
- Gold: between 60 and 79 points
- Platinum: more than 80 points

In the ***LEED*** regulations, the use of green roofs is envisaged in the following points:

- ***SS Credit 5.1: Site Development - Protect or Restore Habitat***
Green roof with INDEX materials and systems planted with local vegetation, avoiding monoculture and promoting biodiversity, with minimum maintenance and irrigation, which does not require the use of fertilisers, pesticides or weed killers.
- ***SS Credit 6.1: Stormwater Design - Quantity Control***
Quantity control of stormwater with green roofs and permeable flooring, with collection for non-drinkable purposes (greywater)
- ***SS Credit 6.2: Stormwater Design - Quality Control***
Quality control of stormwater with green roofs and collection in phytopurification tanks
- ***SS Credit 7.1: Heat Island Effect - Nonroof OPTION 2***
Reduction of heat island effects of roofs in parking areas with green roofs
- ***SS Credit 7.2: Heat Island Effect - Roof OPTION 2***
Reduction of heat island effects of roofs in buildings with extensive or intensive roof gardens

INTRODUCTION

ANALYSIS OF THE INTERVENTION

Whether intervention is made through the renovation of existing terraces by turning them into gardens, or by operating on new facilities, the succession of layers is the same.
The difference consists in the structural analysis which, in the first case, must be carried out to check if the slab is suitable to support the extra load of soil or tanks for aquatic cultures.
Slopes and drains must be provided and a water network must be laid.

THE "GARDEN" SYSTEM

This document does not aim to describe the various types of species and combinations that can be bedded in a roof garden.
The succession of layers that makes up a roof garden for cultivation, when it does not involve simple covering with soil, must recreate the ideal conditions for the development of the plants, therefore good soil alone is not enough - a succession of layers must carry out the job of feeding the plants, providing support, absorbing and draining water, everything being contained and controlled by the waterproofing membrane that must be resistant to the aggression of the roots.

In order for the membranes for roof gardens to gain EC marking, they must possess the resistance to root penetration certification (EN 13948), which lasts 2 years and also subjects the material laying method to tests. Special tanks are covered with the membrane in question, with a base that can be inspected, also from below; the overlaps are bonded on site as actually happens on the roof. The containers are then filled with soil in which the vegetation is grown and kept alive for 2 years according to relevant legislation. At the end of the test, if the periodic inspections of the bottom have not highlighted any leaks, the equipment is disassembled and the samples are carefully observed to evaluate the presence of any damage or holes.

THE "DEFEND ANTIRADICE" ROOT INHIBITOR MEMBRANE

DEFEND ANTIRADICE is the 4 mm thick root inhibitor membrane that INDEX Spa produces for waterproofing roof gardens. It is made up of a resistant and elastic rein-

CERTIFICATION EN 13948 OF DEFEND ANTIRADICE POLYESTER

1. Application of DEFEND ANTIRADICE in test device

2. Test containers waterproofed with DEFEND ANTIRADICE

3. Reference test

4. Laying of planting soil

5. Vegetation implantation

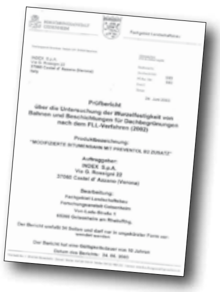
6. Vegetation development after 2 years

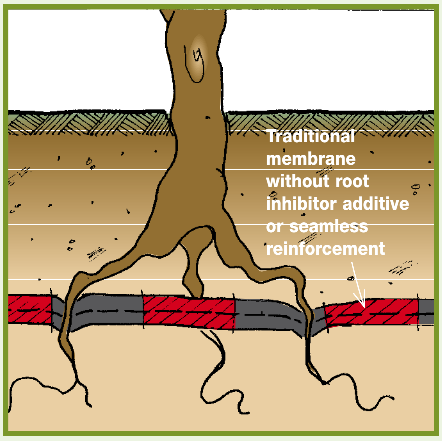
7. Roots' development

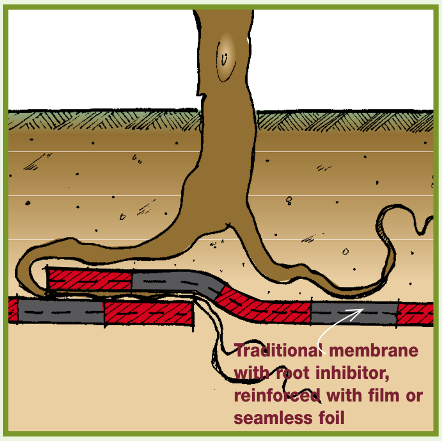
8. Unchanged upper face of DEFEND ANTIRADICE after the testdopo il test

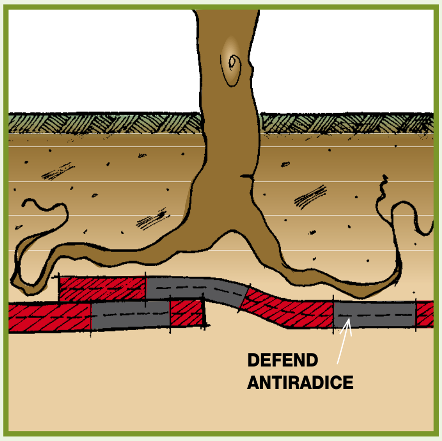
9. Unchanged under face of DEFEND ANTIRADICE after the testdopo il test

Certification
FORSCHUNGSANSTALT GEISENHEIM
to guarantee the resistance to roots conforms to the European test method EN-13948.









forcement in non-woven spunbond polyester fabric impregnated and covered with a waterproof polymer bitumen mass with added PREVENTOL B2 (phenoxy fatty acid ester), a special root inhibitor additive made by Bayer. In traditional membranes the root inhibitor resistance is provided by physical barriers, metal foils or plastic films a few tenths of a millimetre thick as sheet reinforcement, but along the overlaps of these membranes the root inhibitor protection is necessarily interrupted as the reinforcements are only overlapping and the continuity of the layer is only provided by the waterproofing mass that covers them.
Therefore, it is possible for the roots to get through the overlaps of the traditional membranes, making a hole in them.
As DEFEND ANTIRADICE has been completely added and is resistant along its whole waterproof thickness, including the overlaps, it constitutes a continuous root inhibitor shield 4 mm thick. This is shown by the root inhibitor tests with lupins conducted according to DIN 4062 and UNI 8202. Normal membranes can be completely crossed by roots or at the end of the test, although they may not be completely crossed, their face in contact with the soil is weakened by a certain number of roots, as is the upper face of the root inhibitor membranes with metal reinforcement or plastic film, up to the continuous reinforcement.
Further confirmation of the membrane's efficacy as a root inhibitor barrier was that it passed the root resistance tests conducted for 2 years in compliance with European legislation EN 13948.
DEFEND ANTIRADICE not only provides a barrier against roots but its upper face is not even weakened in contact with the soil. After the test all the waterproof thickness remains intact. The root inhibitor resistance of DEFEND ANTIRADICE is long-lasting: the additive is heat resistant, insoluble in water and therefore does not migrate into the soil damaging the existing crops.

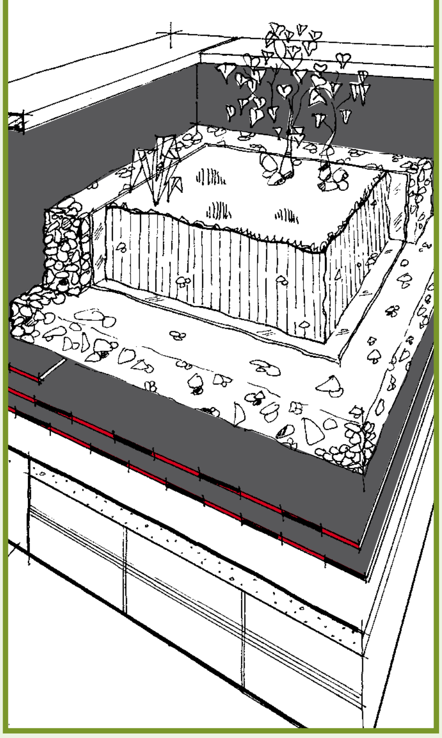
Warning.
EN 13707 legislation on EC marking states that membranes for waterproofing green roofs must pass the resistance to the penetration of roots test in compliance with the FLL procedure that was considered appropriate by the CEN (European Committee for Standardisation) for establishing the suitability use of the membranes for green roofs in compliance with the European method EN 13948 envisaging the exposure to the roots of PYRACANTHA COCCINEA.
The FLL test conducted for 2 years on the INDEX membrane with added Bayer PREVENTOL B2 states not only that the membrane is resistant to PYRACANTHA COCCINEA (Orange Charmer, Agazzino) roots in compliance with the EN 13948 test, but also to AGROPYRON REPENS (Couch grass) rhizomes, defining the membrane: (root-proof and rhizome-proof) in compliance with the FLL procedure.
The report including the test is available on request.
It is underlined, however, that, as indicated in the test report, the test results do not extend to plants with strong and rapid root development to rhizomes, like some species of bamboo, Chinese reed or zebra grass (Miscanthus Sinensis), for which it is necessary to take further precautionary measures compared to the general green roof context (the speed of growth of bamboo rhizomes can reach 100 cm/24h).
The membrane with added Preventol B2 is also resistant to lupin roots in compliance with the DIN 4062 method (UNI 8202 p24). Passing the EN 13948 test means that the membrane can have EC marking for the use of waterproof membranes for green roofs and according to the current state of knowledge constitutes the most recent investigation method known by INDEX on a European level; however, that does not exempt the user of the product from taking suitable precautions for specific plantations that are not represented by the tests mentioned above.

In Germany and other countries, Preventol B2 has been used for over thirty years and, in fact, damage has never been reported due to root penetration in membranes responding to DIN 4062 legislation.
Upon request, Preventol B2 can be added to all Index membranes used for waterproofing plumbing works, to protect buried constructions in general, like foundations, tunnel extradoses and underground car parks. Membranes used for covering surfaces where unwanted vegetation can proliferate can also be treated with this additive, see the case of road decking or under-gravel roofs.
Index membranes with Preventol B2 have been approved and used by the French railways to waterproof 150,000 m² of the green roof of the new high speed line "TGV Atlantique" of the Paris underground stations.
DEFEND ANTIRADICE is produced with the lower face covered in anti-adhesive film called FLAMINA and the upper face covered with screen-printed talcum allowing perfect unrolling of the product during application.
The membranes are stuck onto the laying surface and are easily bonded onto the overlaps with a propane torch.
The sheets can also be perfectly attached onto vertical surfaces.
Hence, with just a few operations an unpierceable and perfectly waterproof shield is obtained.

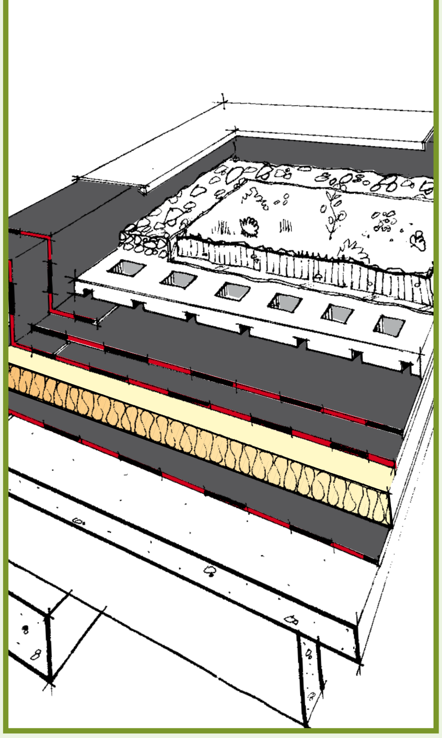
INTENSIVE GREEN ROOFS (ROOF GARDENS) AND EXTENSIVE GREEN ROOFS

There are two different types of green roofs: "intensive green roofs" (roof gardens) and "extensive green roofs".
"Intensive green" roofs have a higher weight and require a minimum soil thickness of at least 30 cm compared to the 5-12 cm of the latter.
For roof gardens, an extra load of 400-750 kg/m² on the structure of the building must be accounted for, compared to the 60-250 kg/m² of the "extensive green roof".
In "intensive green roofs" an accessible garden is created, which requires suitable irrigation and maintenance.
In "extensive green roofs" small plants are grown, which withhold the soil, they are not accessible but the amount of maintenance required is lower and the irrigation system more simple.
The waterproof covering suggested below is suitable for both types; <u>whereas for "intensive green roofs" the thickness of the soil and the draining layer make the use of a thermal insulating layer almost always redundant, for "extensive green roofs" thermal insulation is always envisaged.</u>

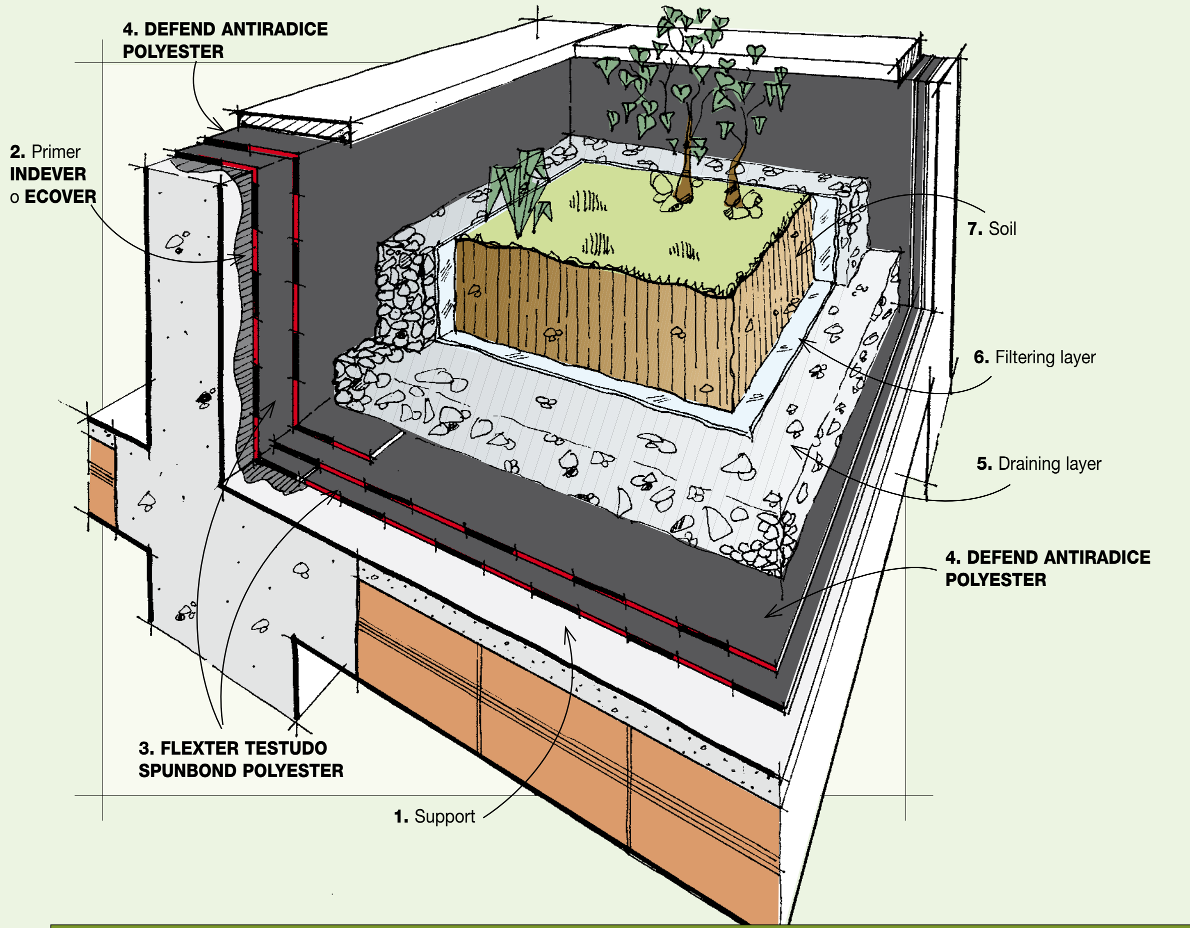
INTENSIVE GREEN ROOFS



EXTENSIVE GREEN ROOFS



INTENSIVE GREEN ROOFS (ROOF GARDENS)



STRATIFIED ELEMENTS
1. Support
2. **INDEVER** or **ECOVER** primer
3. **FLEXTER TESTUDO SPUNBOND POLYESTER**
4. **DEFEND ANTIRADICE POLYESTER**
5. Draining layer
6. Filtering layer
7. Soil

PRIMER

The primer penetrates into the pores of concrete surfaces, stops dust and has the job of promoting adhesion on the surfaces to which the membranes must be stuck. INDEVER is a traditional solvent-based bituminous primer; the ECOVER water-based primer is more innovative and has reduced environmental impact. The whole surface to be covered and the vertical parts onto which the waterproof covering must be stuck, are painted with a coat of about 300 g/m² INDEVER adhesion bituminous primer, a solution based on oxidised bitumen, additives and solvents, with solid content (UNI EN ISO 3251) of 40% and viscosity (UNI EN ISO 2431) of 12÷17 s, or ECOVER, with a water bituminous emulsion base and solid content (UNI EN ISO 3251) of 37% using 250÷400 g/m².

VAPOUR BARRIER

Given the high thickness and thermal inertia of the layered elements for an intensive green roof, a heat insulating layer is **not** normally required, but if a heat insulating layer is used, it also implies the use of the relative vapour barrier.
The water vapour, which during the winter season migrates towards the outside of the heated building, meets with the opposition of the waterproof covering under which it could condense and therefore dampen the adjacent thermal insulation. Wet thermal insulation does not insulate any longer and can be deformed, hence damaging all the stratified elements. Therefore, it is necessary to stop the vapour before it reaches the thermal insulation in a sufficiently warm point of the stratified elements to make the amount of condensation that could form negligible. The layer that protects the insulation from the vapour is called the "vapour barrier". According to the different situations and requirements different technological solutions are identified for the vapour barrier.

	Traditional	Innovative cold-bonded double-sided adhesive (with cold bonding of the insulation incorporated)	Innovative heat-bonded (with heat bonding of the insulation incorporated)
Vapour barrier on roofs of rooms with low humidity (relative humidity <80% at 20°C)	case A **DEFEND - 3 mm** heat-bonded adhesive under stuck insulation (1)	case C **SELFTENE BV BIADESIVO POL** **SELFTENE BV BIADESIVO/V** cold-bonded adhesive under stuck insulation (2)	case E **TECTENE BV STRIP/V** **PROMINENT/V** **PROMINENT POL.** heat-bonded adhesive under stuck insulation (3)
Vapour barrier on roofs of rooms with high humidity (relative humidity ≥80% at 20°C)	case B **DEFEND ALU POL. - 3 mm** heat-bonded adhesive under stuck insulation (1)	case D **SELFTENE BV BIADESIVO ALU POLYESTER** cold-bonded adhesive under stuck insulation (2)	case F **TECTENE BV STRIP ALU POLYESTER** **PROMINENT ALU POL.** heat-bonded adhesive under stuck insulation (3)

(1) *Insulation stuck with molten oxidised bitumen*
(2) *Insulation cold-bonded onto the upper self-adhesive face of the vapour barrier*
(3) *Insulation stuck by heat bonding the strips or heat-adhesive embossings on the upper face of the vapour barrier*

A; B. *On DEFEND heat-resistant insulating panels and THERMOBASE PUR are chosen.*
C; D. *On SELFTENE BV BIADESIVO polystyrene or polyurethane panels can be stuck, and THERMOBASE PSE and THERMOBASE PUR*
E; F. *Heat bonding on PROMINENT is reserved for heat-resistant thermal insulation and THERMOBASE PUR, whereas on TECTENE BV STRIP polystyrene and polyurethane panels can be stuck, and THERMOBASE PSE and THERMOBASE PUR using suitably trained labour.*

THERMAL INSULATION

This is required for containing energy consumption and limiting any dilations of the load-bearing structure; it also prevents internal condensation of water vapour on cold walls. Either fibrous or cellular, the most common insulators are: glass or rock mineral fibre panels, expanded polyurethane or polystyrene panels, perlite agglomerates and cellulose fibres, cellular glass, cork, etc.
Index produces the THERMOBASE insulation in rolls, made up of strips of insulating material already stuck onto a polymer-bitumen membrane, a product that meets the specifications of ***sustainable building*** as membrane/insulation coupling in the factory reduces the laying operations on the roof and the consequent emission of fumes, smells and noise in the environment.
The types envisaged in the event of using THERMOBASE are:

- THERMOBASE PUR/35-V3
- THERMOBSAE PSE/120-V3
- THERMOBASE PSE/EX-V3

Except for in the system known as an "inverted roof", the insulation is always protected by the waterproof covering. The insulating materials are produced in different types, densities and dimensions, according to their intended use. For terraces, it is important to choose materials that are resistant to compression in the type whose laying is expressly declared by the manufacturer as suitable for use and compatible with the polymer-bitumen membranes and bituminous materials in general.
Cellular insulating materials are preferable because, in the event of leaks in the waterproof covering, they absorb less water.
Heat resistant insulating panels (perlite, expanded polyurethane, cork, mineral wools), such as THERMOBASE PUR can be stuck with molten oxidised bitumen or, for safer laying that reduces the risk of burns and the emission of fumes and smells, they can be heat-bonded on Prominent and TECTENE BV STRIP EP membranes (with the exception of cellular glass) and can be heat-bonded directly to the waterproof covering suggested below. Expanded polystyrene insulating panels can be heat-bonded onto TECTENE BV STRIP EP or cold-bonded onto SELFTENE BV BIADESIVO and then, before laying the waterproof covering, they must be protected with the self-heat-adhesive membrane in the AUTOTENE BASE series which is stuck alone onto the polystyrene panel using the heat transmitted from the heat bonding of the waterproof covering above; alternatively rolls of insulation pre-coupled to a membrane such as THERMOBASE PSE/120 or THERMOBASE PSE/EX can be used. The thickness of the insulation must be sufficiently high to prevent the dew point dropping below the vapour barrier and must comply with legislation in force on energy containment in buildings.

THERMOBASE PUR/35-V3					
Thickness	20	30	40	50	60
Thermal resistance R(m²K/W)	0,686	1,025	1,362	1,695	2,029

THERMOBASE PSE/120-V3							
Thickness	20	30	40	50	60	70	80
Thermal resistance R(m²K/W)	0,494	0,740	0,985	1,217	1,458	1,705	1,947

THERMOBASE PSE/EX-V3					
Thickness	20	25	30	40	50
Thermal resistance R(m²K/W)	0,559	0,838	1,114	1,377	1,650

WATERPROOF COVERING AND ROOT INHIBITOR PROTECTION

This is the continuous layer that prevents water passing through the roof.
It is made up of a first membrane FLEXTER TESTUDO SPUNBOND POLYESTER, certified with the DVT-Agreement of the I.T.C.-CNR (former ICITE), and a second one of DEFEND ANTIRADICE/H POLYESTER resistant to the chemical aggression of humic acids and fertilisers.
The high fatigue resistance of the suggested materials allows the choice of the connection of the covering to the laying surface with complete adhesion. This choice is dictated by the priority requirement to be able to quickly and unambiguously trace any leaks and to be able to intervene on the spot with minimum expense. Laying with low-adhesion or semi-adhesion is possible but to the detriment of the traceability of any leaks and the price of expensive repair interventions.
The completely stuck covering is more resistant to impact and static load and in the event of accidental tearing, unlike dry laid coverings, not much water can pass through.
With this system the protective concrete cap can be eliminated as the root inhibitor protection is incorporated in the waterproofing.
The use of a membrane such as FLEXTER TESTUDO SPUNBOND POLYESTER in the stratified elements, certified with the DVT-Agreement, meets the specifications of ***sustainable building*** as the primary requirement of the durability of the system is fulfilled, hence delaying the repair and/or demolition work timescales implies a lower consumption of raw materials, less energy consumption, less waste production and lower emissions of pollutants and greenhouse gases over time.

DRAINING LAYER, FILTERING LAYER, CULTIVATION SUBSTRATE

For the life of a roof garden, good implementation of the draining layer is fundamental.
Effective draining allows fast evacuation of the stormwater hence preventing overflows or stagnation, which could be harmful to the vegetation.
This result is obtained if LECA 8/15 expanded clay granules are laid dry onto the waterproof covering up to a thickness of 10 and 15 cm (30 cm for large trees), with the advantage of exploiting the water retention of LECA (14% in volume) as a water reserve which the roots of plants can draw from in the dry season.
In this way the potting soil above is guaranteed a constant humidity level.
For good draining it is important for the spaces between the granules of LECA not to be blocked up with potting soil. This job is carried out by FILTRO, a rot-proof synthetic fibre non-woven fabric, which withholds the soil without interfering in the passage of the stormwater and uniformly distributes the humidity that, in the dry season, rises due to the capillarity of the expanded clay granules.
The soil for creating the garden must come from workable land and be rich in organic fertilising substances of both animal and plant origin.
The soil that constitutes the substrate of the garden must be appropriately prepared and humus and calcareous or silicone substances must be added according to what is planted there.
The typical composition of a correctly used substrate in roof gardens is as follows: 40% soil taken straight from the land, 30% potting soil, 30% expanded clay.

(See following)

(See previous)

The thickness of the substrate depends on the type of vegetation envisaged and the extra load on the roof, to be taken into consideration for the resistance of the structure, can be calculated considering a volumic mass of the topsoil of 2,100 kg/m^3.
The table below reports the minimum thicknesses for the soil and draining layer in granular materials according to the type of vegetation.

Implantation of the vegetation according to the soil thickness

	Vegetation				
	Grass, rambling shrubs (h<0,6 m)	Flowers, perennial plants, rose bushes	Shrubs	Trees	Large trees
Drainage with: - Draining polystyrene panels (minimum thickness - m)	0,035	0,035	0,035	0,035	Not envisaged
Drainage with: - Layer of granules (such as Leca) (minimum thickness - m)	0,100	0,100	0,100	0,150	0,300
Soil (minimum thickness - m)	0,300	0,400	0,400	0,600	1,000

The table below shows the approximate loads to be envisaged for the calculation of the resistance of the structures according to the type of vegetation.

	Vegetation				
	Grass, rambling shrubs (h<0,6 m)	Flowers, perennial plants, rose bushes	Shrubs	Trees	Large trees
Aeric mass (kg/m^2)	5	10	15	60	200

FORMATION OF THE VEGETATION

The landscape architect selects the plant species and decides on how they should be arranged and the implantation system.

Selection of the plant species

Some plant species are not suitable to be planted in roof gardens and below is a list of the plants that are forbidden by French legislation NF P 84-204-1-1 ANNEXE B.

- Bamboo (all species): *Arudinaria fragesii; Fragesia murielae (=Arundinaria murielae); Fragesia nitida (=Sinarundinaria nitida); Phyllostachys, sp; Pleioblastus aleosus; Pleioblastus pumilus: Pseudosasa japonica; Sinarundina fastuosa.*
- Amur silvergrass, Chinese silvergrass: *Miscanthus floridus; Miscanthus sacchariflorus; Miscanthus sinensis.*
- Aggressive giant reeds; Blue sedge; Giant blue rye; Common reed; Prairie cordgrass: *Arundo donax; Carex glauca; Alymus racemosus; Phragmytes australis; Spartina pectinata.*
- Shrubs: Amélanchier *(Amélanchier, sp)*, Clethra *(Clethra alnifolia)*, Gaultheria *(Gaultheria shalion)*, Olivello spinoso *(Hippophae rhamnoides)*, Sambuco nero *(Sambucus nigra)*, Frangula *(Rhamnus frangula)*, Albero delle farfalle *(Buddleia davidii)*, Poligoni *(Polygonum, sp)*
- Trees: Goat willow *(Salix caprea)*; Weeping willow *(Salix babylonica)*; White poplar *(Populus alba)*; Black poplar *(Populus nigra)*; Canadian poplar *(Populus X)*; Tree of heaven *(Ailanthus altissima)*; Bald cypress, Swamp cypress *(Taxodium distichum)*
- Trees that grow very large: Acacia; Horse chestnut, Ash.

Implantation of the plant species

The supports for trees and shrubs are made of treated wood and rest on the draining layer, while the tallest plants are supported by stainless steel or rust-treated metal tie rods that are anchored to the building in higher points than the maximum height reached by the waterproof covering on the vertical parts of the roof.

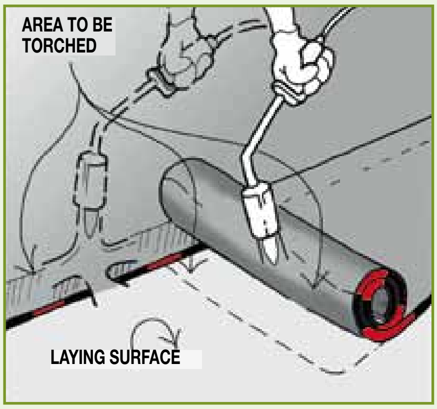
Arrangement of the vegetation on the roof

The arrangement of the vegetation in the garden must take into consideration the growth that they will have over time; the minimum distances from the vertical parts of the roof, the expansion joints and the drains must be respected with appropriate areas especially conformed as indicated below.

Connection methods of the membrane to the laying surface

COMPLETE ADHESION APPLICATION

The torching of the mixture of the rolls must affect the membrane and the support at the same time, concentrating on the roll. The torch flame must also be directed onto the membrane already laid for overlapping.

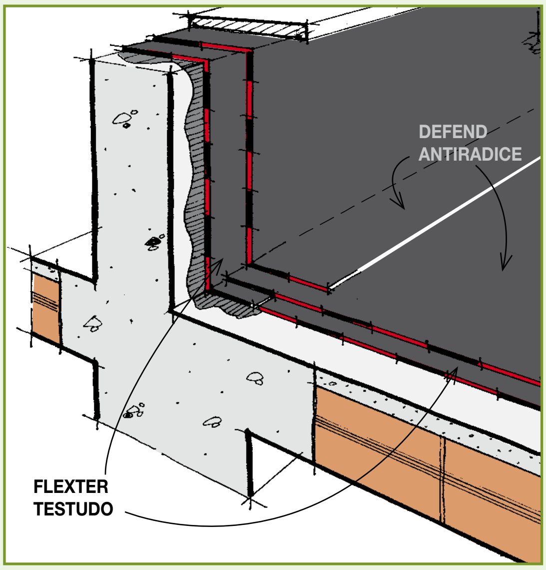


Preparing the laying surface

On the suitably clean and wet slab, a sloping screed (1÷5%) is created with good adhesion and smoothed with a spatula, made up of concrete prepared with 200÷250 kg Portland cement (325 grade) per m^3 of mixture; for the areas where a thickness of less than 3 cm is envisaged, the screed is made from mortar prepared with 350 kg of cement per m^3 of sand.
The screed can be made of concrete with light mineral granules prepared with 250 kg of Portland cement per m^3 of mixture.
The sloping screed may also be made of cellular concrete or light concrete with non-mineral granules as long <u>as they are sufficiently cohesive to allow adhesion to the membranes</u>.
On roofs made of prefabricated reinforced concrete panels, across the joining lines of the tiles, bands of 20 cm wide FLEXTER TESTUDO SPUNBOND POLYESTER 4 are heat-bonded, either before laying the sloping screed or the waterproof covering or vapour barrier placed straight onto the prefabricated panels.
The laying surface must be smooth and flat.
A concrete surface is defined as such if below a 2 m rule placed in all directions no gaps of over 10 mm appear, and under a 0.20 m rule, gaps of over 3 mm.
The surface must be smoothed with a trowel and any cracks or dips must be filled in with mortar.
Any roughness must be removed, as must any remains from building work, such as nails, metal sheets, wood, etc.
Before application, the laying surface must be clean and dry; for concrete and cement and brick laying surfaces it is best to wait for a drying period of 8 days to 3 weeks according to the season.

Vertical parts

The vertical parts of the roof garden must also be waterproofed with DEFEND ANTIRADICE POLYESTER. First of all, it is necessary to paint all the protruding parts with INDEVER (bituminous adhesion primer).
The external wall is covered with a layer of FLEXTER TESTUDO SPUNBOND POLYESTER, which is turned up onto the flat part by least 10 cm.
The waterproof covering is made up of the same membrane to be subsequently applied as the first layer, taking care to match up the top parts of the sheets with the turn-up previously carried out.
The second layer is made with the root inhibitor waterproofing membrane DEFEND ANTIRADICE POLYESTER; the sheets are unrolled parallel to the first and across its overlaps and are then heat-bonded.
The sheets are placed up to the foot of the projecting part, which is then covered by the same kind of sheet that is turned up on the flat section by at least 20 cm.
The vertical waterproofing must exceed the soil level by 15/20 cm and must be protected as indicated below.

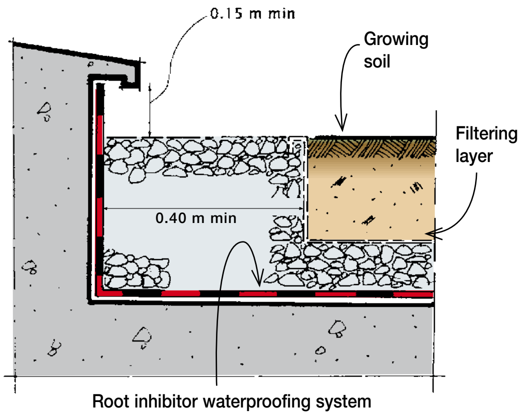


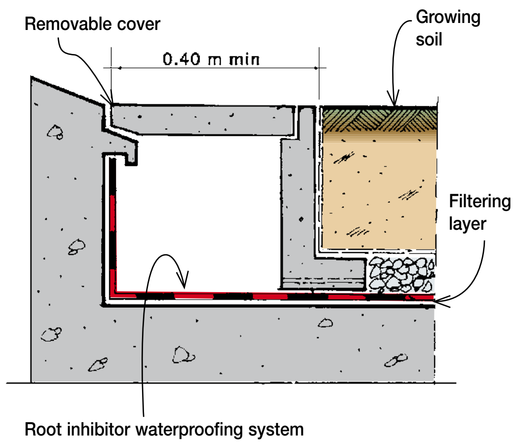
Vertical parts

Conformation of the roof garden near the vertical parts

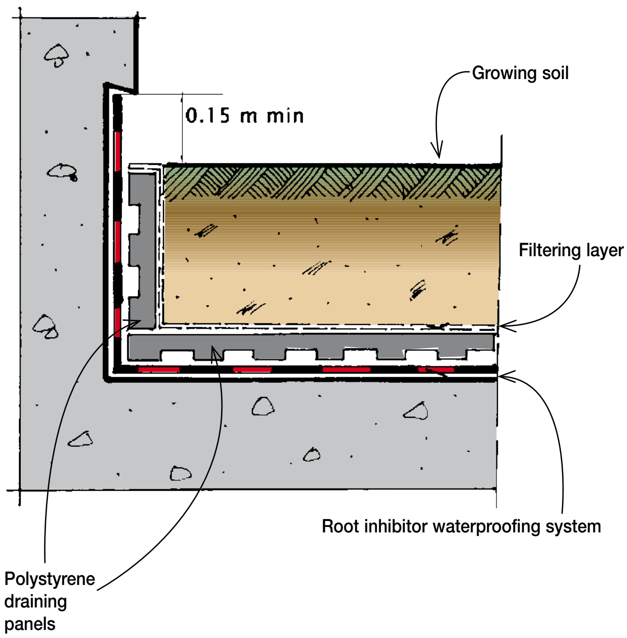
Gardens with a surface area of over 100 m².
Near the vertical parts of the roof in correspondence with the turn-up of the waterproof covering, an infertile area at least 40 cm wide is provided, which can be created according to the two examples indicated below.

In the first example the height reached by the turn-up of the waterproof covering on the vertical parts is at least 15 cm higher than the soil level.



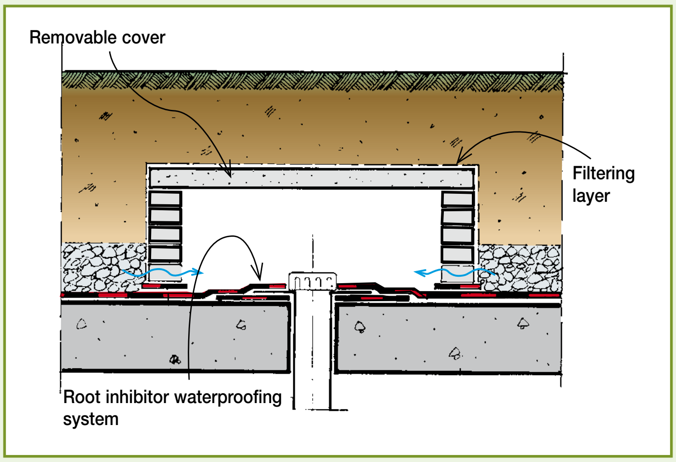


Gardens with a surface area of less than 100 m².
Near the vertical parts of the roof in correspondence with the turn-up of the waterproof covering, the infertile area can be created using polystyrene draining panels at least 3.5 cm thick or a composite draining and filtering geotextile at least 2 cm thick when loaded.
Also in this case, the height reached by the turn-up of the waterproof covering on the vertical parts is at least 15 cm higher than the soil level.



Drains

The drainpipes can be made of lead, copper or synthetic materials, but in all cases the connector and the diameter of the drain must be big enough.
The connector of the drainpipe is closed between the two layers of the waterproof covering, which are heat-bonded.
To prevent any inconvenience, it is best to ensure that the drains can easily be inspected, therefore a manhole with a removable cover must be built around the drain.
The manhole rests on the covering protected with a layer of heat-bonded fabric TESSUTO SPUNBOND POLYESTER 25.
For small roof gardens, it is possible to replace the manhole with a mound of expanded clay placed above the drain almost as high as the whole thickness of the layers.



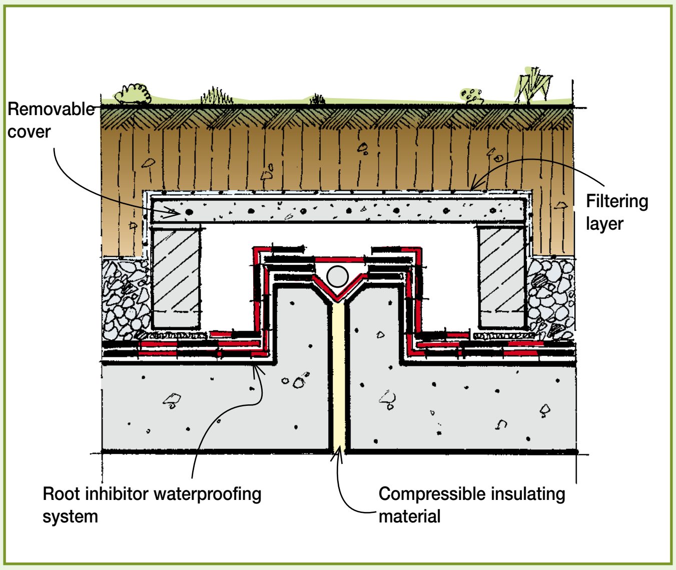
Conformation of the roof garden near the drains
No plant species with woody stalks must be planted within at least 40 cm of the drains.

Expansion joints

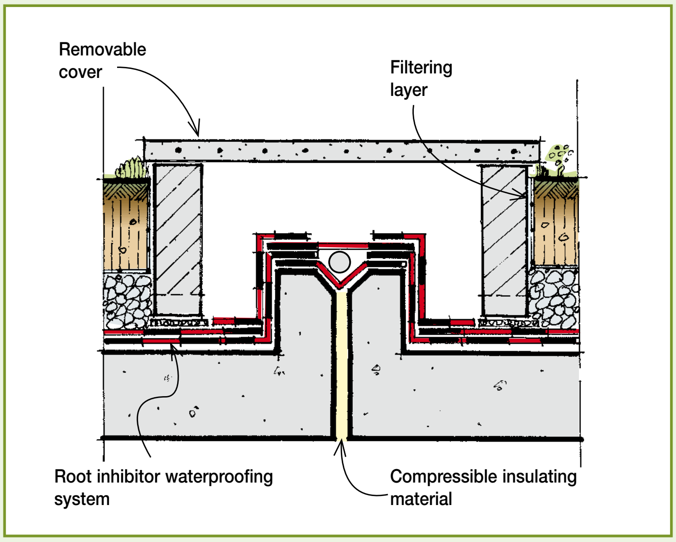
Near the joint it is advisable to put up two walls higher than the layer of topsoil and to protect them as outlined for the projecting parts.
To prevent the formation of condensation, it is best to fill the joint with compressible insulating material.
Flat joints are to be absolutely avoided.

Conformation of the roof garden near the expansion joints

Buried joints.
As for the drains, no plants with woody stems must be planted within at least 40 cm from either side of the expansion joints.



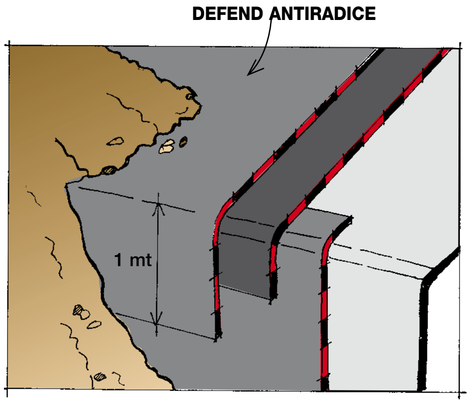
Visible joints.
In correspondence with the projecting joints marked off by walls, the same procedure must be used as for the vertical parts, creating an infertile area made up of polystyrene draining panels at least 3.5 cm thick or a composite draining and filtering geotextile at least 2 cm thick when loaded.



LAYING DETAILS AND WARNINGS
INTENSIVE GREEN ROOFS

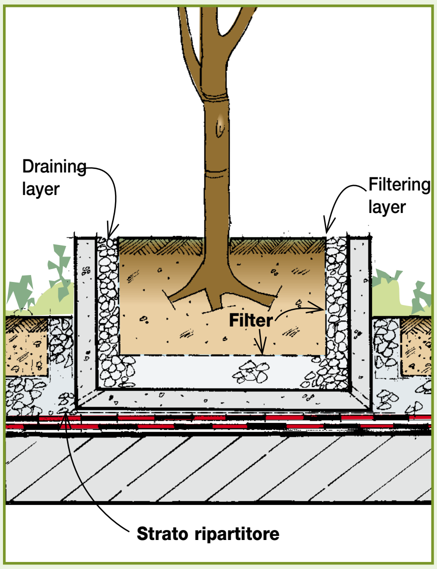
Embankments

If the roof of a terrace is partially covered with soil or in contact with an embankment, as well as the normal waterproofing, a band of DEFEND ANTIRADICE POLYESTER must be provided, laid onto the perimeter of the roof in contact with the soil, with a turn-up of vertical waterproofing of at least a metre.



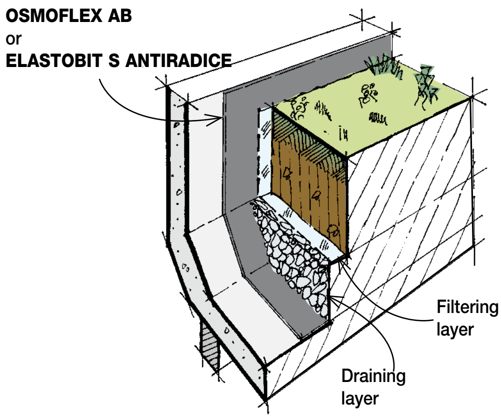
Holes for trees

For fairly demanding gardening projects, where tall trunked trees are to be bedded out, it is necessary to use tubs of a sufficient size and height, which provides deep burying for the normal growth of the roots.
These tubs are to be placed on the draining layer, taking care to separate them with a weight distribution layer.
The same tub must also have a draining layer inside it with relative drains and a separator filter.



Prefabricated planters

The concrete surface must be clean and any traces of oils, dismantled parts, dirt, etc. must be removed. Degraded and loose parts must be removed and the flat surface must be repaired using mortar such as RESISTO TIXO or RESISTO UNIFIX.

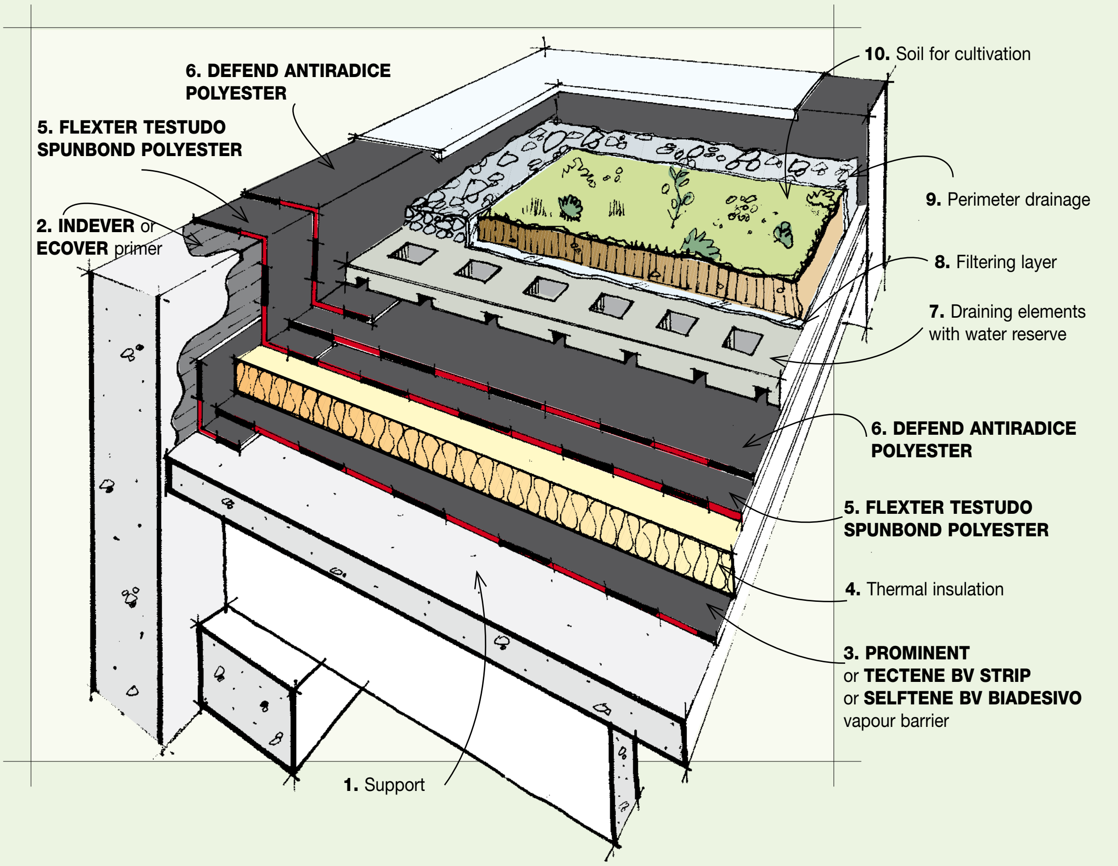


The internal surface of the planter must be protected with a waterproof, two-component, flexible covering, based on hydraulic binders and styrol-butadiene resins, such as OSMOFLEX laid 1 mm thick with a consumption of about 1.6 kg/m^2.
The covering must have an ultimate elongation of 20%, permeability to vapour of μ<1500 and permeability to CO_2 of 160 m.
The mortar is prepared by mixing component A with component B until a uniform paste is obtained, which is to be applied with a trowel, uniformly smoothing horizontally and vertically to a thickness of about 1 mm.

Alternatively, the internal surface of the planter can be protected with two 300 g coats of a solvent-based bitumen-elastomer coating with a root inhibitor additive such as ELASTOBIT S ANTIRADICE with a volumic mass of 0.95 kg/dm^3 and a solid content of 55%.
Once it has dried the waterproofing film has an ultimate elongation of >800% and an ultimate tensile strength of >6.8 kg/dm^3 (in compliance with standard NFT 46002) and a cold-state flexibility, in compliance with UNI 8202/15, of –15°C.
The coating is applied with a brush or roller after mixing the product contained in the tin before use. The second coat must be applied once the first has completely dried.

WATERPROOFING AND ROOT INHIBITOR BARRIER

EXTENSIVE GREEN ROOFS



STRATIFIED ELEMENTS

1. Support
2. **INDEVER** or **ECOVER** primer
3. **PROMINENT** or **TECTENE BV STRIP** or **SELFTENE BV BIADESIVO** vapour barrier
4. Thermal insulation
5. **FLEXTER TESTUDO SPUNBOND POLYESTER**
6. **DEFEND ANTIRADICE POLYESTER**
7. Draining elements with water reserve
8. Filtering layer
9. Perimeter drainage
10. Soil for cultivation

PRIMER

The primer penetrates into the pores of concrete surfaces, stops dust and has the job of promoting adhesion on the surfaces to which the membranes must be stuck. INDEVER is a traditional solvent-based bituminous primer; the ECOVER water-based primer is more innovative and has reduced environmental impact. The whole surface to be covered and the vertical parts onto which the waterproof covering must be stuck, are painted with a coat of about 300 g/m² INDEVER adhesion bituminous primer, a solution based on oxidised bitumen, additives and solvents, with solid content (UNI EN ISO 3251) of 40% and viscosity (UNI EN ISO 2431) of 12÷17 s, or ECOVER, with a water bituminous emulsion base and solid content (UNI EN ISO 3251) of 37% using 250÷400 g/m².

VAPOUR BARRIER

Considering how thin extensive green roofs are, it is almost always necessary to use a layer of thermal insulation and therefore also the relative vapour barrier.
The water vapour, which during the winter season migrates towards the outside of the heated building, meets with the opposition of the waterproof layer under which it could condense and therefore dampen the adjacent thermal insulation. Wet thermal insulation does not insulate any longer and can be deformed, hence damaging all the stratified elements. Therefore, it is necessary to stop the vapour before it reaches the thermal insulation in a sufficiently warm point of the stratified elements to make the amount of condensation that could form negligible. The layer that protects the insulation from the vapour is called the "vapour barrier". For roofs with a covering that has a low dead weight, as envisaged for extensive green roofs, the connection of the vapour barrier to the concrete support is particularly important. To oppose the suction force of the wind, except for particular cases, the connection must be made with total adhesion. To prevent the formation of air bubbles on the vapour barrier generated by concrete supports that are still damp, it is appropriate for the vapour barrier + insulation + 1 layer of the covering all to be laid at the same time.

	Traditional	Innovative cold-bonded double-sided adhesive (with cold bonding of the insulation incorporated)	Innovative heat-bonded (with heat bonding of the insulation incorporated)
Vapour barrier on roofs of rooms with low humidity (relative humidity <80% at 20°C)	case A **DEFEND - 3 mm** heat-bonded adhesive under stuck insulation (1)	case C **SELFTENE BV BIADESIVO POL.** **SELFTENE BV BIADESIVO/V** cold-bonded adhesive under stuck insulation (*) (2)	case E **TECTENE BV STRIP/V** **PROMINENT/V** **PROMINENT POLYESTER** heat-bonded adhesive under stuck insulation (3)
Vapour barrier on roofs of rooms with high humidity (relative humidity ≥80% at 20°C)	case B **DEFEND ALU POL. - 3 mm** heat-bonded adhesive under stuck insulation (1)	case D **SELFTENE BV BIADESIVO ALU POLYESTER** cold-bonded adhesive under stuck insulation (*) (2)	case F **TECTENE BV STRIP ALU POL.** **PROMINENT ALU POL.** heat-bonded adhesive under stuck insulation (3)

(*) *System to be used for surface areas of ≤500 m²*
(1) *Insulation stuck with molten oxidised bitumen*
(2) *Insulation cold-bonded onto the upper self-adhesive face of the vapour barrier*
(3) *Insulation stuck by heat bonding the strips or heat-adhesive embossings on the upper face of the vapour barrier*

A; B. *On DEFEND and DEFEND ALU POLYESTER heat-resistant insulating panels and THERMOBASE PUR and THERMOBASE FR are chosen.*
C; D. *On SELFTENE BV BIADESIVO polystyrene or polyurethane panels can be stuck, and THERMOBASE PSE, THERMOBASE PSE/EX and THERMOBASE PUR*
E; F. *Heat bonding on PROMINENT is reserved for heat-resistant thermal insulation and THERMOBASE PUR, whereas on TECTENE BV STRIP polystyrene and polyurethane panels can be stuck, and THERMOBASE PSE, THERMOBASE PSE/EX and THERMOBASE PUR using suitably trained labour.*

THERMAL INSULATION

This is required for containing energy consumption and limiting any dilations of the load-bearing structure; it also prevents internal condensation of water vapour on cold walls. Either fibrous or cellular, the most common insulators are: glass or rock mineral fibre panels, polyurethane and expanded polystyrene panels, perlite agglomerates and cellulose fibres, cellular glass, cork, etc.
INDEX S.p.A. produces the THERMOBASE insulation in rolls, made up of strips of insulating material already stuck onto a polymer-bitumen membrane, a product that meets the specifications of ***sustainable building*** as the membrane/insulation coupling in the factory reduces the laying operations on the roof and the consequent emission of fumes, smells and noise into the environment.
The types envisaged in the event of using THERMOBASE are:

- THERMOBASE PUR/35-V3
- THERMOBASE PSE/120-V3
- THERMOBASE PSE/EX-V3

The insulating materials are produced in different types, densities and dimensions, according to their destination. It is important to choose materials of the type expressly declared by the manufacturer as being suitable for the use and suitable to be stuck and coated with the polymer-bitumen membrane and bituminous materials in general.
Cellular insulating materials are preferable because, in the event of leaks in the waterproof layer, they absorb less water.
Heat-resistant insulating panels (perlite, expanded polyurethane, cork, mineral wools), such as THERMOBASE PUR can be stuck with molten oxidised bitumen.
For safer laying, reducing the risk of burns and the emission of fumes and smells, the expanded polyurethane panels and THERMOBASE PUR can also be heat-bonded onto the PROMINENT and TECTENE BV STRIP EP membranes and can be heat-bonded directly to the waterproof covering suggested below.
Expanded polystyrene insulating panels can be heat-bonded onto TECTENE BV STRIP EP or cold-bonded onto SELFTENE BV BIADESIVO and then, before laying the waterproof covering, they must be protected with the self-heat-adhesive membrane in the AUTOTENE BASE series, which is stuck alone onto the polystyrene panel using the heat transmitted from the heat bonding of the waterproof layer above; alternatively rolls of insulation pre-coupled to a membrane of the THERMOBASE PSE/120 or THERMOBASE PSE/EX type can be used. The thickness of the insulation must be sufficiently high to prevent the dew point dropping below the vapour barrier and must comply with legislation in force on energy containment in buildings.

THERMOBASE PSE/120-V3							
Thickness	20	30	40	50	60	70	80
Thermal resistance R(m²K/W)	0,494	0,740	0,985	1,217	1,458	1,705	1,947

THERMOBASE PSE/EX-V3					
Thickness	20	25	30	40	50
Thermal resistance R(m²K/W)	0,559	0,838	1,114	1,377	1,650

THERMOBASE PUR/35-V3					
Thickness	20	30	40	50	60
Thermal resistance R(m²K/W)	0,686	1,025	1,362	1,695	2,029

WATERPROOF COVERING AND ROOT INHIBITOR PROTECTION

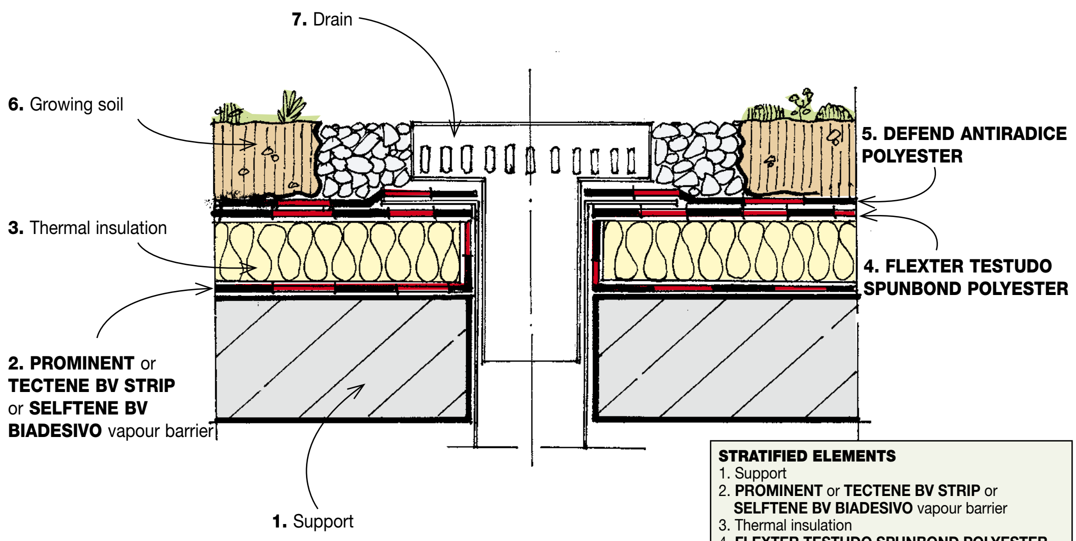
This is the continuous layer that prevents water passing through the roof.
It is made up of a first membrane FLEXTER TESTUDO SPUNBOND POLYESTER, certified with the DVT-Agreement of the I.T.C.-CNR (former ICITE), and a second one of DEFEND ANTIRADICE/H POLYESTER resistant to the chemical aggression of humic acids and fertilisers.
The high fatigue resistance of the suggested materials allows the choice of the connection of the covering to the laying surface with complete adhesion. This is a choice which, in addition to the wind resistance of a covering with a low dead weight, is dictated by the priority requirement to be able to quickly and unambiguously trace any leaks and to be able to intervene on the spot with minimum expense.
The completely stuck covering is more resistant to impact and static load and in the event of accidental tearing, unlike dry laid coverings, not much water can pass through.
The use of a membrane such as FLEXTER TESTUDO SPUNBOND POLYESTER in the stratified elements, certified with the DVT-Agreement, meets the specifications of ***sustainable building*** as the primary requirement of the durability of the system is fulfilled, hence delaying the repair and/or demolition work timescales implies a lower consumption of raw materials, less energy consumption, less waste production and lower emissions of pollutants and greenhouse gases over time.

DRAINAGE AND SOIL FOR CULTIVATION

There are different systems available on the market for the formation of the aforementioned layers and they are all compatible with the waterproof covering previously described. Below are some examples of application with the relative technical details

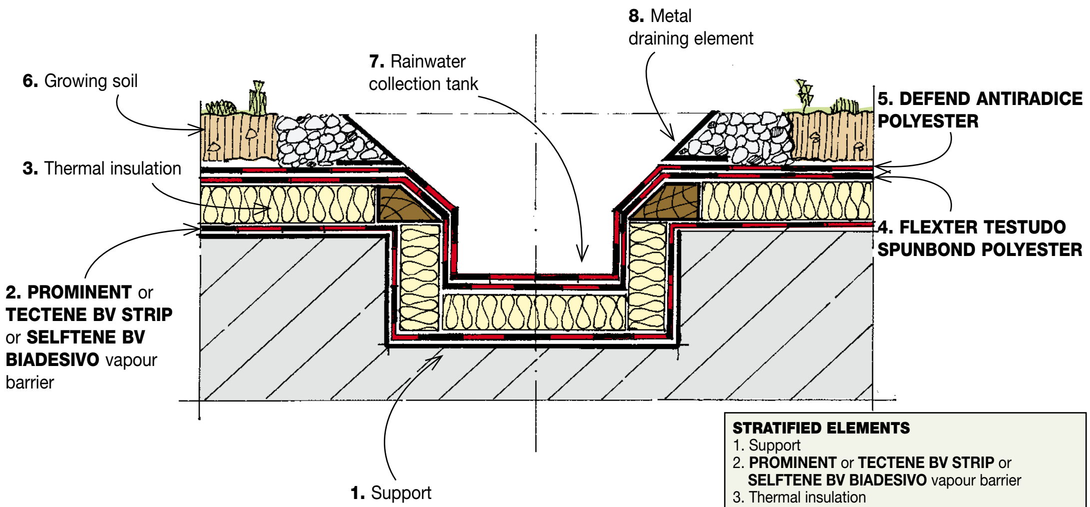
LAYING DETAILS AND WARNINGS
EXTENSIVE GREEN ROOFS

Conformation of extensive green roofs near the drain



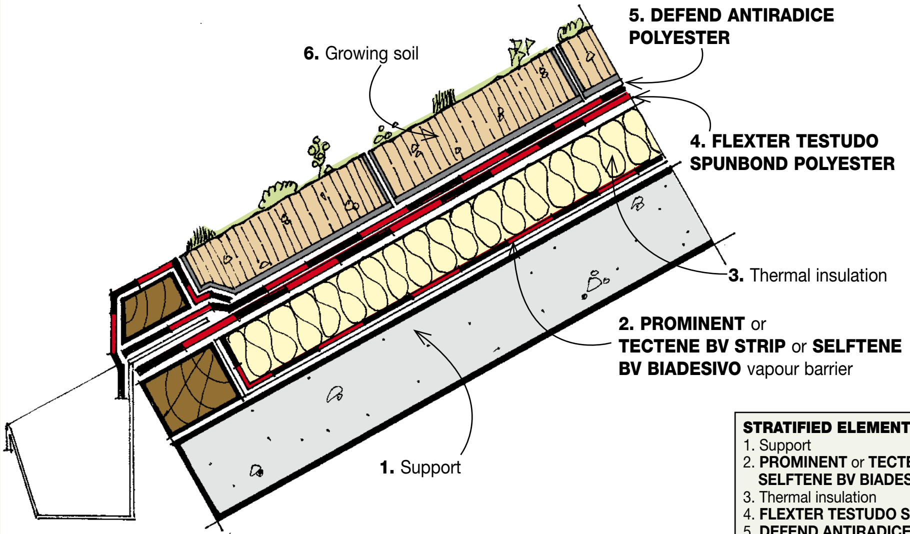
STRATIFIED ELEMENTS
1. Support
2. **PROMINENT** or **TECTENE BV STRIP** or **SELFTENE BV BIADESIVO** vapour barrier
3. Thermal insulation
4. **FLEXTER TESTUDO SPUNBOND POLYESTER**
5. **DEFEND ANTIRADICE POLYESTER**
6. Growing soil
7. Drain

Conformation of extensive green roofs near a rainwater collection tank



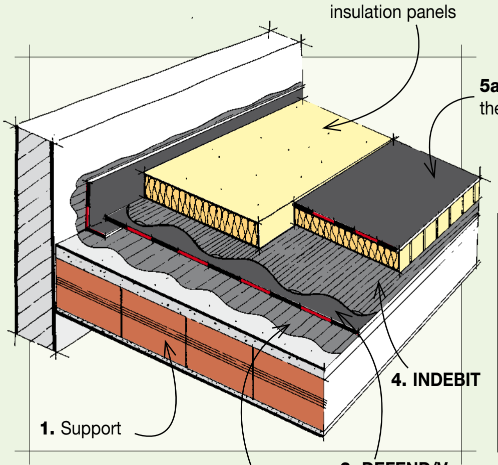
STRATIFIED ELEMENTS
1. Support
2. **PROMINENT** or **TECTENE BV STRIP** or **SELFTENE BV BIADESIVO** vapour barrier
3. Thermal insulation
4. **FLEXTER TESTUDO SPUNBOND POLYESTER**
5. **DEFEND ANTIRADICE POLYESTER**
6. Growing soil
7. Rainwater collection tank
8. Metal draining element

Example of extensive green roof on a slope



STRATIFIED ELEMENTS
1. Support
2. **PROMINENT** or **TECTENE BV STRIP** or **SELFTENE BV BIADESIVO** Vapour barrier
3. Thermal insulation
4. **FLEXTER TESTUDO SPUNBOND POLYESTER**
5. **DEFEND ANTIRADICE POLYESTER**
6. Growing soil

STANDARD VAPOUR BARRIER AND BONDING WITH MOLTEN OXIDISED BITUMEN OF HEAT-RESISTANT INSULATING PANELS OR THERMOBASE PUR PANELS



MEMBRANES:
• DEFEND/V
• DEFEND ALU POLYESTER

case **A**
case **B**

Reinforced vapour barrier elastoplastomeric polymer-bitumen membranes, resistant and impermeable to gases and water vapour, to be chosen according to the vapour permeability (lower for the ALU POLYSTER version).

• Application method on concrete laying surface

Primer. The entire surface to be coated and the vertical parts onto which the waterproof covering must be bonded, are painted with a coat of about 300 g/m² of INDEVER adhesion bituminous primer, or alternatively ECOVER water-based primer.

Vapour barrier. The vapour barrier sheets are overlapped longitudinally by about 6 cm, whereas the end overlap is about 10 cm.

The bonding of the sheets to the laying surface is carried out with total adhesion using the flame of a propane torch.

The bonding of the overlaps of both types is also carried out using a torch.

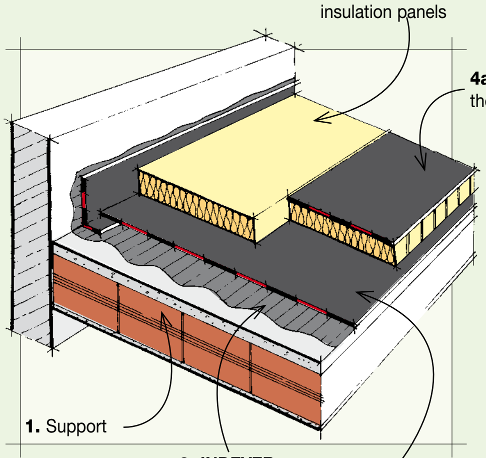
The continuity of the vapour barrier on the vertical parts is carried out by heat bonding, onto the edge of the bottom of the projecting parts, a band of membrane wide enough to cover the flat part by at least 10 cm and be turned up vertically by 5 cm more than the thickness of the envisaged insulation.

To fix the insulation panels or rolls of THERMOBASE insulation onto the vapour barrier, the insulating elements are heat-bonded with oxidised bitumen such as INDEBIT molten at a temperature of no more than 220°C, using 1.5÷2 kg/m². (For the purpose heat-resistant panels are chosen using appropriately trained labour).

Then the overlaps of the membrane coupled with THERMOBASE are heat-bonded.

The connections to the vertical parts are turned up and heat-bonded by at least 20 cm onto the maximum water level and are made up of bands of a polymer-bitumen waterproofing membrane reinforced with spunbond non-woven polyester fabric, stabilised with fibreglass, that is certified with the DVT-Agreement of the I.T.C.-CNR type FLEXTER TESTUDO SPUNBOND POLYESTER 4 mm thick.

DOUBLE-SIDED ADHESIVE VAPOUR BARRIER AND COLD-BONDING OF EXPANDED POLYSTYRENE OR POLYURETHANE, THERMOBASE PSE, THERMOBASE PSE/EX AND THERMOBASE PUR PANELS



MEMBRANES:
• SELFTENE BV BIADESIVO ALU POLYESTER
• SELFTENE BV BIADESIVO POLYESTER
• SELFTENE BV BIADESIVO/V

case **C**
case **D**

Reinforced elastomeric polymer-bitumen vapour barrier membranes, double-sided adhesive, multi-functional, resistant, elastic, impermeable to gases and water vapour, to be chosen according to the vapour permeability (lower for the ALU POLYSTER version) or the mechanical resistance (higher for POLYSTER).

The adhesive faces on both sides create the dual function of vapour barrier below the thermal insulation panels, to protect them from the humidity generated inside the building, and of adhesive layer, for gluing them onto the roof.

These are products to be laid cold, which meet the specifications of ***sustainable building*** as by eliminating the melting pot for the oxidised bitumen, the risks of burns are also eliminated, the laying operations on the roof are reduced and therefore also the emission of fumes, smells and noise.

• Application method on concrete laying surface

Primer. The entire surface to be coated and the vertical parts onto which the waterproof covering must be bonded, are painted with a coat of about 350-500 g/m² of INDEVER PRIMER E adhesion bituminous primer.

Vapour barrier. Once you have aligned and overlapped the sheets along the special longitudinal overlap strip on the top face, remove the silicone-coated film on the bottom face of the membrane and glue in place.

The end overlap is approximately 10 cm and is sealed by simple cold pressure, likewise for the longitudinal overlaps.

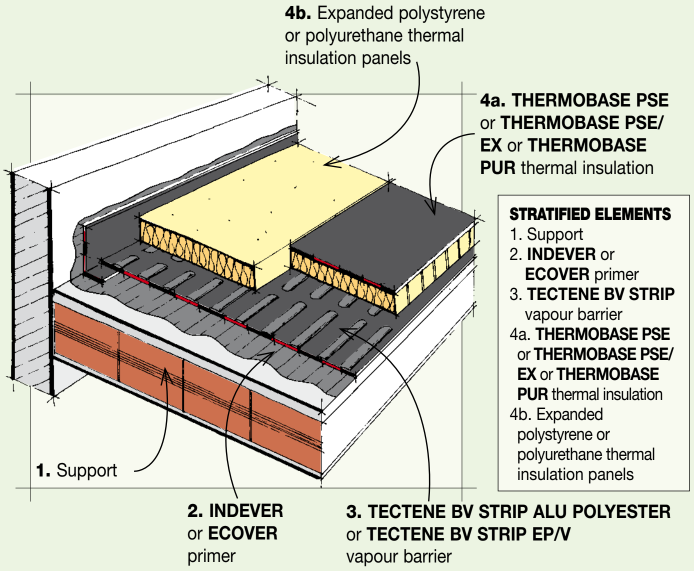
The membrane is turned up on the vertical parts by 5 cm more than the thickness of the envisaged insulation.

The rows of sheets are arranged in such a way as to offset the end overlaps and to prevent 4 sheets crossing.

Adhesion to the laying surface is consolidated by pressing evenly using a metal roller, with particular care on the sheet overlaps.

To stick the insulation panels onto the vapour barrier, remove the silicone-coated film also from the top face and, to prevent the adhesive face from getting dirty and the operator from getting stuck on the glue, just remove the film gradually while sticking the panels in place. Adhesion is consolidated by pressing the adhesive surface of the panel carefully.

VAPOUR BARRIER WITH INCORPORATED HOT-MELT ADHESIVE FOR THE ADHESION OF THE LAYER OF THERMAL INSULATION AND HEAT BONDING OF EXPANDED POLYSTYRENE OR POLYURETHANE, THERMOBASE PSE, THERMOBASE PSE/EX AND THERMOBASE PUR PANELS



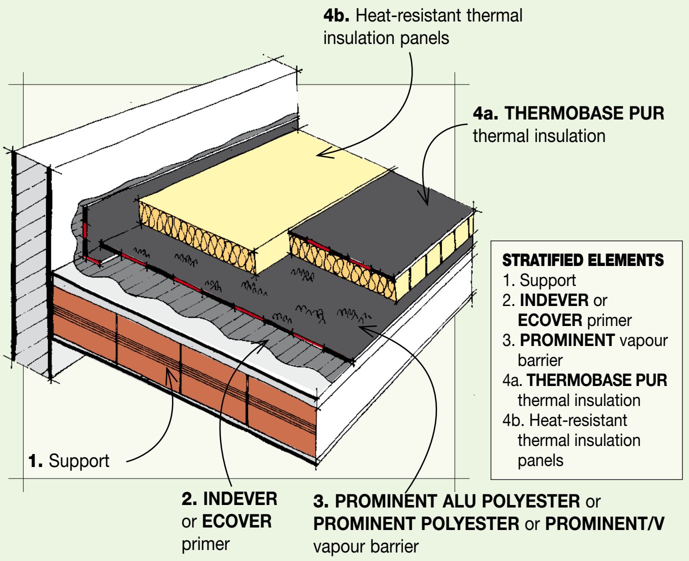
MEMBRANES:
• TECTENE BV STRIP ALU POLYESTER
• TECTENE BV STRIP EP/V

case E
case F

Reinforced elastoplastomeric polymer-bitumen vapour barrier membranes, with the upper face covered in hot-melt strips for heat-bonding to the insulating panels, resistant and impermeable to gases and water vapour, to be chosen according to the vapour permeability (lower for the ALU POLYESTER version).
These are products to be heat-bonded, which meet the specifications of ***sustainable building*** as by eliminating the melting pot for the oxidised bitumen, the risks of burns are notable reduced, the laying operations on the roof are reduced and therefore also the emission of fumes, smells and noise.

• Application method on concrete laying surface
Primer. The entire surface to be coated and the vertical parts onto which the waterproof covering must be stuck, are painted with a coat of about 300 g/m^2 of INDEVER adhesion bituminous primer, or alternatively ECOVER water-based primer.
Vapour barrier. The vapour barrier sheets are overlapped longitudinally by about 6 cm along the selvages with reduced thickness, especially provided on the edge of the sheet in order to allow overlapping without any protruding parts and to obtain a sufficiently flat laying surface for the insulating panels. The end overlap should be about 10 cm.
The bonding of the sheets to the laying surface is carried out with total adhesion using a propane torch.
The bonding of the overlaps of both types is also carried out using a torch.
The continuity of the vapour barrier on the vertical parts is carried out by heat bonding, onto the edge of the bottom of the projecting parts, a band of elastoplastomeric polymer-bitumen membrane reinforced with composite polyester non-woven fabric coupled to aluminium foil, such as DEFEND ALU POLYSTER, in the event of laying STRIP EP ALU POLYSTER, or reinforced with a fibreglass mat such as DEFEND/V, in the event of laying STRIP EP/V, wide enough to cover the flat part by at least 10 cm and be turned up vertically by 5 cm more than the thickness of the envisaged insulation.
For sticking the insulating panels or the THERMOBASE insulation in rolls onto the vapour barrier, the heat-adhesive strips, which cover their upper face, must be heated by means of a propane torch, thus activating adhesion, and the insulating layer that is pressed on top sticks to it perfectly.
For expanded polystyrene, to prevent melting, the torching must be carried out by appropriately trained staff.

VAPOUR BARRIER WITH INCORPORATED HOT-MELT ADHESIVE FOR THE ADHESION OF THE LAYER OF THERMAL INSULATION AND HEAT-BONDING OF HEAT-RESISTANT INSULATING PANELS OR THERMOBASE PUR PANELS



MEMBRANES:
• PROMINENT ALU POLYESTER
• PROMINENT POLYESTER
• PROMINENT/V

case E
case F

Reinforced elastoplastomeric polymer-bitumen vapour barrier membranes, with the upper face covered in hot-melt embossings for heat-bonding to the insulating panels, resistant and impermeable to gases and water vapour, to be chosen according to the vapour permeability (lower for the ALU POLYESTER version) or the mechanical resistance (higher for POLYESTER).
These are products to be heat-bonded, which meet the specifications of sustainable building as by eliminating the melting pot for the oxidised bitumen, the risks of burns are notable reduced, the laying operations on the roof are reduced and therefore also the emission of fumes, smells and noise.

• Application method on concrete laying surface
Primer. The entire surface to be coated and the vertical parts onto which the waterproof covering must be bonded, are painted with a coat of about 300 g/m^2 of INDEVER adhesion bituminous primer, or alternatively ECOVER water-based primer.
Vapour barrier. The vapour barrier sheets are overlapped longitudinally by about 6 cm along the two selvages with reduced thickness, especially provided on the edges of the sheet in order to allow overlapping without any protruding parts and to obtain a sufficiently flat laying surface for the insulating panels, whereas the tops of the sheets are laid opposite each other and heat-bonded onto the faces of DEFEND or DEFEND ALU POLYSTER 3 mm thick and 14 cm wide, which have been previously stuck onto the laying surface.
The bonding of the sheets to the laying surface is carried out with total adhesion using a propane torch.
The bonding of the overlaps of both types is also carried out using a torch.
The continuity of the vapour barrier on the vertical parts is carried out by heat-bonding, onto the edge of the bottom of the projecting parts, a band of elastoplastomeric polymer-bitumen membrane reinforced with composite polyester non-woven fabric coupled to aluminium foil, like DEFEND ALU POLYSTER, wide enough to cover the flat part by at least 10 cm and be turned up vertically by 5 cm more than the thickness of the envisaged insulation.
For sticking the heat-resistant insulating panels or THERMOBASE PUR rolls of insulation above the vapour barrier, the heat-adhesive embossings, which cover their upper face, must be heated by means of a propane torch, activating adhesion and the insulating layer that is pressed on top sticks to them perfectly.

THERMAL INSULATION AND FIRST LAYER OF THE WATERPROOF COVERING WITH
• THERMOBASE PSE/120
• THERMOBASE PSE/EX

Thermal insulators in boards coupled to waterproofing membranes supplied in rolls.
The thickness of the insulation must be sufficiently high to prevent the dew point dropping below the vapour barrier and must comply with legislation in force on energy containment in buildings.

• Application method on TECTENE BV STRIP
By heating the heat-adhesive strips that cover the upper face of the vapour barrier using a propane torch, the adhesion is activated, and the roll of THERMOBASE insulation pressed on top sticks to it perfectly. Then the overlaps and connections to the vertical parts are heat-bonded and turned up by at least 20 cm onto the maximum water level and are made up of bands of a polymer-bitumen waterproofing membrane reinforced with spunbond non-woven polyester fabric, stabilised with fibreglass, that is certified with the Agreement of the I.T.C.-CNR such as FLEXTER TESTUDO SPUNBOND POLYESTER 4 mm thick.
The heating of the heat-adhesive strips and the bonding of the overlap of the elements must be carried out by appropriately trained staff and must take place with necessary caution in order to prevent the expanded polystyrene melting.

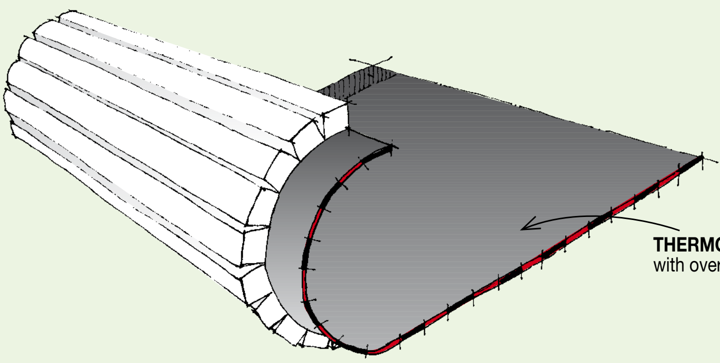
• Application method on SELFTENE BV BIADESIVO
To stick the insulation panels onto the vapour barrier, remove the silicone-coated film also from the top face of SELFTENE BIADESIVO and, to prevent the adhesive face from getting dirty and the operator from getting stuck on the glue, just remove the film gradually while unrolling the rolls of THERMOBASE. Adhesion is consolidated by pressing the adhesive surface of the insulation carefully.
Then the overlaps and connections to the vertical parts are heat-bonded and turned up by at least 20 cm onto the maximum water level and are made up of bands of a polymer-bitumen waterproofing membrane reinforced with spunbond non-woven polyester fabric, stabilised with fibreglass, that is certified with the Agreement of the I.T.C.-CNR such as FLEXTER TESTUDO SPUNBOND POLYESTER 4 mm thick.

THERMAL INSULATION AND FIRST LAYER OF THE WATERPROOF COVERING WITH
• THERMOBASE PUR

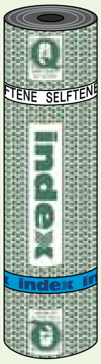
Thermal insulators in boards coupled to waterproofing membranes supplied in rolls.
The thickness of the insulation must be sufficiently high to prevent the dew point dropping below the vapour barrier and must comply with legislation in force on energy containment in buildings.

• Application method on TECTENE BV STRIP or PROMINENT
By heating the embossings or heat-adhesive strips that cover the upper face of the vapour barrier using a propane torch, the adhesion is activated, and the roll of THERMOBASE insulation pressed on top sticks to it perfectly. Then the overlaps and connections to the vertical parts are heat-bonded and turned up by at least 20 cm onto the maximum water level and are made up of bands of a polymer-bitumen waterproofing membrane reinforced with spunbond non-woven polyester fabric, stabilised with fibreglass, that is certified with the Agreement of the I.T.C.-CNR such as FLEXTER TESTUDO SPUNBOND POLYESTER 4 mm thick.

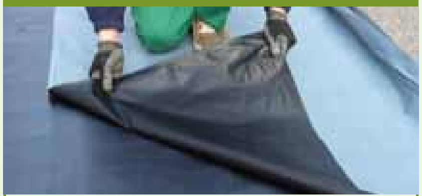
• Application method on SELFTENE BV BIADESIVO
To stick the insulation panels onto the vapour barrier, remove the silicone-coated film also from the top face of SELFTENE BIADESIVO and, to prevent the adhesive face from getting dirty and the operator from getting stuck on the glue, just remove the film gradually while unrolling the rolls of THERMOBASE. Adhesion is consolidated by pressing the adhesive surface of the insulation carefully.
Then the overlaps and connections to the vertical parts are heat-bonded and turned up by at least 20 cm onto the maximum water level and are made up of bands of a polymer-bitumen waterproofing membrane reinforced with spunbond non-woven polyester fabric, stabilised with fibreglass, that is certified with the Agreement of the I.T.C.-CNR such as FLEXTER TESTUDO SPUNBOND POLYESTER 4 mm thick.



LAYING THERMOBASE ON MULTIFUNCTIONAL VAPOUR BARRIERS

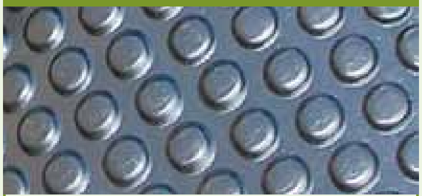


SELFTENE BV BIADESIVO

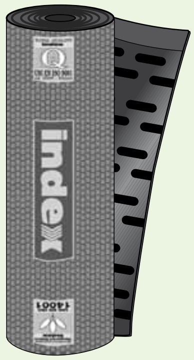


Self-adhesive mixture

PROMINENT

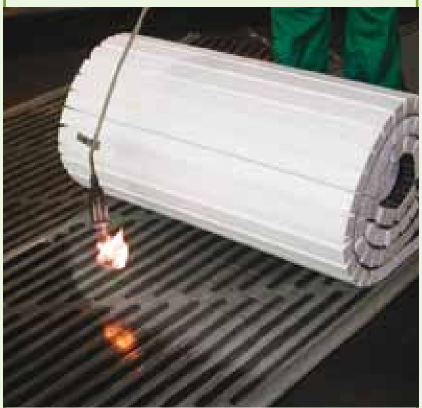


Heat-adhesive embossings



TECTENE BV STRIP

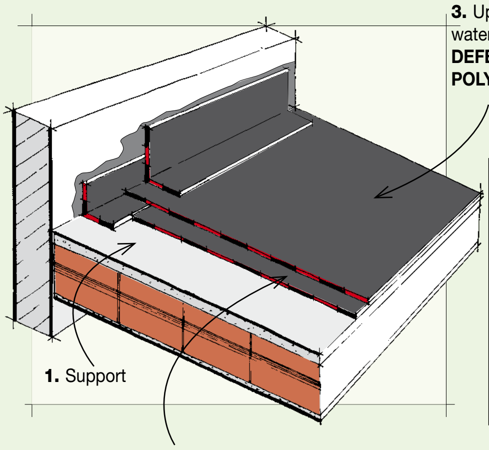
Heat-adhesive strips



Advantages of the system:

- Fire risk from the hot bitumen melting pot is eliminated
- No more burns
- No more fumes
- No more smells
- It can also be stuck safely on slopes

WATERPROOF COVERING ON CONCRETE LAYING SURFACE



STRATIFIED ELEMENTS
1. Support
2. Underlayer waterproof membrane **FLEXTER TESTUDO**
3. Upperlayer waterproof membrane **DEFEND ANTIRADICE POLYESTER**

- **Laying method**

Primer. The entire surface to be coated and the vertical parts onto which the waterproof covering must be bonded, are painted with a coat of about 300 g/m² of INDEVER adhesion bituminous primer, or alternatively ECOVER water-based primer.

- **Waterproof two-layer covering with elastoplastomeric membrane FLEXTER TESTUDO SPUNBOND POLYESTER + DEFEND ANTIRADICE POLYESTER.**

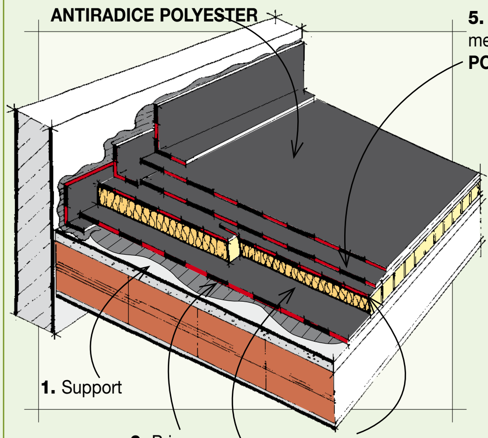
  - Underlayer membrane: Onto the laying surface, with complete heat-bonded adhesion, an elastoplastomeric polymer-bitumen waterproofing membrane is laid, 4 mm thick, with a distilled bitumen, plastomer and elastomer base, with composite reinforcement in spunbond “non woven” polyester fabric stabilised with fibreglass, FLEXTER TESTUDO SPUNBOND POLYESTER 4, certified with the DVT-Agreement of the I.T.C.-CNR (former ICITE).

  The sheets, which overlap by 10 cm longitudinally and 15 cm transversally are heat-bonded with total adhesion onto the laying surface and on the projecting parts are turned up by at least 20 cm more than the level envisaged for the layer of growing soil; the overlaps of the sheets are heat-bonded.

  - Upperlayer membrane: The second layer of the waterproof covering is made up of an elastoplastomeric polymer-bitumen waterproofing membrane 4 mm thick with a phenoxy fatty acid ester root inhibitor additive, reinforced with spunbond non-woven polyester fabric such as DEFEND ANTIRADICE POLYESTER with EC marking and certified as being root-resistant by the FORSCHUNGSANSTALT GEISENHEIM according to the FLL-Verfahren

  The sheets overlapping by 10 cm longitudinally and 15 cm transversally, are arranged across the overlaps of the first layer and heat-bonded onto the whole surface and the overlaps. The sheets cover the projecting parts by at least 20 cm more than the level envisaged for the layer of soil for cultivation.

WATERPROOF COVERING ON LAYER OF THERMOBASE THERMAL INSULATION



STRATIFIED ELEMENTS
1. Support
2. Primer
3. Vapour barrier
4. **THERMOBASE** thermal insulation
5. Underlayer waterproof membrane **FLEXTER TESTUDO**
6. Upperlayer waterproof membrane **DEFEND ANTIRADICE POLYESTER**

- **Laying method**
- **Waterproof two-layer covering with elastoplastomeric membrane FLEXTER TESTUDO SPUNBOND POLYESTER + DEFEND ANTIRADICE POLYESTER.**

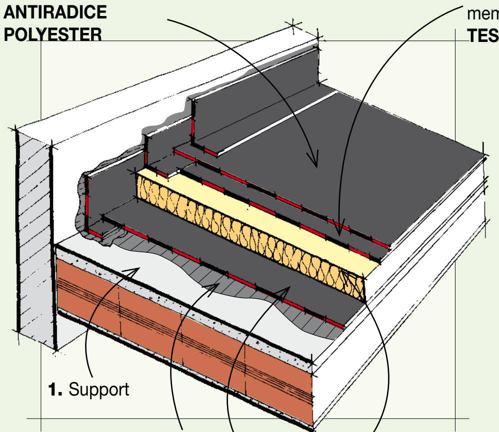
  - Underlayer membrane: Onto the THERMOBASE, with complete heat-bonded adhesion, an elastoplastomeric polymer-bitumen waterproofing membrane is laid, 4 mm thick, with a distilled bitumen, plastomer and elastomer base, with composite reinforcement in spunbond “non woven” polyester fabric stabilised with fibreglass, FLEXTER TESTUDO SPUNBOND POLYESTER 4, certified with the DVT-Agreement of the I.T.C.-CNR (former ICITE).

  The sheets, which overlap by 10 cm longitudinally and 15 cm transversally are heat-bonded with total adhesion onto the laying surface and on the projecting parts are turned up by at least 20 cm more than the level envisaged for the layer of growing soil; the overlaps of the sheets are heat-bonded.

  - Upperlayer membrane: The second layer of the waterproof covering is made up of an elastoplastomeric polymer-bitumen waterproofing membrane 4 mm thick with a phenoxy fatty acid ester root inhibitor additive, reinforced with spunbond non-woven polyester fabric such as DEFEND ANTIRADICE POLYESTER with EC marking and certified as being root-resistant by the FORSCHUNGSANSTALT GEISENHEIM according to the FLL-Verfahren

  The sheets overlapping by 10 cm longitudinally and 15 cm transversally, are arranged across the overlaps of the first layer and heat-bonded onto the whole surface and the overlaps. The sheets cover the projecting parts by at least 20 cm more than the level envisaged for the layer of growing soil.

WATERPROOF COVERING ON LAYER OF HEAT-RESISTANT THERMAL INSULATION



- **Laying method**
- **Waterproof two-layer covering with elastoplastomeric membrane FLEXTER TESTUDO SPUNBOND POLYESTER + DEFEND ANTIRADICE POLYESTER.**

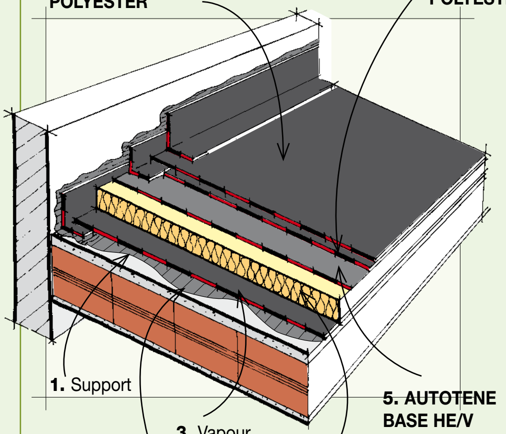
- Underlayer membrane: Onto the thermal insulation, with complete heat-bonded adhesion, an elastoplastomeric polymer-bitumen waterproofing membrane is laid, 4 mm thick, with a distilled bitumen, plastomer and elastomer base, with composite reinforcement in spunbond “non woven” polyester fabric stabilised with fibreglass, FLEXTER TESTUDO SPUNBOND POLYESTER 4, certified with the DVT-Agreement of the I.T.C.-CNR (former ICITE).

The sheets, which overlap by 10 cm longitudinally and 15 cm transversally are heat-bonded with total adhesion onto the laying surface and on the projecting parts are turned up by at least 20 cm more than the level envisaged for the layer of growing soil; the overlaps of the sheets are heat-bonded.

- Upperlayer membrane: The second layer of the waterproof covering is made up of an elastoplastomeric polymer-bitumen waterproofing membrane 4 mm thick with a phenoxy fatty acid ester root inhibitor additive, reinforced with spunbond non-woven polyester fabric such as DEFEND ANTIRADICE POLYESTER with EC marking and certified as being root-resistant by the FORSCHUNGSANSTALT GEISENHEIM according to the FLL-Verfahren

The sheets overlapping by 10 cm longitudinally and 15 cm transversally, are arranged across the overlaps of the first layer and heat-bonded onto the whole surface and the overlaps. The sheets cover the projecting parts by at least 20 cm more than the level envisaged for the layer of growing soil.

WATERPROOF COVERING ON LAYER OF NON HEAT-RESISTANT THERMAL INSULATION



- **Laying method**

For heat-bonding the membranes onto heat-sensitive insulating materials (expanded polystyrene either extruded or sintered) they must first be protected. To stick the membranes to the expanded polystyrene, either extruded or sintered, a special self-heat-adhesive substrate of AUTOTENE BASE HE/V must be used, which is applied dry onto the insulation and subsequently adheres on its own due to the heat produced by the heat-bonding of the upper layer that is stuck on top.

Waterproof covering.

Protection layer. The application of the waterproofing element must be preceded by the laying of an extra protective layer, applied dry onto the insulating panels, with overlaps of 6 cm, made up of a base self-heat-adhesive waterproofing membrane, such as AUTOTENE BASE HE/V, in 2 kg/m^2 elastomer-bitumen, with the lower face and overlapping band of the upper face spread with an adhesive mixture activated with the indirect heat generated by the heat-bonding of the subsequent layer, both protected by a silicone-coated film, which is removed while the roll is unrolled. Then it is possible to lay the first layer of the waterproof covering, which is laid across the overlaps of the previous layer and heat-bonded with total adhesion. The heat generated while torching the first layer of the covering also provides for the automatic adhesion of the protective self-heat-adhesive layer previously laid onto the expanded polystyrene.

- **Waterproof two-layer covering with elastoplastomeric membrane FLEXTER TESTUDO SPUNBOND POLYESTER + DEFEND ANTIRADICE POLYESTER.**

- Underlayer membrane: Onto the layer of AUTOTENE BASE HE/V, with complete heat-bonded adhesion, an elastoplastomeric polymer-bitumen waterproofing membrane is laid, 4 mm thick, with a distilled bitumen, plastomer and elastomer base, with composite reinforcement in spunbond “non woven” polyester fabric stabilised with fibreglass, FLEXTER TESTUDO SPUNBOND POLYESTER 4, certified with the DVT-Agreement of the I.T.C.-CNR (former ICITE).

The sheets, which overlap by 10 cm longitudinally and 15 cm transversally are heat-bonded with total adhesion onto the laying surface and on the projecting parts are turned up by at least 20 cm more than the level envisaged for the layer of growing soil; the overlaps of the sheets are heat-bonded.

- Upperlayer membrane: The second layer of the waterproof covering is made up of an elastoplastomeric polymer-bitumen waterproofing membrane 4 mm thick with a phenoxy fatty acid ester root inhibitor additive, reinforced with spunbond non-woven polyester fabric such as DEFEND ANTIRADICE POLYESTER with EC marking and certified as being root-resistant by the FORSCHUNGSANSTALT GEISENHEIM according to the FLL-Verfahren The sheets overlapping by 10 cm longitudinally and 15 cm transversally, are arranged across the overlaps of the first layer and heat-bonded onto the whole surface and the overlaps. The sheets cover the projecting parts by at least 20 cm more than the level envisaged for the layer of growing soil.

TECHNICAL SPECIFICATIONS

PRIMER

INDEVER
Quick drying adhesion bituminous primer suitable for preparing surfaces for the heat bonding of polymer-bitumen membranes, such as INDEVER, with a base of oxidised bitumen, additives and solvents with solid content (UNI EN ISO 3251) of 40% and cup viscosity of DIN/4 at 23°C (UNI EN ISO 2431) of 12÷17 s.

INDEVER PRIMER E
Quick drying solvent-based adhesion bituminous elastomer primer suitable for the preparation of surfaces for the heat bonding of standard polymer-bitumen membranes and cold laying of self-adhesive and self-heat-adhesive polymer bitumen membranes such as INDEVER PRIMER E.
The primer has a solid content (UNI EN ISO 3251) of 50% and cup viscosity of DIN/4 at 23°C (UNI EN ISO 2431) of 20 ÷ 25 s.

ECOVER
Adhesion bituminous primer suitable for the preparation of surfaces for the heat bonding of polymer-bitumen membranes, such as ECOVER, with a bituminous water emulsion base with solid content (UNI EN ISO 3251) of 37%.

VAPOUR BARRIER

STANDARD VAPOUR BARRIER MEMBRANES

DEFEND ALU POLYESTER
Elastoplastomeric polymer-bitumen vapour barrier membrane, 3-mm thick (EN1849-1), reinforced with aluminium foil coupled to a non-woven composite polyester fabric stabilised with fibreglass, with water vapour permeability (EN 1931) μ=1,500,000, tensile strength (EN 12311-1) L/T of 250/120 N/50 mm and ultimate elongation (EN 12311-1) L/T of 15/20%.
DEFEND/V
Elastoplastomeric polymer-bitumen vapour barrier membrane, 3-mm thick (EN1849-1), reinforced with fibreglass mat, with water vapour permeability (EN 1931) μ=100,000, tensile strength (EN 12311-1) L/T of 300/200 N/50 mm and ultimate elongation (EN 12311-1) L/T of 2/2%.

INNOVATIVE VAPOUR BARRIERS WITH INCORPORATED ADHESIVE FOR COLD-BONDING OF THE THERMAL INSULATION

SELFTENE BV BIADESIVO ALU POLYESTER
Double-sided adhesive elastomeric polymer-bitumen vapour barrier membrane of 3 kg/m² (EN1849-1), reinforced with aluminium foil, coupled to a non-woven composite polyester fabric stabilised with fibreglass, with water vapour permeability (EN 1931) μ=1,500,000, tensile strength (EN 12311-1) L/T of 250/120 N/50 mm and ultimate elongation (EN 12311-1) L/T of 15/20%.
SELFTENE BV BIADESIVO POLYESTER
Double-sided adhesive elastomeric polymer-bitumen vapour barrier membrane of 3 kg/m² (EN1849-1), reinforced with non-woven composite polyester fabric stabilised with fibreglass, with water vapour permeability (EN 1931) μ=100,000, tensile strength (EN 12311-1) L/T of 400/300 N/50 mm and ultimate elongation (EN 12311-1) L/T of 40/40%.
SELFTENE BV BIADESIVO ALU POLYESTER
Double-sided adhesive elastomeric polymer-bitumen vapour barrier membrane of 3 kg/m² (EN1849-1), reinforced with fibreglass mat, with water vapour permeability (EN 1931) μ=100,000, tensile strength (EN 12311-1) L/T of 300/200 N/50 mm and ultimate elongation (EN 12311-1) L/T of 2/2%.

INNOVATIVE VAPOUR BARRIER MEMBRANES WITH INCORPORATED HEAT ACTIVATED ADHESIVE FOR STICKING HEAT-RESISTANT THERMAL INSULATION

PROMINENT ALU POLYESTER
Elastoplastomeric polymer-bitumen vapour barrier membrane of 4 kg/m² (EN1849-1), with incorporated adhesive for sticking insulating panels, made up of heat-adhesive embossings, 5 mm thick, distributed across 40% of the upper face of the sheet, reinforced with aluminium foil coupled to a non-woven composite polyester fabric stabilised with fibreglass, with water vapour permeability (EN 1931) μ=1,500,000, tensile strength (EN 12311-1) L/T of 250/120 N/50 mm and ultimate elongation (EN 12311-1) L/T of 15/20%.
PROMINENT POLYESTER
Elastoplastomeric polymer-bitumen vapour barrier membrane of 4 kg/m² (EN1849-1), with incorporated adhesive for sticking insulating panels, made up of heat-adhesive embossings, 5 mm thick, distributed across 40% of the upper face of the sheet, reinforced with non-woven composite polyester fabric stabilised with fibreglass, with water vapour permeability (EN 1931) μ=100,000, tensile strength (EN 12311-1) L/T of 450/400 N/50 mm and ultimate elongation (EN 12311-1) L/T of 40/40%.
PROMINENT/V
Elastoplastomeric polymer-bitumen vapour barrier membrane of 4 kg/m² (EN1849-1), with incorporated adhesive for sticking insulating panels, made up of heat-adhesive embossings, 5 mm thick, distributed across 40% of the upper face of the sheet, reinforced with fibreglass mat, with water vapour permeability (EN 1931) μ=100,000, tensile strength (EN 12311-1) L/T of 300/200 N/50 mm and ultimate elongation (EN 12311-1) L/T of 2/2%.

VAPOUR BARRIER

INNOVATIVE VAPOUR BARRIER MEMBRANES WITH INCORPORATED HEAT ACTIVATED ADHESIVE FOR STICKING NON HEAT-RESISTANT THERMAL INSULATION

TECTENE BV STRIP ALU POLYESTER

Elastoplastomeric polymer-bitumen vapour barrier membrane with incorporated adhesive for sticking insulating panels, made up of heat-adhesive strips distributed across 40% of the upper face of the sheet, 3 mm thick (EN1849-1) reinforced with aluminium foil coupled to a non-woven composite polyester fabric stabilised with fibreglass, with water vapour permeability (EN 1931) μ=1,500,000, tensile strength (EN 12311-1) L/T of 250/120 N/50 mm and ultimate elongation (EN 12311-1) L/T of 15/20%.

TECTENE BV STRIP EP/V

Elastoplastomeric polymer-bitumen vapour barrier membrane with incorporated adhesive for sticking insulating panels, made up of heat-adhesive strips distributed across 40% of the upper face of the sheet, 3 mm thick (EN1849 -1), reinforced with fibreglass mat, with water vapour permeability (EN 1931) μ=100,000, tensile strength (EN 12311-1) L/T of 300/200 N/50 mm and ultimate elongation (EN 12311-1) L/T of 2/2%.

THERMAL INSULATION

INSULATORS PRE-COUPLED WITH MEMBRANES

THERMOBASE PSE/120

Thermal insulation supplied in rolls with overlapping selvage such as THERMOBASE PSE/120 made up of insulating strips 5 cm wide and 100 cm long in sintered expanded polystyrene with a compression resistance of 10% (EN 826) ≥120 KPa [CS(10)120] heat-bonded continuously to a polymer-bitumen membrane P4 110 cm wide to allow the elements to be overlapped longitudinally. The membrane is reinforced with non-woven composite polyester fabric stabilised with fibreglass and has a hot stability (EN 1110) of 120°C, flexibility (EN 1109) of -15°C, ultimate tensile strength (EN 12311-1) L/T of 600/400 N/5 cm and ultimate elongation (EN 12311-1) L/T of 40/40%.

THERMOBASE PSE/EX

Thermal insulation supplied in rolls with overlapping selvage such as THERMOBASE PSE/EX made up of insulating strips 5 cm wide and 100 cm long in extruded expanded polystyrene with a 10% compression resistance (EN 826) ≥200 KPa [CS(10/Y)200] heat-bonded continuously to a polymer-bitumen membrane P4 110 cm wide to allow the elements to be overlapped longitudinally. The membrane is reinforced with non-woven composite polyester fabric stabilised with fibreglass and has a hot stability (EN 1110) of 120°C, flexibility (EN 1109) of -15°C, ultimate tensile strength (EN 12311-1) L/T of 600/400 N/5 cm and ultimate elongation (EN 12311-1) L/T of 40/40%.

THERMOBASE PSE/PUR

Thermal insulation supplied in rolls with overlapping selvage such as THERMOBASE PUR made up of 5 cm wide and 100 cm long insulating strips of expanded polyurethane rolled continuously between two fibreglass mats or two bituminised foam boards which are continuously heat-bonded to a polymer-bitumen membrane P4 110 cm wide to allow the longitudinal overlap of the elements, with a 10% compression resistance (EN 826) ≥100 KPa [CS(10/Y)100]. The membrane is reinforced with non-woven composite polyester fabric stabilised with fibreglass and has a hot stability (EN 1110) of 120°C, flexibility (EN 1109) of -15°C, ultimate tensile strength (EN 12311-1) L/T of 600/400 N/5 cm and ultimate elongation (EN 12311-1) L/T of 40/40%.

WATERPROOF LAYER

AUTOTENE BASE HE/V

Self-heat-adhesive waterproofing base membrane, such as AUTOTENE BASE HE/V, in elastomeric polymer-bitumen, with mass per unit area of 2 kg/m^2 (EN 1849-1); the bottom face and the overlapping strip of the top face are coated with an adhesive mix, which is activated by the indirect heat generated by heat laying the next layer, both protected by a silicone-coated film which is removed as the roll is unrolled. The membrane, strengthened with a reinforced fibreglass mat has ultimate tensile strength (EN 12311-1) L/T of 300/200 N/50 mm, ultimate elongation (EN 12311-1) L/T of 2/2% and cold flexibility (EN 1109) of -25°C.

FLEXTER TESTUDO SPUNBOND POLYESTER

Elastoplastomeric polymer-bitumen waterproofing membrane, 4-mm thick, based on distilled bitumen, plastomers and elastomers, with composite reinforcement consisting of spunbond non-woven polyester fabric stabilised with fibreglass, FLEXTER TESTUDO SPUNBOND POLYESTER 4, certified with ITC-CNR Agreement (ex ICITE). The membrane has a tensile strength (EN 12311-1) L/T of 850/700 N/50mm, ultimate elongation (EN 12311-1) L/T of 50/50 %, resistance to tearing (EN 12310-1) L/T of 150/150 N, resistance to impact (EN 12691 - method A) of 1,250 mm, resistance to static load (EN 12730) of 15 kg, hot dimensional stability (EN 1107-1), L/T of ±0,3/±0,3%, cold flexibility (EN1109) of -20°C and heat resistance (EN1110) of 140°C.

MINERAL FLEXTER TESTUDO SPUNBOND POLYESTER

Elastoplastomeric polymer-bitumen waterproofing membrane, self-protected with slate granules, 4 mm thick measured on the selvage, based on distilled bitumen, plastomers and elastomers, with composite reinforcement consisting of spunbond non-woven polyester fabric stabilised with fibreglass, MINERAL FLEXTER TESTUDO SPUNBOND POLYESTER 4 type, certified with ITC-CNR Agreement (ex ICITE). The membrane has a tensile strength (EN 12311-1) L/T of 850/700 N/50mm, ultimate elongation (EN 12311-1) L/T of 50/50 %, resistance to tearing (EN 12310-1) L/T of 150/150 N, hot dimensional stability (EN 1107-1), L/T of ±0,3/±0,2%, cold flexibility (EN1109) of -20°C and heat resistance (EN1110) of 140°C.

DEFEND ANTIRADICE POLYESTER

Elastoplastomeric polymer-bitumen waterproofing membrane, 4 mm thick, with a phenoxy fatty acid ester root inhibitor additive, reinforced with spunbond non-woven polyester fabric such as DEFEND ANTIRADICE POLYESTER with EC marking and certified as being root-resistant by the FORSCHUNGSANSTALT GEISENHEIM according to the FLL-Verfahren. The membrane has a tensile strength (EN 12311-1) L/T of 600/400 N/50mm, ultimate elongation (EN 12311-1) L/T of 35/40 %, resistance to impact (EN 12691 - method A) of 1,250 mm, resistance to static load (EN 12730) of 15 kg, cold flexibility (EN1109) of -10°C and must pass the resistance to root penetration test in compliance with European legislation EN 13948.

Technical specification

The figures shown are average indicative figures relevant to current production and may be changed or updated by INDEX S.p.A at any time without previous warning. The advice and technical information provided, is what results from our best knowledge regarding the properties and the use of the product. Considering the numerous possible uses and the possible interference of conditions or elements beyond our control, we assume no responsibility regarding the results which are obtained. The purchasers, of their own accord and under their own responsibility, must establish the suitability of the product for the envisaged use.

• FOR ANY FURTHER INFORMATION OR ADVICE ON PARTICULAR APPLICATIONS, CONTACT OUT TECHNICAL OFFICE • IN ORDER TO CORRECTLY USE OUR PRODUCTS, REFER TO INDEX TECHNICAL SPECIFICATIONS •

index
Construction Systems and Products

Internet: **www.indexspa.it**
e-mail Inform. Tecniche Commerciali: **tecom@indexspa.it**
e-mail Amministrazione e Segreteria: **index@indexspa.it**
e-mail Index Export Dept.: **index.export@indexspa.it**

Via G. Rossini, 22 - 37060 Castel D'Azzano (VR) - Italy - C.P.67 - Tel. (+39)045.8546201 - Fax (+39)045.512444

TOTAL QUALITY index UNI EN ISO 9001

Environmental Management Systems index UNI EN ISO 14001

index "GBC Italia" Associated

MBDP

Cg - 1.000 - 9/2010en