

Dear reader,

Would you like to find out, how "green" your hometown is on roof level? Then you have two options. Take a flight tour or zoom in with Google Earth. The majority of Green Roofs are still installed on flat roofs and, therefore, hidden from public view. "An image says more than 1000 words" – one of our targets is to bring pictures of these prime ecological examples to the public. The main focus of this newsletter is on pitched Green Roofs which are really "eye candy". In addition we will feature one of the most exciting current Green Roof projects: The Ronald McDonald Hundertwasser House in Essen Germany.

Nature + Architecture = Beauty  
It's as simple as that! Have fun with our new IGRA Newsletter!

Wolfgang Ansel  
Director IGRA

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## The Ronald McDonald Hundertwasser House: Green Roofs Meet Fast Food

In the Essen Gruga Park, a very special building was constructed last year. The Ronald McDonald House was built as a faithful reproduction of the last design of the famous Austrian artist Friedensreich Hundertwasser. A special highlight is the accessible intensive Green Roof (950 sqm) with grass, herbs, flowers, shrubs and trees.

### A dream becomes reality: The World Apart

A Ronald McDonald Hundertwasser House? – The name alone causes surprise. People immediately ask themselves how the visionary artist from Austria



Hundertwasser Design: "volcano crater" and "protecting den"

and the Fast Food Company from America might have come together. Their common ground lies in the insight that the architecture of a building plays an important role for human health. Long before the term "Sick Building Syndrome (SBS)" became generally known, Hundertwasser already divided houses into healthy and unhealthy buildings. This brought the controversial artist the reputation of an "architect healer".

Also the Ronald McDonald House Charities aim to create a healthy and motivating atmosphere in the buildings from this foundation. Families with gravely ill children find a home there for a while, in order to have silence and bit of distance from the stressful days at the clinic. Both concepts merge in the natural and humane architecture of the Ronald McDonald Hundertwasser House in Essen, for which a "volcano crater" and a "protecting den" were the inspirations for the design.

### The third skin: man's house

The building itself is a true compendium of Hundertwasser architecture. The floors are uneven, multi-coloured ceramic mosaics adorn the uninterrupted facade, and each window is differently arranged in form, size and colour. Gold-onion domes, colonnades and "tree tenants" leaning out of their windows complete the picture. Of course, the utilization of the roof area plays an important role too, as a living space for plants, animals, and humans; with good reason Hundertwasser is one of the most famous advocates of Green Roofs.

### The horizontal belongs to nature, the vertical to man

The planning and construction of the accessible roof areas were a special challenge for anyone involved in the building project. After all, the landscaped rim of the "volcano crater", which is 8-9 m in width, and rises from ground level up to a height of 15 m. The roof slopes are up to 35° and, therefore, at the upper limit for Green Roofs. In order to support the occurring thrust forces, state-of-the-art Green Roof technology was applied. Special drainage elements, anti-erosion nets and shear barriers ensure that the artist's dreams do not start "slipping".

Even the selection of plants stands out clearly from simple extensive Green Roofs. The roof area (1,200 sqm) consists for the most part of "sparse woodland" (950 sqm). On a substrate layer of recycled clay tiles with mature compost and clay (at least 500-600 mm), 50 trees and 130 shrubs were planted.

Maple, mountain ash, hornbeam, lime, and different fruit trees will form a colourful mixed forest one day. To guarantee lasting stability for the trees, the root balls were secured with a special underground anchoring. A special advantage: the tree fixing is invisible and at the same time maintenance-free. For the lower vegetation, a seed mixture of "Flowering Meadow" and lawn was chosen. Combined with paths and terraces, the roof area offers to the house guests a "nature experience" without having to travel long distances.

### Nature + Architecture = Beauty

The Ronald McDonald Hundertwasser House in Essen is a perfect example for how art, architecture, and ecology can support and complement each other.

The frequently uttered criticism of architects that Hundertwasser's plans would not be very long-lived does not apply in this case. Modern Green Roof technology in combination with professional installation guarantees the safe function of the Green Roof as well as the protection of the building. Continuous care and irrigation have also been organized, after all the roof areas are utilized, intensive Green Roofs. In this way, the course is set to make Hundertwasser's central equation, "Nature + Architecture = Beauty", also remain valid for the Essener project in the following years.



Accessible roof areas offer "Nature experience" round the corner

### Pitched Green Roofs:

## A Demanding Technical Challenge

**When using modern Green Roof technology even roofs with a slope of up to 35° can be equipped with a natural protection layer. To prevent the Green Roof from erosion a suitable build-up and professional installation are required.**

Which slope marks the border between Green Roof systems for flat and pitched roofs? In most instances standard Green Roof system build-ups can be easily installed on flat roofs with a fall of < 10°. With increasing slope the Green Roof system build-up becomes more complicated and the technical requirements and plant selection criteria need to be adjusted to the additional demands. Considerations then include higher shear forces, danger of erosion and drought stress.



Remarkable business card: The pitched Green Roof of a landscape gardener

### Technical requirements

Having root-resistant waterproofing is a prerequisite for pitched Green Roofs; installing an additional root barrier requires much effort and increases the risk of slippage. In addition, stable abutments have to be installed at the eaves edge to transfer shear forces from the Green Roof system build-up into the roof construction. For the calculation of the shear forces the weight of the system build-up (including snow load), the roof slope and the shear length have to be considered. On steep pitched roofs > 20° additional shear barriers on the roof may be necessary to absorb the shear forces. Important: after being anchored into the roof's subconstruction the barriers have to be waterproofed separately. They also need to incorporate gaps to allow the excess rainwater to run off between them. It is recommended that the design of the shear barriers and the eaves profiles be done by a structural engineer.

With increasing slope the Green Roof system build-up is more complicated and the substrate has to be protected from erosion; anti-erosion nets made of jute and plastic grid elements can be used for this purpose. Even though it is possible to build pitched Green Roofs with a slope of 45° it is not recommended to exceed 30° due to significant access limitations for upkeep and maintenance.

### Plant selection



Different plant communities on a ridged roof (left side: north exposure, right side south exposure)

A precondition for the lasting success of a pitched Green Roof is the appropriate selection of the plants. In general fast surface coverage is high in priority. Densely planted root ball plants or installed pre-cultivated vegetation mats are measures which help avoid erosion on steep pitched roofs. Apart from the slope it is also important to consider the exposure of the roof area and the location of the building when selecting plants. Perennials and grasses can be used on pitched Green Roofs in locations with a northern exposure; whereas, Sedum, due to the species' high water retention capacity, is the most suited

for pitched roofs with a southern exposure.

One has to bear in mind that the water run-off is much faster on pitched roofs compared to that on flat roofs. Therefore, it is advisable to plan for an additional irrigation system to provide water during dry periods.



Additional protection with anti-erosion net for pitched roofs > 15°

Pitched Green Roofs with grass or lawn, as in Scandinavian tradition, need high maintenance requirements and financial expenses when installed in areas with warmer climates and lower amounts of precipitation. This includes, along with a deeper substrate layer and irrigation, regular attendance to mowing and removal of the cuttings.

Even extensive Sedum roofs require a minimum of two maintenance visits per year. Therefore, accessibility of the roof must be ensured from the beginning of the planning phase. Importantly, plans should also include fixing devices for safety.

## The Gallie Craig Coffee Shop: Green Roof Overlooks the Cliffs of Scotland



Harmony - the cliff line and the Green Roof merge

The new Gallie Craig coffee shop at Drummorie in Stranraer has the most spectacular position, perched above cliffs overlooking the Mull of Galloway. In view of the outstanding natural beauty of the location it is not surprising that the project had to go through rigorous planning authorisation before construction could begin; with a Green Roof system the obvious choice to crown the building.

The architect IB MacFadzean, and the client, knew that Alumasc offered a complete Green Roof system and had extensive experience with installations of a similar nature to that which they had proposed. The Green Roof was installed

by Alumasc Approved Contractor, SW Roofing of Dumfries, however the actual planting was installed by the client contributing to a cost effective solution.

The complete roof system was installed without hindrance and now enables the building to achieve a remarkable level of harmony with its environment – a situation which will persist for many years to come with the comprehensive Alumasc Warranty. This insurance relates to the Derbigum Waterproofing covering both material and workmanship, and thus, provides long-term assurance of reliable performance for the roof.

*Nick Ridout, Alumasc Exterior Building Products Ltd.*

<b>Project:</b>	<b>Gallie Craig Coffee Shop</b>
<b>Location (City, Country):</b>	<b>Drummorie, Stranraer, UK</b>
<b>Year of Construction:</b>	<b>2005</b>
<b>Roof Size:</b>	<b>400 sqm</b>
<b>Slope:</b>	<b>15°</b>
<b>Building Type:</b>	<b>Commercial</b>
<b>Green Roof Type:</b>	<b>Extensive</b>
<b>Vegetation:</b>	<b>Grasses</b>
<b>Architect/Designer:</b>	<b>IB MacFadzean</b>
<b>Contractor:</b>	<b>SW Roofing of Dumfries</b>



## Ecological Renovation with Green Roofs in Amsterdam



Georaster - stable grid element for steep pitched roofs



A visual highlight - the steep areas (40%) with lawn

This Green Roof project was part of a renovation of the 19th century warehouses located on the waterfront of "Het IJ" in Amsterdam. The old warehouse "Australië" was integrated into a new residential building and on a portion of this new building the Green Roof was created. The Green Roof includes a flat section with trees and lawn and is located approximately 5 meters above ground level. The flat lawn then changes appearance into a very steep lawn which stops at an upper wooden terrace. The steep lawn was the biggest challenge in this project during the planning phase as well as during the building phase. To make sure that the grass has enough nutrition and water, the Green Roof contractor planned, together with the engineers of ZinCo Benelux, a system build-up with two layers of

"Georaster". The stable grid elements offer a large root space and shear force protection at the same time. The lower layer of "Georaster" was filled with a mineral substrate and the upper layer was filled with a richer substrate for intensive Green Roofs. On top of these two layers the sod was attached to the Georaster elements. This is necessary for the first period until the roots of the grass have established a natural fixation in

the substrate. Now the biggest challenge is mowing the lawn!

*Olivier Copijn, ZinCo Benelux*

<b>Project:</b>	<b>Australiëgebouw</b>
<b>Location (City, Country):</b>	<b>Amsterdam, the Netherlands</b>
<b>Year of Construction:</b>	<b>2005</b>
<b>Roof Size:</b>	<b>550 sqm</b>
<b>Slope:</b>	<b>1% and 40%</b>
<b>Building Type</b>	<b>Office building</b>
<b>Green Roof Type:</b>	<b>Intensive</b>
<b>Vegetation:</b>	<b>Lawn and trees</b>
<b>Architect/Designer:</b>	<b>DKV Architecten Rotterdam</b>
<b>Contractor:</b>	<b>Roosendaal Landscaping</b>

### Green Roofs Worldwide: New Green Roof Database

Are you looking for Green Roof references and eco design examples for community development? Then visit:

[www.igra-world.com/green-roofs-worldwide/database](http://www.igra-world.com/green-roofs-worldwide/database)

The new database of the International Green Roof Association features outstanding Green Roof projects all over the world. The database is searchable under the categories "Country", "Building Type", "Green Roof Type", "Size" and "Year of construction".

Public parks on shopping malls in Great Britain, representative roof gardens in Germany, biotopes on garages in the Netherlands, green islands in the business districts of Hong Kong, hospital design

award winners in Turkey – all these buildings have one thing in common: they prove that ecology and economy can be combined in harmony within the field of Green Roofs.

Check the database for projects in your country and get in touch with local experts and Green Roof advocates.

The basis of business is the fulfilment of people's wishes. And nature is on top of the list of human needs.



### Conferences:

## Green Roofs for Australia

Showcasing built-environment innovation, Green Roofs for Australia is a two-day event on 22 and 23 February 2007 at Brisbane Technology Park, Miles Platting Rd, Eighth Mile Plains, Queensland, Australia. Major themes include new business opportunities, education directions, the latest technology and its applications in Australia and New Zealand. Also: learn about unique plant varieties suited to Green Roofs in Down-Under and discover ways Green Roofs counter climate change and assist in urban water management.

Green Roofs for Australia is an event for: urban planners, architects, engineers, landscape architects and designers, specialist builders, policy makers, developers, building owners, municipal government, built environment academics and horticulture contractors.

The event includes a Green Roof Photo Expo of the best Green Roof projects in the Northern Hemisphere, plus innovative technology.

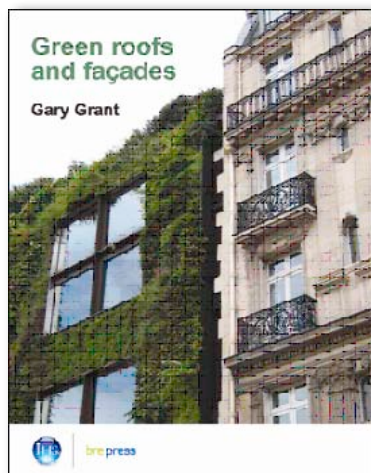
For conference details and registration, or to book a photo expo position, please go to:

[www.greenroofs.org.au](http://www.greenroofs.org.au)



### New Books:

## Green Roofs and Facades



Green roofs are part of the wider green and sustainable development agenda. To meet the rapidly growing interest, IHS BRE Press has published a new guide for Green Roofs. Green roofs and facades on buildings offer a wide range of benefits, including attenuation of rainwater run-off, improved thermal stability and energy conservation, enhanced air quality, wild-life habitat and open space.

This book provides an accessible overview of the development of Green Roofs and the contribution they can make to sustainable development. It explains the benefits of their use, and identifies the key aspects that must be considered in designing, building and maintaining them. It is fully illustrated with numerous examples of successful applications from around the world.

Architects, landscape architects, planners, designers, building services engineers and students of these disciplines will benefit from the information contained in this publication. The guide is also an ideal reference tool for building owners and developers, roofing contractors and materials suppliers.

**About the author:** Gary Grant is a Space Enabler for CABE, chartered environmentalist, and Member of the Institute of Ecology and Environmental Management.

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[www.ihsbrepres.com](http://www.ihsbrepres.com)

## Green Roofs in Brazil

Green roofs seem to have always been a global language. When I was asked to write this article, I went to our ancestral native culture (Taquara Tradition) and found out about underground well-houses with a central pole holding the roof, which were covered with straw, soil and spontaneous native vegetation growing on it.

More recently, we have had important contributions with the Bule Marx suspended gardens in Rio de Janeiro in late thirties. In the eighties it was cool to have gardens on top of buildings, but they were expensive and leakage problems were often due to inappropriate waterproofing methods. Roof gardens were focused on the visual effect rather than thermal comfort. It was the time of the "intelligent" buildings, and every problem could be solved with potent air-conditioning. Since the nineties more consideration has been given to the ecological approach. After 2000, good Green Roof research started in Rio de Janeiro by Manfred Koehler, and Marco Schmidt. Since this time proposals have come up related to urban heat, water run-off control, and biodiversity. They have concluded that Brazil has a good potential for the application of Green Roofs. Actually, in order to realize these public benefits we need a massive cooperation of different people and this requires much time and effort to shift existing paradigms. It still seems that the majority of professionals, academics and scientists know little about Green Roofs.



House owner experienced the pleasure of going "green".

As a Green Roof aficionado, in the last five years I have been progressively engaged in trying to convince people about the benefits. Mainly people's initial objections to Green Roofs are concerned with the roof leaking or that it will become wet inside. After, they will often ask if it grows wild and whether they will need to go up to trim it. Before you are able to fully explain everything the question of irrigation will come up. If we proceed successfully, the next query will be whether it attracts bugs. We then explain that it is one of the intentions of the Green Roof to be attractive to other types of life. Not everyone accepts this idea at first. However, one common point is that everyone would like to open the window and enjoy a more nature friendly scenario than we have nowadays in our city.

In the far south of Brazil we are experiencing a certain boom where ecological roofs have started to spread due to a small enterprise. The matter is that new, practical modular construction methods of extensive Green Roofs, ([www.ecotelhado.com.br](http://www.ecotelhado.com.br)) has brought the costs down and made Green Roofs affordable to the average person. For the first time here thermal comfort has been given a commercial focus and has made an impact. Once small Green Roofs started to show up throughout the city of Porto Alegre, people started to become curious about them. As the media helped spread interest, a new favorable atmosphere has been created among architects, building companies, city environmental departments and academic researchers. As living roofs can satisfy many sustainability policy requirements in modern cities governments have reason to start creating incentives. I figure that we are next to a turning-point.

*João Manuel Linck Feijó  
Agronomy Engineer, Brazil*



Modular light-weight system Ecotelhado allows installing 120 sqm in one day.

### The next IGRA-newsletter will feature the following topics:

- Extensive, Semi-Intensive or Intensive Green Roofs: Decision Support and Typology
- Subaru Show-"Roof": The First Drive-Through Roof Garden in Singapore
- Green Roofs Worldwide: Focus Spain

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The International Green Roof Association (IGRA) is a global network for the promotion and dissemination of Green Roof topics and Green Roof technology.

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