



# Green roofing goes live

Living roofs are often specified for their symbolic value, or as a statement of the owner or developer's environmental credentials. The Heart of Healing, a South African NGO involved in sustainability projects, claims that living roofs transform dead, sterile surfaces into breathtaking gardens which yield immeasurable environmental benefits, and greatly enhance the quality of life of the inhabitants of the building.

#### The challenge:

An aerial view of most cities will reveal rooftops that are flat, dull and lifeless.

#### Project description:

Green roofs are flat or gently pitched roofs that have been overlain with a growing medium, creating a habitat on what would otherwise have been a plain surface. They are also sometimes called living roofs or vegetated roof structures, and are possibly one of the most tangible elements of a sustainability strategy, being visible, natural and distinctive.

In addition to providing an attractive, roof-level habitat, living roofs can also contribute to the management of surface water run-off, the mitigation of local air pollutants and the extension of the useful life of a roof membrane.

#### Planning background and demands:

Although green roofs are often a feature of low-impact green development, the planning context for green roofs is increasingly becoming the redevelopment of urban brownfield sites as these sites represent the greatest opportunities to employ the potential benefits of green roofs.

Key issues that can be addressed, in part, by the specification of green roofs on urban brownfield development, include:

- Control of stormwater run-off in response to constraints on peak flow capacity in the drains and loss of porous land surface through redevelopment
- Negative effects of increased development density, including poor quality urban microclimates
- Loss of valuable habitats for flora and fauna that have increasingly colonised derelict urban land
- The need for green space in dense developments

Green roofs can, therefore, form part of a designer's armoury of solutions which combat some of the implications of urban development. Recently, though, with energy efficiency and on-site renewables dominating the popular agenda, these roofs could end up at the bottom of a long list of sustainable options.

By contrast, in Germany and Switzerland, green roofs have been promoted as a key element of flood mitigation strategies and there exists a flourishing market for such structures.

#### Green roof technologies:

Current green roof technology has been around for 30 years, and is well established. Irrespective of the green roof type being specified, it will possess the following key components:

- A root barrier which sits above the waterproof membrane to prevent root penetration.
- Insulation on inverted roofs (tapered insulation) is required to create a drainage fall. The extra weight of the growing medium is set off against the weight of pavours or ballast required for conventional roofs.
- A drainage layer is formed in gravel, granulated clay or pre-formed plastics.
- The filter mat consists of a geotextile designed to retain fine soil particles within the growing medium.
- The selection and overall depth of the growing medium is determined by the planting strategy and wider sustainability objectives.
- Planting can range from "ready to use" cultivated sedum blankets, through to the setting of individual plant plugs or shrubs, to self-seeding strategies.

#### Roofing categories:

There are three broad families of living roofs, all of which use related technologies. Extensive roofs have a shallow growing medium and support a narrow range of hardy plants with a short flowering season, such as sedum or some grasses. Fully established sedum blankets can also be planted, giving an instant green roof effect. It is, however, worth noting that because of limited water retention, some extensive roofs can suffer from loss of plants during prolonged dry periods. Extensive roofs of this kind have the advantages of being light-weight, and require only limited maintenance, although their contribution to biodiversity is restricted.

Semi-extensive roofs have a deeper growing medium of up to 150 mm that enables a wider range of planting and potentially the creation of a more diverse habitat. Semi-extensive roofs also have significant capacity for water retention, and can be an important element of a sustainable urban drainage system. Planting on semi-extensive roofs tends to rely on individual plant plugs, meaning the range of species can be more diverse, but that they take two years or more to mature. Deeper soils also mean that a wider range of invasive species can take root, and that more weeding and maintenance is required.

Intensive roofs are the traditional solution for roof gardens. The growing medium may be up to 1 m deep in places to allow for the planting of shrubs or trees. These roof gardens are typically planned as

an amenity, and the species used are often less hardy.

Some form of irrigation may be necessary as a result. These may also require high levels of maintenance.

When selecting a system and completing its design, the following additional design criteria should be taken into account:

- Climate – local temperature and rainfall
- Location, height and orientation of the roof, related to prevailing winds, sun, etc.
- Physical constraints such as structural capacity, overall section depth, etc.
- Suitable maintenance strategy
- Roof membrane specification and the presence of roof falls, including the risk of ponding
- Drainage specification
- Access provision – for use of the roof as an amenity and for maintenance
- Visibility of the roof – affecting choice of planting and the speed of maturation

#### Benefits of green roofs:

Living roofs provide a wide range of potential benefits. Many of these are tangible, but will not necessarily be secured by the owner. An example of this is a reduction in storm water run-off which will only benefit third parties who are “downstream”, rather than an owner. For this reason, it is difficult to establish an economic case for a green roof investment. By contrast, subsidies and tax incentives in Switzerland and Germany underpin a market of 15-million m<sup>2</sup> a year.

#### Some large benefits resulting from installing green roofs include:

- Sustainable drainage – A typical extensive green roof will fully intercept between 50% and 75% of rainwater, and will delay all surface run-off, reducing peak storm water flows and the scale of the rainwater installation required. The filtering action of plants in green roofs is also claimed to prevent pollutants such as nitrates, phosphates and particulates from entering the water courses.
- Microclimate – A wide number of claims with respect to the positive effect of green roof vegetation on microclimate are made. These are cumulative and depend on the action of a large aggregate area of roof to make a noticeable difference. The beneficial outcomes include: direct absorption of nitrous oxide, direct local cooling in the immediate proximity of the roof, indirect cooling through the reduction of heat radiated into the air by building surfaces or held and released by a building's thermal mass, and indirect reductions in the formation of photochemical smog due to reduced air temperatures and the absorption of airborne chemical compounds by the roof vegetation.
- Biodiversity – Green roofs provide opportunities to create biodiversity or, in some cases, to recreate environments that could be lost through redevelopment. The extent of this depends on the variety of planting and the depth of the growing medium. The roof can be designed to provide a habitat for nesting birds and invertebrates as well as plant species.
- Building performance – Aspects of building performance that provide direct payback to building owners include increased durability of the roofing membrane, and reduced energy costs due to the soil acting as an insulant when dry. Germany suggests that this energy saving is equivalent to 2 litres of fuel oil/m<sup>2</sup> of green roof/year.
- Aesthetics – The appearance of a green roof is likely to be an improvement on an uncovered, flat roof.



• Davis Langdon

For more info on living roofs in South Africa, click on to [www.heartofhealing.co.za](http://www.heartofhealing.co.za). Information for this article was obtained from an article compiled by Davis Langdon.

Dr Gerhard Brümmer  
Director  
Davis Langdon

Ms Corrie Pienaar  
National Research Manager  
Davis Langdon

Tel: 012 460 5100  
Fax: 012 460 5677

Tel: 012 460 5100  
Fax: 012 460 5677

E-mail: [gerhardb@davislangdon.co.za](mailto:gerhardb@davislangdon.co.za) Website: [www.davislangdon.com](http://www.davislangdon.com)

E-mail: [corrie@davislangdon.co.za](mailto:corrie@davislangdon.co.za) Website: [www.davislangdon.com](http://www.davislangdon.com)