GREEN ROOF SYSTEMS

SPRING 2017

Green roofs are used to provide visual aesthetics to the construction project, to introduce nature back into cities and to mitigate the impact of densely populated urban areas.
They are a useful and increasingly cost effective way to provide attractive, useful, environmentally friendly open spaces on otherwise 'lost' flat roofs and podium decks.

Green roofs are very adaptable and can be designed for large or small areas on most structural decks. However, truly understanding the horticultural requirements of introducing vegetation onto artificial surfaces is a discipline which requires specialist skills and knowledge.
All green roofs need light, water, drainage, and correctly engineered soils. Without ALL of these elements the green roof vegetation will not thrive. Wallbarn green roof systems are constructed in order to provide sustainable long term vegetation and to minimise maintenance.

Wallbarn has many years of experience in landscaping and green roofing technologies. We are constantly innovating and developing new products and techniques to improve and enhance rooftop living.

Wallbarn is a member of the Green Roof Organisation (GRO) and supports the updated GRO Code for green roofing.

CONTENTS

PAGE

GREEN ROOF SYSTEMS

M-TRAY® MODULAR GREEN ROOF SYSTEM 1
ROLL-OUT EXTENSIVE GREEN ROOFS 8
BIODIVERSE ROOF SYSTEMS 10
INTENSIVE GREEN ROOFS 11
ACCESSORIES FOR GREEN ROOFS 12

WALLBARN GREEN ROOF SYSTEMS GIVE THE FOLLOWING BENEFITS

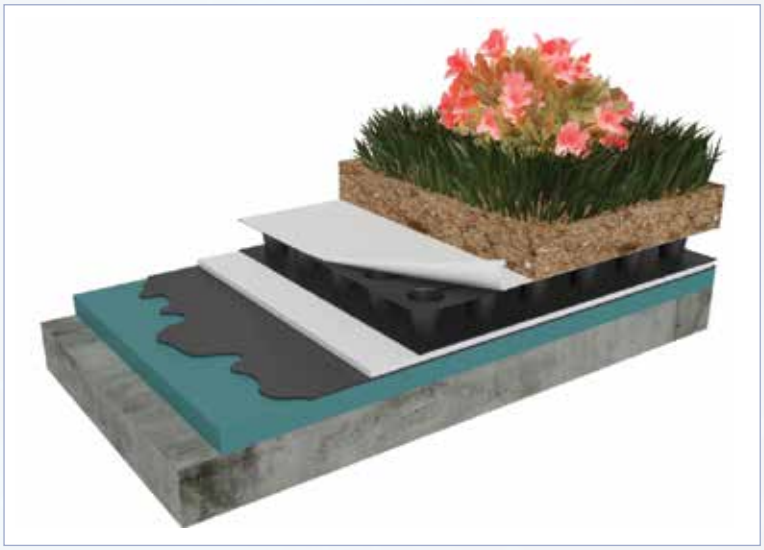
IMPROVING THE ENVIRONMENT

Provides valuable habitat

Attracts insects, invertebrates and birdlife

Absorbs CO2, pollution and dust particles

Combats the Urban Heat Island Effect



INSULATION

Reduces transmission of noise and vibration

Thermal insulation – absorbs solar heat, provides valuable cooling

RAINWATER ATTENUATION

Absorbs rainwater in the substrate and from vegetation uptake

Reduces the amount and speed of rainwater run-off

Delays run-off before rainwater starts to escape from the roof

Puts less pressure on drainage systems as a whole

Enhances water harvesting systems

BALLASTING INVERTED WATERPROOFING SYSTEMS

A valuable and attractive alternative to pebbles or concrete slabs on rooftops to hold down insulation boards or loose laid waterproof systems

PROTECTING THE STRUCTURE AND WATERPROOFING LAYER

By covering the waterproofing membrane damage caused by UV, impact and abrasion, plant and bird infestation is prevented

Reduces and regulates the temperature of waterproofing, reducing surface thermal movement

OPTIMISING THE DEVELOPMENT FOOTPRINT

Provides additional green space and helps BREEAM ratings

Provides an attractive feature for occupiers to utilise

Brings a feeling of open space to high density environments

Helps with the planning permission process

Can increase the value of the development

EASY TO INSTALL

All Wallbarn systems have been developed to accommodate straightforward, non-complex installation and build-up – improves speed and reduces costs

M-TRAY® MODULAR GREEN ROOF SYSTEM

WALLBARN presents the new M-Tray®. It has been developed and further improved in order to make sedum and wildflower green roofs easier to install, with less disruption to both the plants and the structure. It is designed to also give a more seamless and luxurious finish and to provide an instant green roof.

Wallbarn has been at the forefront of developments in the extensive green roofing sector for a number of years, and has always strived to provide products which mix top quality elements and ingredients with user friendly, hassle free installation.

Our new design allows us to supply the best quality vegetation to site. The fully established, mature sedum or wildflower plants, are contained within easy-to-carry trays which click together to form an almost invisible join.

M-Tray® has been designed and developed by Wallbarn in the UK and is the subject of Community Registered Design (No. 002953943-0001) and US Design (Application No. 29/553,129).

WHY MODULAR?

The main advantages of modular over roll-out green roof systems include convenience and speed of installation, future-proofing, and the delivery of instant results.

All the elements required for a successful green roof have been measured and installed into the M-Tray® modules at the nursery. Users can feel confident that the plants, growing medium and filtration components are suitable and compatible, and at the correct level to give strong, healthy growth over the long term.

The trays are grown for a period of at least 6 months and all will have been through at least one spring growing season; so the plants are well established, healthy and strong, and fully integrated into the substrate (unlike sedum blankets, which are not).

Mess and disruption are big issues with roll-out systems. Moving bags of aggregate-based substrate onto rooftops is fraught with risk – the aggregate goes everywhere and as it is so granular, it can damage waterproofing membranes very easily. Sedum blankets are also supplied rolled up, so the plants get damaged during the transport and installation process.

This is not the case with the M-Tray® modules.

Another key benefit is accessibility. As each module is 500 x 500mm, one M-Tray® can be carried by one operative. For areas which are very difficult to access, such as single storey extensions, domestic projects and other completed structures, roll-out is simply not possible. M-Tray® can be hand-balled into even the most awkward areas, even carried through a window (pictured) if necessary. They are the perfect retro-fit product.

Speed is also a major factor. It has been proven that green roofs constructed using Wallbarn M-Tray® are installed much faster than in traditional roll-out methods.

It is also an instant green roof. Since the sedum are less shocked by the installation process, as soon as the trays are connected together the whole area is filled with well-established plants. They will start to grow straight away, forming a seamless layer of vegetation much faster.

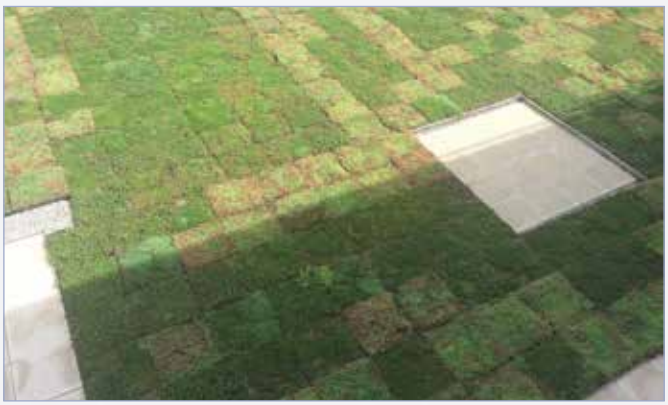
Access to the roof is future-proofed. If there are problems with the deck beneath or inspection is required, one M-TRAY® or section can easily be lifted out without disruption to the whole roof.

WHY MODULAR?

The modular green roof panels are packaged and delivered in the most convenient manner.

By being palletised, the plants can get to the roof quickly and without the risk of damage.

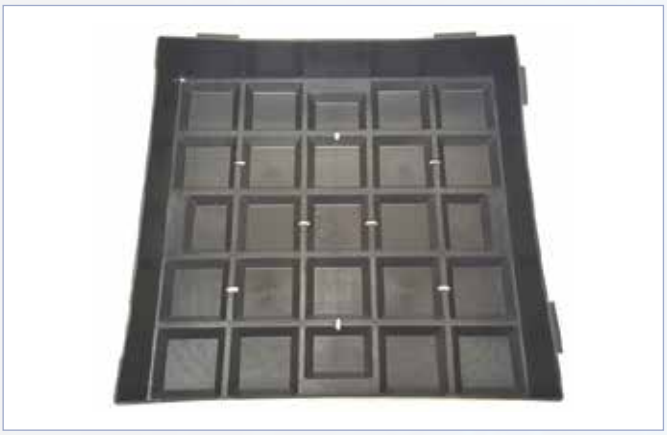
The speed and ease of installation is illustrated very well in the images shown here.

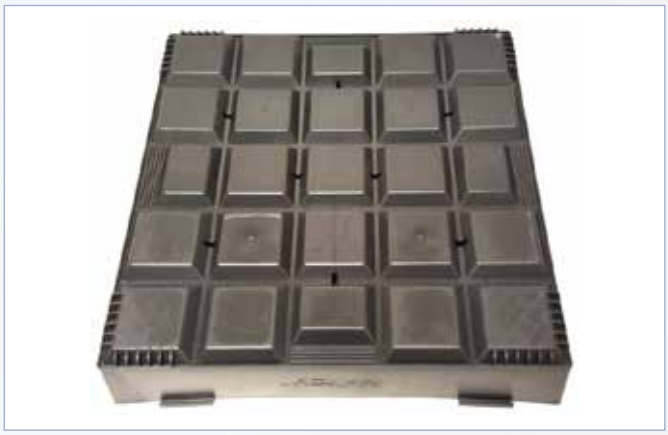


THE DESIGN – WHAT'S NEW?

SHAPE

M-Tray® has been especially designed for the extensive green roof market.





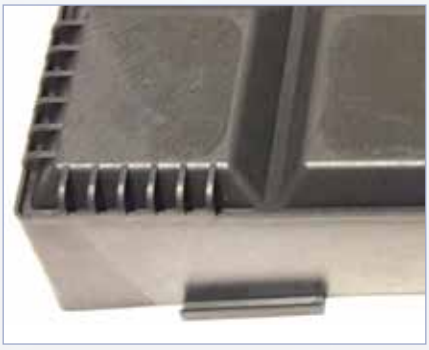
The module measures 500 x 500 x 100mm. As four units make up exactly one square metre estimating is a far easier process.

There are less drainage holes than in previous versions to keep water within the green roof system for longer. This allows the plants to absorb more rainfall, increasing attenuation and delaying discharge into outlets.

The edges of the module do not have drainage holes in order to prevent the sedum dying back at the edges. Stronger plant growth at the edges creates a more seamless layer of vegetation when the modules are connected.

Four gently ridged hand grips are positioned to enable installers to carry each module easier.

SMOOTH EDGES & CONNECTING BRACKET



The connecting brackets are designed to give a tight connection, with the minimum of gap between each module. The joint is only 6mm so the plants will grow over it quickly, making it disappear in ultra-quick time (white units for illustrative purposes only – all M-Tray® units are supplied in black colour).

The corners of the modules are rounded and smooth, so no sharp edges (which might puncture the membrane beneath) are present. It also makes handling the trays easier and the edges can be mounted onto Wallbarn pedestals if additional height is required.

TRIMS & EDGING

100mm aluminium edge trims and connectors fit neatly onto the sides of the modules. Fixings are designed to slot together neatly although they are not always neccesary.

STEP BY STEP INSTALLATION

The problems associated with giant bags filled with sharp aggregate or sheet membranes blowing away in the wind are avoided using the Wallbarn M-Tray® system as they have all the necessary elements contained within them.

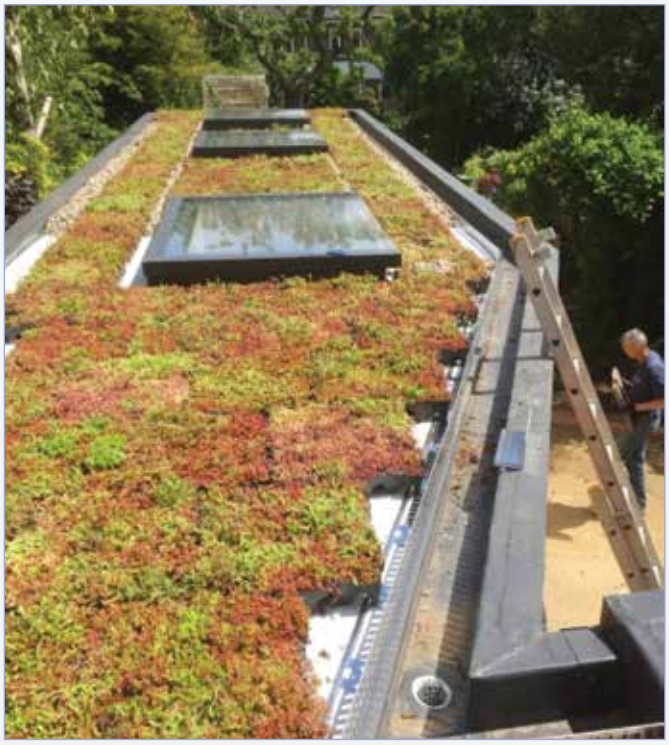
M-Tray® modules will be transported to site shrink wrapped on pallets for easy, clean delivery. They can be craned safely onto the roof if necessary.

Each module is 500 x 500 x 100mm, so exactly 4 units make up one square metre.

Unpacking the pallets is a simple process. None of the contents will spill out and each module can be carried by one person without disruption.

A separation and filtration geotexile layer should be firstly installed onto the deck. This protects the waterproofing and prevents abrasive damage. Wallbarn can supply a 300gsm recycled fleece for this purpose.

Start from the middle of the green roof and work outwards towards the edges. Place a module down and then click the next into place. There are two connection points on two sides of each module. Once connected up on all four sides, the module will be fully secured.



The edges should be filled with a border of washed riverstones, in accordance with the GRO code of practice. Objects such as roof lights and cables should be surrounded with riverstones to prevent root invasion and act as a fire break.

An aluminium edge trim can be added at any exposed edges or where the stones need to held away from objects such as drainage outlets.

The modular sections mean detailing around objects is a simple process and clean lines are created. Hard landscaping sections such as paving and decking, mounted onto Wallbarn pedestals, can be added to the area to allow for regular access. As everything is suspended on top of the deck, drainage is uninterrupted.

Pop-up sprinklers or other features can be installed in conjunction with M-Tray® to further improve the landscaping. M-Tray® provides real landscape solutions and enhances rooftop living.

M-TRAY® WITH WILDFLOWER

As well as the sedum trays, Wallbarn plants up a wildflower mix into the M-Tray®. A varied mix of at least six different native species has been selected. All these flowers and herbs are low growing, hardy species, chosen to be pollinators for butterflies and bees.

KEY ADVANTAGES

The advances made in the design of the new M-Tray® model include:

- deeper cavities for extra root growth
- optimum drainage leading to stronger plant growth
- more established vegetation at point of installation
- more efficient transport and packaging
- exactly 4 units per m^2
- easier to carry trays with smooth handles
- closer connection between trays for more seamless plant growth
- no sharp edges, less risk to the membrane
- nothing spills out, less mess
- made from recycled plastic with recycled substrate
- less packaging, less waste
- UK designed and manufactured in UK

EXPORT & LICENSING OPPORTUNITIES

As well as supplying live products for installation on UK green roofs and landscaping spaces, Wallbarn is committed to M-Tray® as an export product.

We can supply the modules as empty trays for local landscapers worldwide to plant up and propagate according to the local climactic conditions and their own markets.

Licensing opportunities are available for both the M-Tray® brand and the mould, which can be granted to specific partner companies across the globe.

M-Tray® has been designed and developed by Wallbarn in the UK and is the subject of Community Registered Design (No. 002953943-0001) and US Design (Application No. 29/553,129). Further worldwide design registrations are currently being carried out.

An M-Tray® "Bible" is available to guide partners in the growing and installation process and we have drawn on many years of experience to create this publication.

Our aim is to get more green spaces into urban centres worldwide. With M-Tray® this is a possible and economically viable prospect. Join us in our vision.

TECHNICAL DATA

PRODUCT	M-TRAY® MODULAR GREEN ROOF CONTAINER
SUITABLE FOR	EXTENSIVE GREEN ROOF PLANTS WITH LIGHTWEIGHT, FREE-DRAINING SUBSTRATE
TYPE OF CONSTRUCTION	PERMANENT
WIDTH / BREADTH	500MM X 500MM
HEIGHT	100MM
SHAPE OF WALLS / SIDES	TAPERED / ANGLED
UNITS PER M2	4
MATERIAL	RECYCLED POLYPROPYLENE
THICKNESS OF MATERIAL	3MM
INTERNAL RIDGE HEIGHT / RESERVOIR HEIGHT	20MM
NUMBER OF INTERNAL DRAINAGE RESERVOIRS	25
DRAINAGE HOLES PER UNIT	8
DISTANCE BETWEEN TRAYS AT BASE	20MM
DISTANCE BETWEEN TRAYS AT 50MM FROM BASE	10MM
DRY WEIGHT (EMPTY)	1.1KG
WEIGHT PLANTED & SATURATED ❶	24KG
CONNECTORS PER UNIT	4
NUMBER OF HANDLES ON UNDERSIDE	4
DETAIL OF CORNERS / EDGES	SMOOTH / REINFORCED
EU DESIGN TRADEMARK	NO 002953943-0001
US DESIGN TRADEMARK	NO 29/553,129

❶ Based on filling with Wallbarn produced & approved lightweight, extensive green roof substrate; fully planted with mature sedum plants to recommended coverage and saturated.

ROLL-OUT EXTENSIVE GREEN ROOFS

The roll-out green roof is a simple, low maintenance sedum green roof system where each element is supplied separately and installed layer by layer. It is an effective way of greening a roof deck and bringing a sense of nature to built-up areas.

The main features of extensive green roofs are:

- lightweight systems – can be as light as 50kg per m2
- total build-up depth – 100-150mm thick
- simple vegetation – mainly sedum
- drought tolerant
- saline tolerant
- low maintenance requirement
- irrigation systems optional

Extensive green roofs are designed to be lightweight. Therefore, they can be used on a large variety of structures.

The sedum plants we use have been selected to be easy to manage and do not need a large amount of watering, making them ideal for areas which may be overlooked but are difficult to access and maintain.

The sedum blankets contain a mixture of different species of sedum, specifically selected to provide a a variety of different textures, colours and flowering periods and are supplied with at least 85% coverage. They are designed to give consistent, all year round coverage of vegetation throughout the year.

Mixes of wildflowers, herbs and bulbs can also be incorporated into the blankets. We supply healthy, freshly cut sedum blankets.

INSTALLATION

Extensive green roof systems are built up in individual layers from the waterproofed deck or insulation layer (inverted roof).

Each element of the system is supplied separately: the substrate will be delivered in bags, the drainage and filtration membranes come in rolls and the sedum is usually supplied rolled up into sedum blankets. They are delivered to site on pallets and will need to be moved to the roof top carefully to avoid damage.

The build-up is made up as follows (from base upwards):

- Wallbarn recycled polyester geotextile filter fabric. Wallbarn supplies a range of different geotextile fabrics and we recommend a fabric of at least 300gsm – code GE-PE-PECT-0300-Z.
- Protecto-drain. Flexible, cuspated and perforated membrane (made from HDPE, available in 8mm or 20mm, depending on drainage / attenuation requirement). This is loose laid onto the geotextile, cup-side up. This collects water but also allows excess water to escape through the perforations into the roof outlets.
- Wallbarn recycled polyester geotextile filter fabric, to allow water to pass through the system but to prevent substrate particulates from blocking the drain.
- Lightweight engineered substrate (manufactured from a blend of crushed aggregate and green waste to form a gritty mineral based low nutrient mix).
- The sedum blanket is then rolled out onto the substrate and gently pressed into place. Alternatively, plug plants are distributed over the surface.

BIODIVERSE ROOF SYSTEMS

Biodiverse roofs and brown roofs are two different things:

- Biodiverse roofs are where seed or plants are introduced into the substrate at the time of construction.
- A brown roof is where the substrate surface is left to self-vegetate from windblown and bird lime seed dispersal.

After several years both type of roof may look the same as the vegetation reaches a maturity.

They have become a popular type of roof garden finish in recent years as they are seen by many planners as a more natural, rugged urban feature and can offer a greater diversity of species as well as prolonged foraging for insects.

The concept of biodiverse roofs is that a plain, low nutrient environment is created at roof level.

Tough, hardy plants will start to germinate in the substrate in a natural way, replicating wild urban spaces that are found at ground level.

Wallbarn uses wildflower seeds that are mixed into the substrate, plug-plants or our new pre-seeded BeeMat (two layers of biodegradable fabric impregnated with wildflower seeds to guarantee an even spread, and to provide an ideal climate for germination).

Biodiverse roofs require fairly little maintenance. They still offer sound acoustic and temperature insulation properties to the building, and will help to attenuate water runoff from the rooftop to a significant degree. The substrate level is normally up to 150mm, which offers a medium weight build-up, usually no heavier than 120kg per m^2.

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

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 project.

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.

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

Wallbarn M-TRAY® can be produced as biodiverse modular roof system by adapting substrate and vegetation type to suit the project requirements.

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.

They are more akin to traditional landscaping but positioned on a roof.

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.

Wallbarn provides design consultation to integrate hard and soft landscaping materials to maximise the project potential. We supply all components required for intensive green roof systems which allow the installer to purchase drainage materials, soils and other associated products from one single source. Issues such as increased weight, irrigation, and maintenance, need to be considered at early design stage.

- Intensive green roof systems magnify the environmental and aesthetic benefits of green roofs
- They offer greater biodiversity
- There is more dust and pollution absorption
- They give a higher level of water attenuation and delay of water run-off
- They give improved thermal and sound insulation benefits
- Lush, luxurious roof gardens have been proven to increase the value and accelerate the take-up of buildings when offered on the market. This can increase the speed of sale as well as rental yield
- The footprint of the building is being optimised. There is less wasted space in densely populated areas and there is increased amenity value

The build-up of intensive green roof systems differs from project to project and as such, Wallbarn should always be consulted at concept stage to advise on correct product selection and use, particularly in relation to the vast array of waterproof systems used in UK.

Intensive green roofs are also far more complex than the sedum and extensive roofs. Even with lightweight materials being used in the soil substrate, the depth of it means weight loadings are vastly increased. Therefore a different protection, drainage and filtration build-up is required for increased drainage capacity and load bearing.

Irrigation 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 soil within the system.

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

ACCESSORIES FOR GREEN ROOFS

Wallbarn provides solutions for rooftop living and we offer a number of products to help complete the whole landscaping package.

ALUMINIUM ANGLE

Parapets and upstands should be kept clear of plants, to avoid roots clogging outlets and vents, and to reduce fire risk.

This is in accordance with the GRO code of practice for green roof construction.

A border of rounded riverstone pebbles should be constructed around the edges. An aluminum angle should be installed to create the separation between those growing elements and areas such as drains and roof lights.

The profile is right angled, so it can sit underneath either the M-Tray® or the pebbles and be weighted down sufficiently.

It can be mechanically fixed to the surface beneath, but if this is not possible due to the waterproofing membrane's integrity, the angle can be ballasted.

Where there is an exposed edge with no parapet, the perforated aluminium angle can be used to provide an edge to the green roof itself. It is recommended that the angle is mechanically fixed to the deck in some way. The pebbles are then installed the other side. This ensures free flow of drainage water.

IRRIGATION SYSTEMS

Wallbarn can supply a range of irrigation systems for installation with extensive sedum green roofs as well as intensive roof gardens.

These range from simple timer based sprinkler networks to fully automated, web based irrigators, which will feature drought and leak detectors, separate growing zones and control panels.

HARD LANDSCAPING

Green roof systems, whether being the roll-out version or M-Tray®, can be constructed so that soft landscaping and hard landscaping fit seamlessly.

Areas such as paving or timber decking (laid onto Wallbarn ASP or TD pedestals) can be built up to the same height as the vegetation, creating one seamless garden level.

SUBSTRATE FOR GREEN ROOFS

Wallbarn has developed its own specially designed substrate to nurture and sustain sedum and wildflower plants in the long-term on green roofs.

We have worked with leading stock growers, construction consultants and soil experts to develop a suitable substrate for use in green roofing.

We have tested substrate components and ingredients both in the laboratory and in field trials; over a period of more than 24 months to establish the optimum.

The key requirements for this specially mixed compound which we have ensured are included are:

- A free draining mix - water needs to be able to escape to avoid overloading the roof and drowning the plants.
- Lightweight substrate – sufficient ballast to prevent wind erosion is needed but heavy ingredients should be avoided.
- Strong healthy plants – compare the root growth in Wallbarn's M-Tray® modules, reaching down to the full 100mm to green roof systems which use only rubble or crushed bricks. Rubble will compress to a solid mass over time and the roots cannot penetrate it, leading to weak plants and significant die-back.
- Nutrient levels – the substrate cannot be simply brick dust as this prevents root growth. The mixture needs to have enough nutrients to help the sedum plants grow and develop, but not too high a nutrient level as this can encourage growth of weeds.
- Longevity – we need to ensure that the substrate does not oxidize to too great a level. Some topping up will be required on all green roofs as nutrients are used up and plants grow, this substrate is developed for long-term plant sustenance.
- Sustainability – although the exact recipe of our mixture is a closely guarded secret, we use recycled green waste from a variety of sources, recycled coir, our own compost, local grit/aggregate and recycled construction waste to create our substrate mix.

We can supply this substrate in 25 kg bags for smaller projects or in 1m^3 jumbo bags for larger projects. Ask us for more details.

www.facebook.com/wallbarn www.twitter.com/wallbarn

For more information please contact:

Wallbarn Ltd

Unit 16, Capital Business Centre • 22 Carlton Road • South Croydon • CR2 0BS • UK

T: +44 (0)20 8916 2222 • F: +44 (0)20 8916 2223

E: sales@wallbarn.com • W: www.wallbarn.com