

# SKY'S NO LIMIT

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Green roofs are a successful means to further green our local environments, but their use goes far beyond commercial applications. Nigel Dunnett looks at their practicality for smaller scale installations

For such a relatively modest feature, a green roof on a garden shed or building can have an impact that far outweighs the area it occupies. If visible, it immediately sends a signal about the intent behind a garden, flagging up environmental motivation in a way that other components fail to match. Moreover, creative use of green roofs can transform run-of-the-mill structures into the central focus of the garden. So often sheds are tucked away out of sight or, where they are prominent, can be extremely ugly, especially when viewed from above. Indeed, most of us who live in towns and cities look out onto our own, or someone else's grey and monotonous shed roof. Let's turn these from embarrassments into the structures that we work the

whole garden around. In a very small garden the summerhouse or shed becomes the focus of the entire scheme. Where space is plentiful we can use green roofed buildings to end views and vistas, or to create the theme for smaller enclosures or rooms.

#### Green roof benefits

It is not only visual transformation that prompts us to consider green roofs for gardens. Their wider environmental benefits are becoming better known. In our water-conscious times, any vegetation that clothes impermeable surfaces, such as roofs or paths, traps rainfall for the benefit of the space on which it falls, rather than being immediately shed and lost to the drains. On

Green roofs are ideally placed to increase the aesthetic appearance of an otherwise non-descript garden structure. This green roof at Orsett Heath in Essex uses a substrate of brick rubble to a depth of 70mm.

**Case study: Garden shed designed by Nigel Dunnett, Sheffield**

This extensive green roof in the author's garden was created on a typical sloping roofed garden shed, transforming it into the centrepiece of a small garden. After painting the shed, posts (3x3in or 4x4in) were sunk into concrete at each side of the shed and braced to it. Heavy-duty pond liner provides a root-proof layer. On top of the liner sits a wooden framework, which rests against the posts, thereby taking some of the extra weight. The framework compartments are filled with substrate — a 50:50 mix of light expanded clay granules (LECA) and gritty John Innes Number 3 compost — to a depth of 10cm, over a drainage layer of crushed aerated concrete breeze blocks. All construction materials are readily available. Planting is a mix of commonly available alpines such as thymes, dianthus and armeria, together with other seed-raised alpines and dry-tolerant short herbaceous plants and grasses.



a larger scale, extensive use of green roofs helps to prevent the increasingly familiar problem of flash flooding following heavy rainfall. While this may seem to have little relevance to the garden scale, more immediate benefits include both thermal and sound insulation to the room below the roofed structure, and we can all appreciate the added habitat and wildlife value of greening previously barren structures.

For those with a horticultural or ecological bent, garden green roofs provide rich opportunities for growing a very wide range of plants, both native and non-native. While the focus of much green

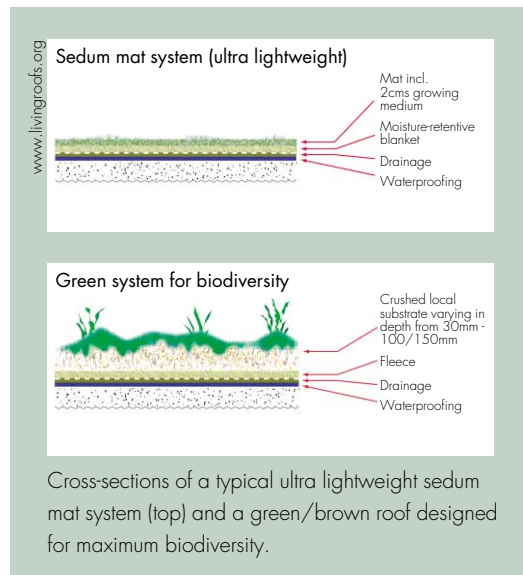
roof development in countries such as Germany, Switzerland and the USA has been on large-scale commercial and industrial structures, we in the UK, with our rich horticultural tradition and garden culture, have the opportunity to lead the way in creative and exciting small scale applications — not only sheds and summerhouses, but garage roofs, flat roof extensions, outhouses, porches and other domestic surfaces.

**The basics**

In its widest sense, a green roof can include any sort of planting on a building, including traditional roof gardens (so-called intensive green roofs). However, most people now use the term mainly to refer to more lightweight, relatively thin roofs that are not necessarily intended for regular use or access and which are the most 'ecological' in that they require minimal or no irrigation and little in the way of maintenance (extensive green roofs). Semi-extensive green roofs are slightly deeper and enable greater horticultural possibilities, while still requiring low input, but they require greater structural support.

**Cross-section**

All green roof types consist of the same basic build-up of a series of layers, differing mainly in the depth of growing medium and therefore the type of vegetation they support. Green roofs can be obtained from and installed by commercial companies or they can be designed and constructed on a more do-it-yourself basis, or a





IMAGES LEFT AND OPPOSITE: NIGEL DUNNETT

mixture of the two. It is worth considering the standard construction of a typical commercial system before exploring how this can be modified.

A typical commercial green roof consists of:

- ➔ **Waterproof layer:** The base layer of any green roof is the waterproofed layer of the roof. This must not only be waterproof, but also root-proof. Reputable green roof companies will provide a guarantee (usually 25 years) against leakage.
- ➔ **Drainage layer:** Normally situated on top of the waterproof layer, the drainage layer has the function of removing excess water from the roof — most green roof plants are tough and drought tolerant so do not take to sitting in waterlogged soil. Commercial drainage layers

take the form of preformed plastic cellular layers. Simple lightweight aggregates will perform the same function.

- ➔ **Filter mat:** Geo-textile material usually sits between the drainage layer and the growing medium to prevent substrate from clogging up the drainage layer.
- ➔ **Growing medium:** Often referred to as substrate, the growing medium supports plant growth and is usually composed of an artificial 'soil' that is very lightweight. Typically, commercial substrates are composed of aggregate materials, such as recycled crushed bricks or tiles, light expanded clay granules, perlite or vermiculite, mixed with a small proportion (around 10 to 20 per

**Case study: Shelter at Langdon Country Park, Essex, designed by John Little/The Grass Roof Company**

Two separate roofs make up this project in an Essex country park. One roof uses reclaimed soil and green waste compost, the other crushed concrete. The roofs are extensive green roofs designed for maximum biodiversity and are planted with drought-tolerant species. Areas of bare substrate, approximately 70mm deep, are exposed to help the soil/concrete to heat up and thereby encourage invertebrates. The roofs act as miniature brownfield sites — more important than ever in this area, given the pressures of the Thames Gateway development on the horizon.



JOHN LITTLE

cent volume) of organic matter such as green waste compost.

→ **Vegetation:** The living elements of the roof.

**Planting up**

The most common types of green roof supplied by green roof companies are composed of sedum species, often supplied as pre-grown mats that are placed on top of the substrate or drainage layer. These green roofs provide a reliable, even cover and flower during the early summer months.

There are many other options available depending on the objectives of the roof. Green roofs provide ideal conditions for wildflower meadows, particularly short-growing calcareous (chalk and limestone types), and offer new opportunities for growing alpine plants more commonly used in rock gardens. It should be borne in mind that the term ‘green roof’ is in some ways misleading. Unless irrigation is supplied throughout the summer it is unlikely that the roof will stay a pristine fresh green through a very dry season. For this reason the term ‘living roof’ or ‘eco roof’ is often used to prevent misunderstanding.

**Designing green roofs**

Some designers may wish to influence the appearance of a green roof by designing their own vegetation layer and/or using substrates of their choice. Most green roof companies will be happy to work with you on this, supplying the base layers and then leaving the rest to you. The simplest approach is to undertake the planting yourself onto a ready supplied substrate, using either pot or plug material, a seed mix, or a combination of approaches. You may also source your own substrate. This is becoming common for the most ecological green roof types, where locally derived waste or recycled materials are used (for



Above: Construction pictures of a green roof terrace at Moorgate Crofts Business Centre, Rotherham. Concrete blocks delineate the paved areas, with crushed brick beneath for drainage. The crushed brick and substrate sits on top of a filter mat, which lies on the plastic drainage layer (close-up picture). Further drainage is installed at the periphery, with pebbles also helping to protect the roof edge against wind eddies.

Below: Table showing substrate depths, vegetation options and typical loading of green roofs.

Type of green roof	Typical depth of substrate (cm)	Type of vegetation	Typical loading (kilos per square metre)
Extensive green roofs	0-5	Simple sedum/moss communities	70-80
	5-10	Short wildflower meadows. Low growing drought-tolerant perennials, grasses and alpines, small bulbs	80-150
Semi-extensive green roofs	10-20	Mixtures of low-medium perennials, grasses, bulbs and annuals from dry habitats. Wildflower meadows. Hardy sub-shrubs	150-200
Intensive green roofs	20-50	Medium shrubs, edible plants, generalist perennials and grasses, turf grasses	200+
	50+	Small deciduous trees and conifers, shrubs, perennials and turf grasses	200+

example, the subsoil dug up when the building foundations are created, or demolition materials from a previous building).

It is perfectly possible to construct a green roof yourself, using readily available materials (see case study on page 18). Of course, your plans must be completely watertight (literally!) if working for a client, for insurance purposes. If the roof is on a small cheap structure such as a shed, or for personal use then you can afford to be less stringent.

However they are constructed, there are two key considerations to bear in mind in green

**Case study: Roof terrace at Moorgate Crofts Business Centre, Rotherham, designed by Nigel Dunnett and Michela Griffiths**

A semi-extensive green roof terrace on the third floor designed for use by office workers. The plantings have to look good throughout the year while requiring minimal maintenance and irrigation only in severe drought. Substrate consists of crushed recycled brick and tile with 20 per cent green waste compost. Two different plant mixes are used: alpines and sedums in 100mm depth of substrate, and a naturalistic dry meadow of grasses and perennials in 200mm substrate depth. Swathes and bands of different coloured stone mulches give visual interest in winter.



NIGEL DUNNETT

**Case study: Sedum roof, designed by David Beattie/FlorDepot, North Yorkshire**

Pre-grown NutriFoam® mats on this garden shed comprise sedum sprouts on a substrate of recycled brick, clay, pumice and composted bark fines over a moisture retentive foam mat, laid directly onto the waterproofed building surface. Typically sedum sprouts will take 12-18 months to achieve full vegetation cover. Fully-grown sedum mats can achieve an instant effect, however, and are recommended for roofs with a pitch of up to 20 degrees. On roofs with a steeper pitch a honeycomb structure to contain the pre-grown sedum is advised.



planting than those supplied by a green roof company, it is highly recommended that you employ the same contractor to install the waterproofing and also to put and spread the substrate onto the roof — in this way the guarantee will remain. Otherwise, you must clarify with the contractor how any subsequent work that you do above the waterproofing layer affects the waterproof guarantee.

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**Further information**

- ➔ A full day is devoted to designing, planting and managing garden and domestic green roofs at the forthcoming National Green Roof Conference at the University of Sheffield on June 20-21. Full details at the website: <http://shef.ac.uk/landscape/greenroof/index.htm>
  - ➔ Further information on planting and design options for green roofs can be found in: Dunnett, N. and Kingsbury, N. *Planting green roofs and living walls*, Timber Press, 2003
  - ➔ Living Roofs is an independent website dedicated to promoting green roofs in the UK. Web: [www.livingroofs.org](http://www.livingroofs.org)
- Green roof suppliers:
- ➔ Bauder: [www.bauder.co.uk](http://www.bauder.co.uk)
  - ➔ BBS Green Roofing: [www.green-roofing.co.uk](http://www.green-roofing.co.uk)
  - ➔ Blackdown Horticultural Consultants: [www.greenroof.co.uk](http://www.greenroof.co.uk)
  - ➔ Enviromat: [www.enviromat.co.uk](http://www.enviromat.co.uk)
  - ➔ FlorDepot: [www.flordepot.co.uk](http://www.flordepot.co.uk)
  - ➔ Greenfix Sky Gardens: [www.greenfix.co.uk](http://www.greenfix.co.uk)
  - ➔ Lindum Turf: [www.turf.co.uk](http://www.turf.co.uk)
  - ➔ SarnaVert Green Roofing: [www.sarnafil.co.uk](http://www.sarnafil.co.uk)
  - ➔ The Grass Roof Company: 07967 733720

- roof design: structural loading and waterproofing.
- ➔ *Structural loading:* The most important factor for any green roof development is whether the building structure can take the load of the additional weight that the green roof imposes. Where the green roof is being put onto a newly designed structure, then the structural support can be designed to take the required load, but where an existing structure is being retro-fitted with a green roof, it is essential to obtain professional advice from an architect or structural engineer if in any doubt.
  - ➔ *Waterproofing:* It is also crucial to ensure that the roof is completely waterproof before adding the green roof element. For complete peace of mind when working for a client, it is strongly advised that you use a reputable roofing contractor. Even if you intend to use different substrates and

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