Wallbarn

GREEN ROOF SYSTEMS

WALLBARN PROVIDES A NUMBER OF DIFFERENT OPTIONS FOR GREEN ROOF INSTALLERS – FROM LOW LEVEL EXTENSIVE SYSTEMS TO INTENSIVE ROOF GARDENS AND BIODIVERSE SYSTEMS.

With the steady progression of urban growth across the world, there is tremendous pressure to construct buildings in a more concentrated fashion, to faster and faster deadlines. This risks turning cities into “concrete jungles” of stark, noisy, unwelcoming high rise blocks.

Aerial views of cityscapes show up vast swathes of flat roofs and concrete decks – empty, impermeable, wasted space contributing to a sense of oppression in many inner cities. Green roofs can be used to beautify the construction project, to introduce nature back into cities and to mitigate the impact of densely populated urban areas.

Green roofs and living walls are a useful and increasingly easy way to provide attractive, useful, environmentally friendly open spaces on otherwise ‘lost’ flat roofs and podium decks. They are adaptable and can be designed for large or small areas on most structural decks.

Wallbarn has a variety of green roof solutions, from low maintenance, off-the-shelf standardised products through to highly engineered luxurious gardens in the sky, designed, constructed and maintained by us in conjunction with our horticultural partners.

Green roofs offer considerable benefits, including:-

Improving the environment

- Provides natural habitats
- Attracts insects and birdlife
- Absorbs CO^2, pollution and dust particles
- Combats the Urban Heat Island Effect

Insulation

- Reduces transmission of noise and vibration
- Thermal insulation – absorbs solar heat rather than radiate it and reflect it
- Thick damp soils cool the building reducing air conditioning use

Rainwater attenuation

- Absorbs rainwater through the roots of the plants
- Reduces the amount and speed of rainwater run-off
- Offers a delay before rainwater starts to escape from the roof
- Puts less pressure on drainage systems as a whole
- Helps with water collection techniques

Ballasting inverted waterproofing systems

- A more attractive alternative to pebbles or concrete slabs on rooftops to hold down insulation boards

Protecting the structure and waterproofing

- By covering the waterproofing membrane it prevents damage caused by UV, impact and abrasion, plant and bird infestation
- Brings down temperature of waterproofing membrane thereby extending its life
- Reduces the temperature of both glass and concrete structures considerably

Optimising the structural footprint

- Provides additional space in construction projects – uses the rooftop
- Provides an attractive feature for occupiers to utilise
- Brings a feeling of open space to high density environments

Money saving

- Can help with the planning permission process
- Increases the value of the development
- Buildings with green roofs have been proven to become occupied faster than “naked roofs”.

Easy to install

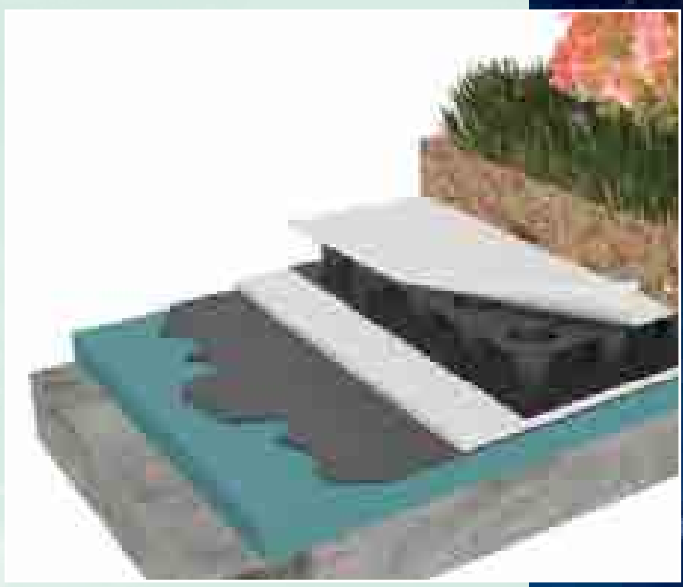
- Much simpler and cheaper than in previous years

PRINCIPLES OF GREEN ROOF DESIGN

Green roof systems are constructed in several distinct layers, all critical to ensure the plants are sustained, and the roof and building structure below does not become compromised.

The main issues to bear in mind for green roofs are irrigation and drainage. Without an effective means for the water to escape the roof, the system will become waterlogged, the substrate will become rancid and the plants will die.

Separation and filtration are also vital. Since the moisture level needs to be kept as consistent as possible, installers need to ensure that the soil is not eroded in order for the roots to grow properly, and those roots need to be separated from the waterproofing membrane to prevent damage. The buildup for the different types of green roof system is fairly similar.



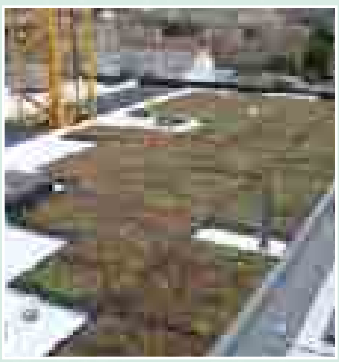
The main elements (from the waterproofed concrete deck upwards) are:

- Geotextile separation and protection layer
- Perforated membrane for water collection and drainage
- Geotextile filtration and separation layer
- Growing medium / soil substrate
- Vegetation

Wallbarn uses loose and geotextile fabrics for filtration and separation, made from recycled polyester.

Substrate composition is very important to the success of a green roof system. Installers need to prevent overloading the roof but also sustain the vegetation to the correct growth level.

The type of substrate depends on:



- The weight tolerance of the structure
- The types of plants being installed
- The depth of the substrate
- Whether artificial irrigation is to be installed

Wallbarn has developed a number of different main substrate types, depending on these factors, and designs and mixes the exact make-up of the growing medium to suit the specific green roof design.

TYPES OF GREEN ROOF

Green roofs can be broken down and considered in four main types:

- Extensive green roofs
- Semi-extensive systems
- Intensive roof gardens
- Biodiverse (brown roof) systems

EXTENSIVE GREEN ROOFS

The extensive green roof is the simplest, most low maintenance type of green roof system. They are the easiest way of greening a boring, ugly looking roof deck and bringing a sense of nature to built-up areas.

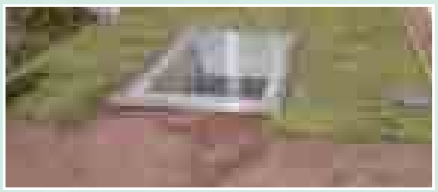
The main points to remember for extensive green roofs are:

- Lightweight systems, as light as 50kg per m^2
- Overall build-up maximum 125mm thick
- Simple vegetation – mainly sedum
- Low maintenance

Because of their simplicity extensive green roofs can be retro-fitted onto decks, as part of refurbishments or beautification of existing buildings. And being comparatively lightweight, at typically 50kg per m^2 (saturated weight) they can be used on a large variety of structures.

The sedum is easy to manage and does not need a large amount of watering, making it ideal for areas which may be overlooked but are difficult to access and maintain.

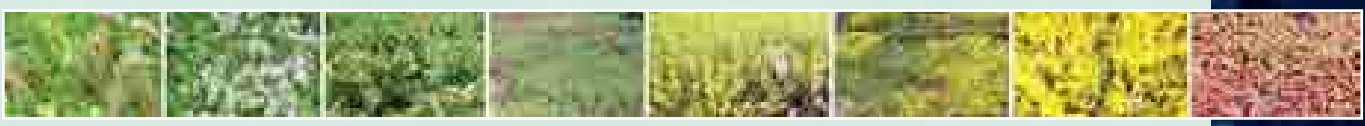
We find that the best vegetation to use for extensive green roofs is sedum. This plant grows in Alpine areas in rocky outcrops in its natural state, so is used to growing at height. It takes its nutrients from passing water droplets, and does not “draw” nutrients from the soil. Therefore, a low-nutrient, lightweight substrate can be used, made up of items such as brick based aggregate, marine gravel, perlite, lecca and sand; along with small amounts of green waste, compost and peat.



The build-up is relatively simple, no thinner than 60mm, designed to be the minimum requirement to ensure the plants can achieve good root growth throughout the substrate and thrive long-term.

Our sedum blankets are at least six months old and grown from a mixture of at least six different species of sedum. This ensures a consistent, all year round coverage of green vegetation, with some plants offering changing colours and textures throughout the year, flowering in parts throughout the summer.

We guarantee to supply healthy, freshly cut sedum blankets with at least 85% coverage.



INSTALLATION

Extensive green roof systems are built up in flexible layers from the waterproofed deck (built to a fall into the roof outlet).

Each component of the system is supplied in rolls and delivered to site on pallets.

The build-up is made up of a geotextile fabric, loose laid onto the waterproofed deck. This acts as protection and separation layer.

Next a flexible cupped, perforated membrane made from HDPE is loose laid onto the geotextile, cup-side up. This collects water in 20mm cups and allows excess water to escape through the holes into the roof outlet.

A second loose laid geotextile fabric is used as a filtration layer, ensuring water but no particles pass through.

The substrate is then installed. It is important to lay this as soon as possible in order to ballast the layers below. It is made from a special lightweight mix of aggregate, green waste, marine grit, peat and fertilizers and is designed to promote root growth in sedum and similar plants. It is important that the substrate is as lightweight as possible, free-draining and does not contain any elements which may clog up the drainage layers.

The sedum blanket is then rolled out onto the substrate and gently pressed into place. Wallbarn uses reinforced blankets in preference to plug planting.

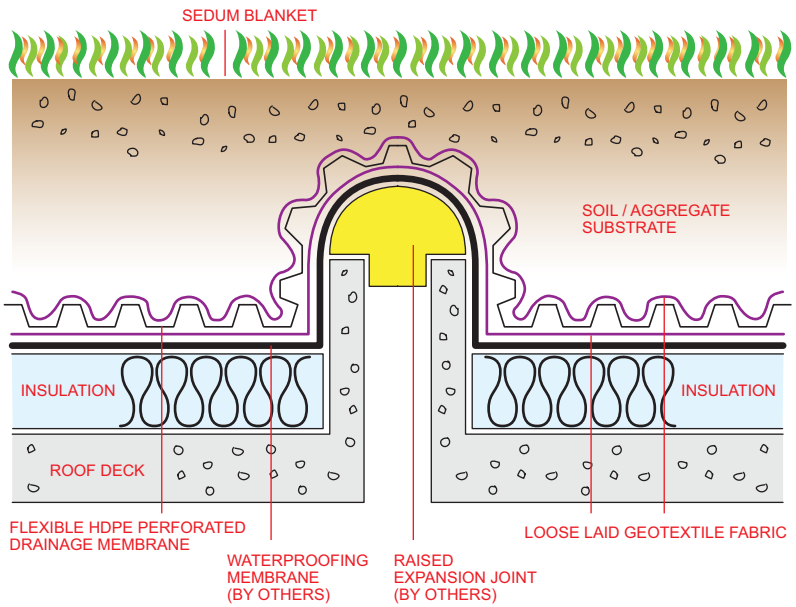
This helps create an instant greening effect and by covering the whole area will reduce any risk of the substrate being eroded by wind.

Wallbarn can offer a sedum / wildflower mix blanket for use in extensive green roofs as a standard item. These blankets can also be plug planted with herbs and certain dwarf plants to add variety to the roof finish.

It is advisable that the edges of the roof and all roof outlets are set apart from the vegetation in order to remain free from any obstructions.

A perforated aluminium angle is installed around the edges of the green roof to contain the substrate and plants, and a border of washed pebbles is placed in the cavity up to the height of the growing medium.

Extensive Green Roof System



extensive (lightweight) roof system

Build-up height (min)	60mm
Build-up height (max)	125mm
Weight saturated	60kg
Water retention %	50%
Irrigation required	Optional

SEMI EXTENSIVE GREEN ROOFS

Semi extensive systems are similar to extensive green roofs but have a thicker substrate level which allows for more variety of planting. Vegetation such as grass, small shrubs and perennials can be installed.

Wallbarn semi extensive green roof systems have a substrate level up to 250mm thick.

However, this thicker growing medium will have a much higher nutrient level, and will hold more water, meaning it is likely to be much heavier than the aggregate based substrate used on sedum roofs.

Therefore, designers need to be considering a saturated weight up to 300kg per m^2 at the maximum depth of 250mm.

These plants will require much more water than the sedum, so an automatic irrigation system is recommended, as the area will need sustaining, and water will always pass though the drainage membranes.

Contractors do not want too much water to be held within the soil as this will lead to overloading of the structure, so the drainage system is designed to continually draw water away form the green roof.

Therefore, water needs to be input at a moderate but consistent rate, hence an irrigation system.

semi-extensive roof system

Build-up height (min)	125mm
Build-up height (max)	250mm
Weight saturated	300kg
Water retention %	60%
Irrigation required	Recommended

INTENSIVE GREEN ROOFS

Intensive green roofs consist of much deeper substrates which give far greater scope to design and grow more interesting and elaborate gardens onto concrete decks.

Wallbarn supplies intensive green roof systems with soil substrates up to 900mm (although some green roofs can have much deeper soil and root capacity).

So long as the structure can support the weight, almost unlimited planting and landscaping can be achieved, including large shrubs, grassland, flowerbeds and even trees.

Intensive green roofs tend to be areas where greater access and people traffic is envisaged.

Intensive green roofs offer considerable benefits to the urban landscape far and above anything a light sedum roof can offer. With the increased soil levels and intricate planting, natural gardens and parkland can be recreated on rooftop level, meaning:

- More diverse vegetation will attract insects in far higher numbers, in turn increasing the level of birdlife in the roof garden.
- Dust and polluting particles will be absorbed – as much as 0.5 kg of particles per m^2 at high substrate levels.
- Up to 80% of water can be absorbed by the plants and drainage layers where the substrate is 900mm deep. Intensive green roofs also slow down the run-off during the initial deluge by up to 12 hours.
- Insulation properties become much more relevant and economical on intensive roofs. They have been proven to increase the thermal insulation by up to 30% in terms of keeping buildings cool in summer. They have been shown to cool down ambient temperatures by up to 2°C in high density urban areas. Wet roofs will cool buildings even further.
- Sound insulation can reduce noise by up to 40 decibels in certain applications.
- Lush, luxurious roof gardens have been proven to increase the value and accelerate the take-up of buildings when offered on the market. They pay for themselves medium term.
- The footprint of the building is being optimised. No more wasted space in densely populated areas.

However, intensive green roofs are much more expensive to install and will require far more maintenance, leading to higher and long term running costs. It should always be remembered that these are gardens and should be treated as such.

Intensive green roofs are often laid out with considerable hard landscaping areas interfacing with the soft areas. This makes access and utility much easier, meaning gardens can be enjoyed by residents.

Intensive green roofs are far more complex than the sedum roofs. Even with lightweight materials being used in the soil substrate, the depth of it means much higher weight loadings on the roof, up to 600kg per m^2 in some cases. Therefore a different drainage and filtration build-up is required for increased drainage capacity and load bearing.

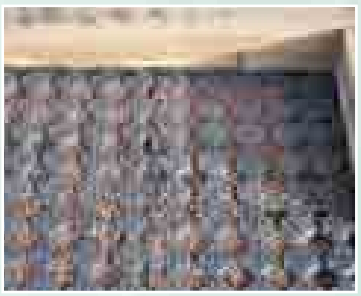
Designers have to consider the weight of saturated trees, rainwater present in the soil and even snowfall on branches as well as the components as they are installed when calculating the tolerance of the sub structure.

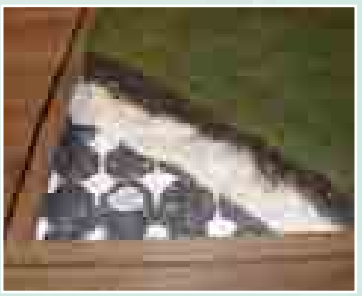
As well as the weight of the soil, the higher nutrient level required to sustain vegetation such as trees will need to be effectively filtered before water run-off to prevent “brown water” presenting an unattractive sight in any water recycling systems.

Irrigation also needs to be anticipated at an early stage. Designers need to imagine what they want the gardens to look like post construction. This will dictate the plant selection, which will in turn dictate the levels of irrigation (and weight of saturated water within the system) required.

Structural engineers need to be advised of the stresses involved at design stage – not at retro-fit stage.

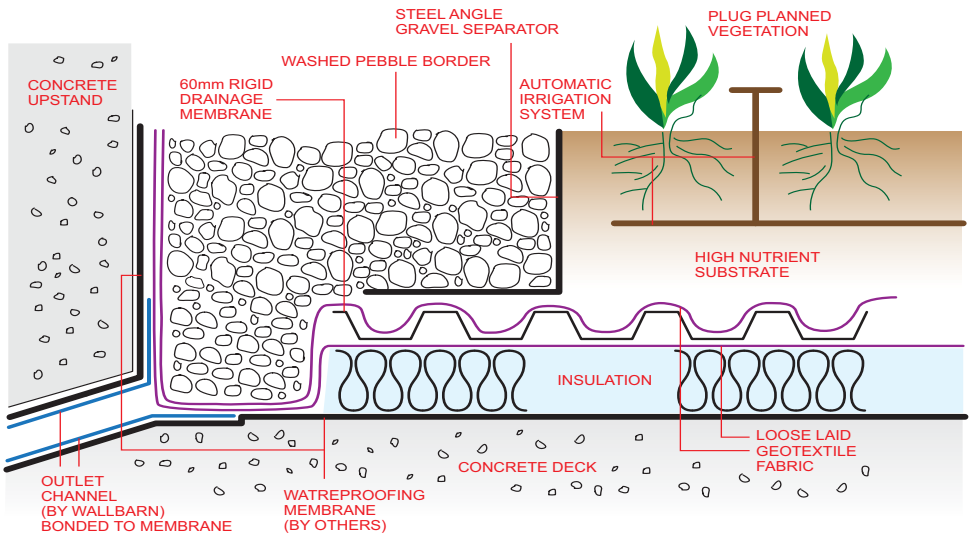
The build-up of Wallbarn intensive green roof systems is different to our other green roofs because of the weight and drainage capacity involved. We use a rigid 60mm deep perforated reservoir and drainage membrane to avoid any crushing of the intermediate layers, thus ensuring constant water flow and no blockages.





Intensive green roof systems are much more complicated and difficult than sedum roofs. They will need far more maintenance and irrigation, and are far more expensive to install.

Intensive Green Roof System



intensive roof system

Build-up height (min)	300mm
Build-up height (max)	900mm
Weight saturated	600kg*
Water retention %	80%
Irrigation required	Essential

* weight of trees, large plants can be considerable

BIODIVERSE (BROWN ROOFS)

Biodiverse roofs (sometimes called brown roofs) have become a popular type of roof garden finish in recent times as they are seen by many planners as a more natural, rugged urban feature.

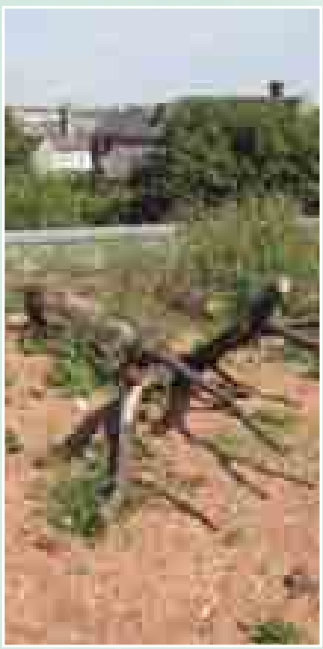
The concept of biodiverse roofs is that a plain, low nutrient environment is created at roof level with very little planting. The area is sparsely planted, wildflower seeds are mixed into the substrate, and then the roof starts to develop and grow itself from wind-borne seeds. Tough, hardy plants will start to germinate in the substrate in a natural way, replicating wild urban spaces at ground level.

Biodiverse roofs require fairly little maintenance. They still offer sound and temperature insulation properties to the building, and will help to attenuate water runoff from the rooftop to some degree. The substrate level is normally up to 100mm, and would offer a lightweight build-up, usually no heavier than 50kg per m^2.

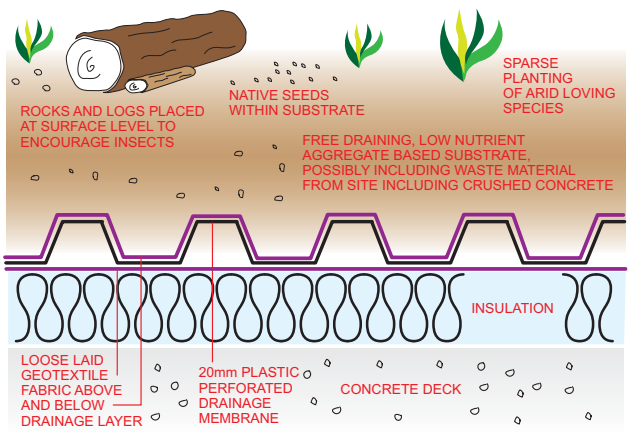
Waste material from the construction process, such as crushed aggregate and concrete, can be introduced into the substrate, adding to a sense of recycling elements of the site, and cutting down on costs of waste disposal (however, caution must be exercised when using waste from the site to avoid contaminated material or sharp objects, which could damage the waterproofing being placed onto the roof).

Often objects such as rotting tree stumps, stones and rocks can be introduced onto the area to encourage insects and other wildlife.

Biodiverse roofs can be used to replicate the ground terrain prior to construction taking place.



Biodiverse Roof System



biodiverse roof system

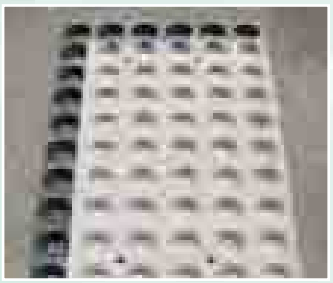
Build-up height (min)	60mm
Build-up height (max)	100mm
Weight saturated	60kg
Water retention %	45%
Irrigation required	No

MODULAR GREEN ROOF SYSTEMS

Wallbarn offers green roof systems in modular format, supplied as a ready-grown, fully established sedum green roof mounted on portable, easy-to-fit trays with all growing, filtration and drainage components included.

These green roof systems can be made up in sizes 0.25m^2, 0.5m^2 and 1m^2. They are ideal for smaller green roofs, the non-professional installer, and roofs with very poor access.

The sedum has been grown on the modules for approximately six months, meaning it is strong, established and covers the area fully. It is an instant green roof.



The modules are pre-grown in our nursery. A mix of six varieties of sedum is planted from cuttings into a course mix of substrate with a matting fabric which performs two tasks: to act as a backing / carrier which the roots can penetrate, anchoring the plants; and also helps filter the water run-off, so no particles run through the system and clog up the cavity or outlet pipes.

The sedum, substrate and matting are mounted onto a drainage membrane made from 100% recycled polypropylene with 60mm deep perforated cups, which allow for substantial root growth and also a means for excess water to escape.

Each tray has an exposed row of drainage cups which can be clipped into the drainage cups of the next tray or unit, up to the level of the sedum. This interlocking system means that each pod or module is fitted securely to its

neighbour with no need for sharp fixings and no synthetic upstands or lips interfering with the sedum growth.

If there are problems with the deck beneath, one “pod” or section can easily be lifted out without any disruption to the whole deck.

In other designs the whole area may need to be taken up when trying to discover the source of leaks, for example.

The sedum has been grown onto the trays for approximately six months. This makes it strong, well established, healthy and fully integrated into the intermediate layers. This means less shock or bedding-in time and less risk of wind uplift or erosion in the crucial time period just after installation.

This system has many distinct advantages:

- Applicators do not need to contend with large amounts of loose substrate on the roof, with the risk of debris blowing off the roof.
- Substrate depth and makeup is consistent across the whole area.
- Mess is avoided on the roof.
- Modules are packed onto pallets for easy movement onto the roof.
- Ideal for areas of restricted access.
- Much faster installation.
- Expert landscaping knowledge not required for installation.
- The sedum is fully established with strong, healthy growth.
- It is an instant green roof, with coverage of over 85%.

INSTALLATION

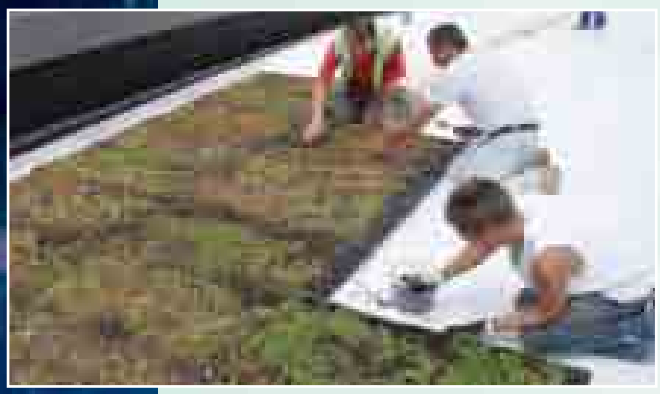
The problems of getting living green roof systems onto roofs is made considerably easier by using modular systems from Wallbarn.

The pods are delivered shrink wrapped on pallets and can be craned up onto the roof safely, quickly and easily.

The drainage sheeting is egg-box shaped, so an air gap will maintain the vegetation during transportation. However, it is essential that the modules are installed as soon as possible as the living plants will start to deteriorate quickly without access to light and moisture.

First, protect the waterproofing by loose laying a geotextile filter fabric – we recommend a recycled polyester fabric of at least 300gsm.

Each tray or pod measures 0.5 x 1m and weighs a maximum of 25 kg saturated, so two installers can handle them easily without any risk of the contents spilling out onto the roof.



Each section has an overlap of drainage membrane, so the egg-box shaped cells from one module can be fitted beneath the substrate of the next to achieve a secure and seamless fit together.

No mechanical fixings are needed to go through into the deck, giving less disturbance to the waterproofing. The weight of the system will hold everything in place.

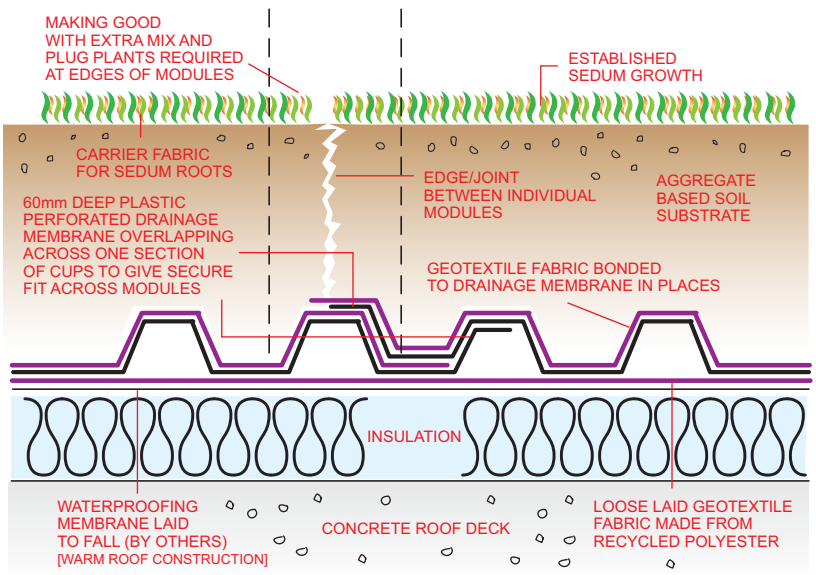
The modules are secured into place by interlocking the drainage cups and butting the sedum together. An operative is required to make good the edges of the sedum and ensure that the substrate is covering the joined areas to ensure consistent growth across each unit. A gang of three operatives for installation is the most efficient way to install these modules.

The edges of the vegetation can be enclosed using an aluminium angle which sits beneath the drainage membrane.

A border of rounded pebbles is usually installed around the edges. This prevents the plants or their roots blocking the outlets.

Large volumes can be installed in a very short amount of time. Installation is clean and easy, the modules can be installed on completed or even occupied buildings without major disruption or mess.

Modular Green Roof System



Wallbarn offers a complete range of solutions for green roofs and roof gardens. From the smallest domestic terrace to large scale green roof projects, we can design the scheme and tailor the most suitable product for the client's needs.

We also design, supply and install living walls in sedum, ivy, fern and mixed planting. Please see our LIVING WALLS brochure or check out our website www.wallbarn.com for more details.

WALLBARN GREEN ROOFS, LIVING WALLS AND SUSTAINABLE CONSTRUCTION TECHNIQUES. WE OFFER ALL THE OPTIONS FOR TODAY'S MODERN BUILDINGS.

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