

# Green Roof NEWS



International Green Roof Association  
Global Networking for Green Roofs

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– Safe Section Changeover

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Title image: IGRA



Dear Reader,

Even the best laid Green Roof plans can go wrong if the underlying roof is not prepared to meet demands. In order to improve information exchange at the interface of roofing technology and vegetation technology, the International Green Roof Association has created a practical brochure: “Bridging Trades – Safe Section changeover”. We present the exclusive brochure contents and provide you with a link to a free download of the document in this edition of Green Roof News.

The practical planning, installation and maintenance of Green Roofs is also on the agenda of the upcoming 4<sup>th</sup> International Green Roof Congress 2015 in Istanbul. Registration is now available. You can find information about the exciting programme and the attractive early birds discounts as well as further reports from spectacular Green Roofs in Armenia, Germany and Singapore on the following pages.

Have fun reading!

Sabine Frueh  
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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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## MAIN THEME New IGRA Guidelines:

## Bridging Trades – Safe Section Changeover



The constantly growing number of Green Roofs is bringing safety aspects into the focus. Even the simplest building construction requires close cooperation between all partners involved. The same applies to the creation of Green Roofs when the Green Roof installation follows the roof construction and waterproofing work. Lack of information flow, uncertainties about examination criteria and missing safety measures can create a risk of failure. This regards, for example, the due diligence of the landscape contractor while working on the sensitive waterproof membrane and the inspection of the waterproofing before installing a Green Roof.

Therefore, the International Green Roof Association (IGRA) has developed a new guideline, "Bridging Trades – Safe Section Changeover: Roofing Technology – Vegetation Technology"

The content of the IGRA Guidelines is made up of two main modules:

- A checklist that provides a clear and concise overview of current examination criteria for the roof and vegetation technology interface.
- A commentary volume that provides further explanations and graphic material of all technical terms and questions in the checklist.

## CHECKLIST AND LOG "SAFE SECTION CHANGEOVER"



Master copies for the technical examination of the roof area before Green Roof installation begins

- Checklist "Safe Section Changeover"
- Log "Safe Section Changeover"

The guideline is not only designed for Green Roof installers and roofers. It is also designed for architects, planners and developers who can take advantage of the practical and legal references.

The guideline provides a compact summary of the most important examination criteria and topics which will save a lot of work for all concerned. Its application is not restricted to the technical inspection. It can also serve as a basis for coordinating the roofer and

Green Roof installer work during the project planning phase. When contractors work hand in hand, not only does it lead to a smooth construction sequence and maintained deadlines, but the separate awarding of contracts also generally increases the quality of the work.

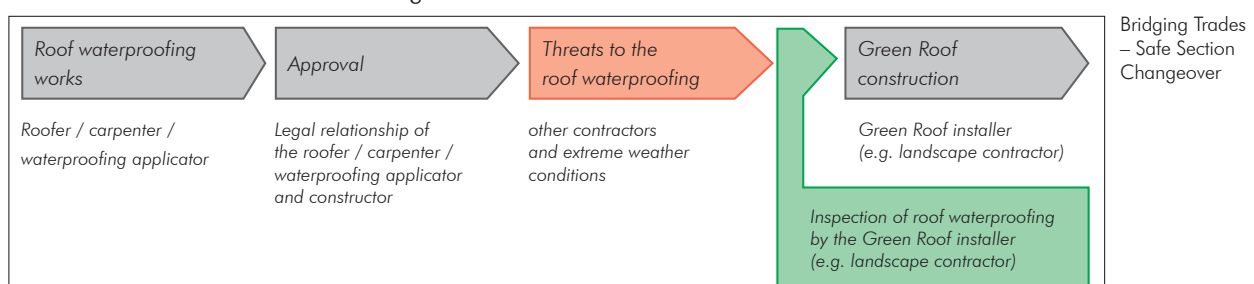
Before commencing with the landscaping work, the Green Roof installer should inspect the initial work carried out by the roofer for defects or damage (this is even mandatory by law in some countries). This may be carried out as a technical examination with the constructor, the architect/planner and the roofer who performed the waterproofing. Such a direct exchange of information allows for a rapid inspection of the roof construction. Any problems can be rectified promptly. This examination provides an extra measure of safety for all involved. Special attention is to be paid to:

- The roof substructure and waterproofing must be compatible with the selected Green Roof system (intensive, semi-intensive or extensive) both qualitatively and functionally.
- Waterproofing and roof details must be carried out professionally and be free from defects.
- Special safety measures are to be taken for the transition period after the waterproofing work is finished and before the Green Roof installation starts.

## The 4 Step Inspection Process

## 1. Compilation of important documents

Copies of the bid index and the tender specifications with accompanying planning documents, roof detail drawings and roof plan will be needed, as will the building details (roof size, building height, roof pitch and orientation, type of substructure, design load criteria) and national building regulations and planning approval restrictions. The manufacturers' guidelines for the installation of the waterproofing also need to be presented, as adherence to them forms the basis for the waterproofing guarantee. The acceptance report from the construction site manager and roofer confirming proper construction of the roof deck and the waterproofing would also be helpful.



The intended use of the roof area often determines whether a building permit for the Green Roof is needed from the local authority. Intensive Green Roofs or Roof Gardens which are designed to be used as a living and leisure area normally require a permit. All other forms of extensive or low maintenance Green Roofs normally do not require any special permission.

## 2. Inspecting the Roof Construction and Roof Waterproofing

Green Roofs can be realized on different types of roofs. Wooden constructions, metal sheeting as well as reinforced concrete decks can be considered appropriate roof substructures. The base for the Green Roof is a roof construction with appropriate load bearing capacity and specifications which meet the requirements of the selected Green Roof type. Roof construction inspection should therefore cover the following points:

- Sufficient Design Load Criteria
- Consideration of Roof Pitch
- Reliable Roof Drainage
- Height of Abutments at Roof Details
- Design of the Waterproofing System
- Securing against Wind Uplift
- Quality and Root Resistant Certificate of the Waterproofing
- Roof Use and Fall Protection Systems
- Permanent or Temporary Irrigation Water Supply



Roof edge bitumen waterproofing

Inspection of the waterproofing is to be carried out very carefully and can be done on a dual tier basis. A visual inspection is obligatory as a first step. If there are external contractors working on the roof during the transition period between waterproofing approval and the Green Roof pre-installation inspection, or if there are other reasons for an increased danger potential, extra caution is needed. In the case of obvious bad workmanship, or if a technical norm requires a more thorough examination, the visual examination is insufficient. It might be necessary to bring in experts. Furthermore, there are various testing procedures for finding leakages and damaged roof sheeting. The following aspects need special consideration:

- Conformity of the Waterproofing Work with Standards and Guidelines
- Inspection of the Roof Surface
- Integrity of the Lap Joint
- Construction of Roof Details
- Ceiling Top Floor

The results of the technical inspection should be com-

pleted in a written report. Photographic documentation of the technical inspection is advisable.



Welded seams on bitumen sheets/welding plastic sheeting

## 3. Section Changeover

A Green Roof can only provide excellent waterproofing protection against mechanical damage, material aging and effects of the weather once it has been completed. Therefore, adequate protective measures need to be taken until Green Roof installation starts. Construction coordination for the transition period should also be agreed upon by all involved parties during the planning phase. A lot of costs can be spared by forming agreements across sections concerning the use of cranes, scaffolds and other building site equipment. Topics to be discussed are:

- Hazards of the Roof Waterproofing (third party contractors, extreme weather conditions etc.)
- Safety Measures during the Transition Period (regulating access, usage of protective covers etc.)
- Fall Protection Systems during Installation Work
- Safe and Easy Access to the Roof Area during Green Roof Installation

Trade-spanning use of site facilities ...



... for roof waterproofing ...



... and Green Roof installation.

#### 4. Reporting Concerns

Any concerns resulting from the technical inspections should be submitted to the building owner or architect immediately together with documented proof and a description of possible consequences of negligence.

#### Closing Words

The building owner expects all partners involved to use their experience and qualifications to guarantee the successful establishment of the Green Roof. At the interface between the roofer and landscape

contractor working package, this involves expert assessment of each work stage by the next company. The first purpose of the technical inspection prior to Green Roof installation is to guarantee an accurate roof construction and waterproofing work which is key to long-term success of the Green Roof. The second purpose is to reinforce the credibility of the Green Roof installer and to leave the building owner with a feeling of a Green Roof job well-done.

The online version of the brochure is available as free download, just visit:

<http://www.greenroofworld.com/EN/press.html>

### MAIN THEME Basic Green Roof planning: Roof Construction



Extensive roof greening: attractive ecological protective cover

**From the design engineer's perspective, a roof is only the uppermost exterior component of a building. It is an integral part of the external shell, satisfying human protection requirements – protection from climatic influences, rain, wind, and sun as well as protecting people and property inside the building. Thanks to its characteristics of providing space (as a result of its gradient), the flat roof or low-slope roof – as special type of roof – demands being designed and used as an additional space. Green Roofs and roof gardens serve this task well.**

Landscapes emerge on the roof with various surfaces, gardens and walkways, different kinds of plants. From this perspective, the question for the technically knowledgeable person is how to design the roof construction over the roof's basic function of weatherproofing – and how to eliminate any additional risks accruing from this. The effects of a Green Roof designed in a visually appealing fashion are quickly overshadowed if, for example, the sealing fails and the roof leaks. Technical regulations are available which can be used as an aid in producing functioning, thermally-insulated and sealed roofs that can be greened.



Intensive roof greening: utilized roof areas need higher load reserves

#### Rules and standards

One will need a basic set of technical rules and standards to start planning a roof that is thermally insulated and sealed. Most developed countries have a system of standardization by which technical quality and manufacturing specifications, as well as installation and maintenance techniques, can be controlled. Generally, these sets of standards are published by specialty associations that deal intensively with that particular field. In Germany, for example, the DIN system is predominant; rules on rooftop waterproofing materials and technique are published by a national German roofing and waterproofing association, and corresponding rules for Green Roofs are produced by the Landscape Research, Development & Construction Society (FLL).

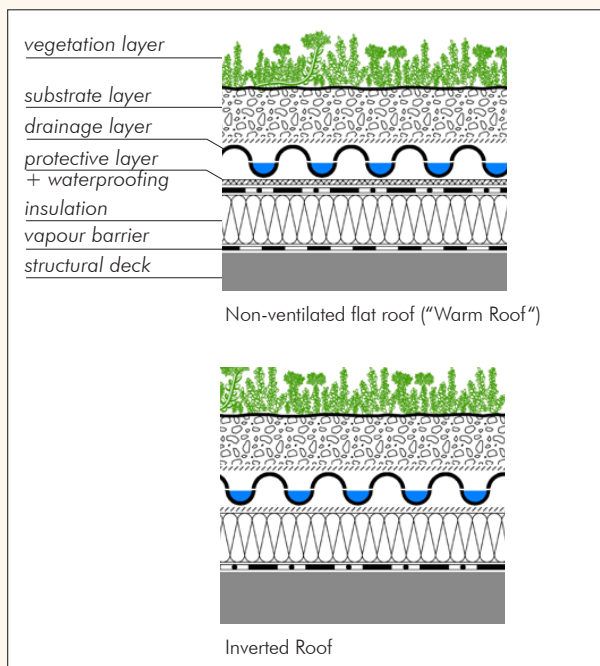
Standardization ensures reliability and efficiency throughout the construction process. The relevant set of regulatory conditions should be sought out and utilized on a country by country basis.

## Methods for sealing Green Roofs

There are various methods for sealing rooftops. The three most common are bituminous waterproofing, plastic sheeting, and liquid sealing compounds. Each has a range of advantages and disadvantages, specific handling, installation and maintenance techniques. These can of course be found through materials suppliers or the aforementioned standardization associations. Interestingly, the dominance type used varies by continent. However, the goal is simple and singular: a lightweight, durable and affordable sealant layer to keep water out of the roof.

## Roof Construction

Green Roofs are divided into non-ventilated, single-layer construction method and inverted roofs. The thermal insulation layer in the non-ventilated flat roof ("Warm Roof") is beneath the sealant, whereas in the case of the inverted roof insulation is laid on top. The following diagrammatic sketches illustrate the layer sequences resulting from the construction method:



## Root resistance

All building materials for roof sealing that are used beneath Green Roofs must be root-resistant. Root protection may be provided through a sealant or through an additional root protection sheet. A method to demonstrate the root resistance of sealing materials in order to ensure root protection was created by the German Landscape Research, Development & Construction Society (FLL) by specifying test criteria and repeatedly modifying these over the years. Differentiation is done by the testing duration taking place over 2 years in an air-conditioned, canopied test or 4 years under outdoor conditions.

As an alternative for the so-called FLL test pursuant to the rules of the FLL there is testing according to European DIN standard DIN EN 13948 "Flexible sheets for waterproofing – Bitumen, plastic and rubber sheets for roof waterproofing – Determination of resistance to root penetration". This method deviates considerably from the FLL test. The most serious difference lies in the simplified testing without stress on the test sample by the particularly root-aggressive rhizome-forming quack grass.



Test plants: Fire Thorn and Couch Grass

Ideal conditions for plant / root growth in the 2 and 4 annual audit

Certified "root resistant" no root penetration in the test membrane

## Detail structure

The detail structure should be carried out after proactive planning. The technical rules and standards as mentioned at the beginning offer support for this. In the case of inverted roofs, the system details as specified by the system suppliers shall apply.

Specifics for greened areas are:

- ensuring that the border area is kept away from plant cover at a width of 50 cm.
- protecting the opening sealing from mechanical damage at perimeter components and penetrations through suitable bendable, resistant building materials, for example, using appropriately canted metal sheets.
- ensuring a permanently functioning area drainage.

## Roof pitch and drainage

To ensure greening growth, a reliable irrigation balance for the roof area should be planned and provided. This may be achieved by a slope, or in some cases through a dam-up method. In addition to a sufficiently dimensioned roof drainage, a slope in the plane of the roof sealant may be helpful – except for a roof garden with water dam-up: in this case a roof without any slope would be advantageous.

## Fall protection

In order to ensure the safety of persons working on the roof who are, for example, assigned to carry out upkeep and maintenance work during the utilization phase of the building, roping-up or other protective devices against falling from the roof should be provided for them.

## Transfer of trades

After sealing of a roof, verification should be carried out in all cases prior to applying the Green Roof. This process should be conducted carefully and with all responsible parties present in order to achieve consensus and reliability. The guideline document "Bridging Trades – Safe Section Changeover" can serve as a helpful tool in this process.

*Andreas Frank, Certified Expert for Flat Roofs and Waterproofing Membranes, Germany (summarized version)*



Tried and tested: fall protection systems which do not penetrate the roof



Maintenance and care access points with extensive Green Roofs

## MAIN THEME Look Beyond the Backyard:

## Interview with Roland Appl, President of IGRA



Roland Appl, President of the International Green Roof Association (IGRA), answers a few important questions pertaining to the release of the new IGRA document, "Bridging Trades – Safe Section Changeover".

### 1. Why has the IGRA released this document, Bridging Trades – Safe Section Changeover?

The information transfer at the interface of the roofing and vegetation technology is of special importance for the success of a Green Roof project. This is one of the essential Green Roof market experiences we have made in Germany. Since the theme of "Trade Transition" is not limited to Germany, but rather exists in a similar way worldwide, we at IGRA have decided to compensate for that obvious information gap with this new brochure.

### 2. What, in a brief overview, is the content of the document?

The content is divided into three main parts.

The first part describes the practical benefits for the user, which can come from both the design area, as well as from the areas of planning and installation. Also described are the auditing obligations of the Green Roofer in respect to the work completed previously by the Roofing specialists. This first section also describes relevant standards and guidelines. The second part consists of reproducible checklists and report templates that, if adhered to, ensure that all essential working points are observed and that nothing is forgotten during the work changeover. The third part goes into more depth, including photos, illustrations, and background information on what to look for in detail when conducting a trade transition.

### 3. Why was this document necessary?

Companies that are dealing for the first time or only for a short time with Green Roofs often lack the expertise that is necessary to assess waterproofing work previously conducted on the roof. While this document cannot replace years or even decades of experience, it can prevent you from forgetting or overlooking important things, thereby preventing potential roof damages.

#### 4. What do you anticipate to be the impact of this document?

I hope that this guide will allow the transition between the roofing specialists and the Green Roof technical crew to occur as smoothly as possible, without problems, because this is key to the realization of a Green Roof as a long-term sustainable structure, one that will need no repairs during its lifetime.

#### 5. Who will make use of it? Do you think this document will be used internationally?

The brochure can be of use to all that work with the planning, coordination, and in particular the implementation of Green Roofs. Of course, there are various international standards and norms but also

international preferences. But wherever roofs are built with sensitive outermost waterproofing layers, which could stand for weeks or even months before Green Roof installation starts, there is the danger that the seal could sustain damage. The interest to avoid such roofing vulnerabilities and uncertainties is, in my experience, found everywhere in the world.

#### 6. For how long will this document be relevant? Will it be updated in the future?

Since the construction of flat roofs will not revolutionarily change in the near future, this brochure should not lose its relevance for many years. However, in the case of technical development or new discoveries realized through reader feedback, new editions will be updated appropriately.

## EVENTS 4<sup>th</sup> International Green Roof Congress 2015 in Istanbul/Turkey: Join the Green Roof Network

### 4<sup>th</sup> International Green Roof Congress

20 - 21 April 2015  
ISTANBUL

Accelerating international interest and investment into ecological design is the current reality, either in the forms of environmental planning, urban storm water management or living architecture. The incorporation of Green Roofs and facades of fantastic scale and biodiversity is quickly gaining a forefront position in global architectural concerns, and a great many professional disciplines will find their fields affected by this change. Whether specializing in planning and design, architecture, landscape architecture, urban ecology or environmental science, informing oneself and keeping an edge on the most up-to-date research and techniques is critical for success. The 2015 International Green Roof Congress in Istanbul is an international summit of experts and leaders in this exciting new realm; a unique opportunity for exchange and discussion of the most current achievements in this field.

#### Congress programme

The 4<sup>th</sup> International Green Roof Congress will host important players involved in the promotion of Green Roofs worldwide, through exceptional works of architectural achievement. The congress languages are English and Turkish (simultaneous translation).

The first plenary sessions on Monday will include an address to question of longevity and reliability in Green Roofs by Roland Appl, president of IGRA (International Green Roof Association). In a series of clear steps, the foundation of Green Roof technology will be established.

Upon this foundation, a series of groundbreaking and high-profile projects involving Green Roofs will be presented.



**Dr. Ken Yeang** was named “one of the 50 people who could save the planet” by The Guardian. His presentation to the Congress will consequently pertain to ecological architecture and master planning.



**Laura Gatti**, one of the designers behind the celebrated Bosco Verticale of Milan, Italy will present on the specifics of her project. Since the confirmation of her attendance to the Congress, Bosco Verticale has been awarded the 2014 International Highrise Award by a unanimous jury. This closely-watched project will be described by the design team themselves at the 4<sup>th</sup> International Green Roof Congress.



**Jaron Lubin**, of Safdie Architects, will be present to speak about the spectacular Green Roofs involved in two projects of that firm: the Jewel Project extension at the Changi Airport, and the Marina Bay Sands Hotel. Both located characteristically in the living architecture hot-spot of Singapore, these projects bring Green Roofs to a level of progressive design and technological finesse rarely seen before.



**Herbert Dreiseitl**, artist, landscape architect and founder of Atelier Dreiseitl will present on his longstanding topic of choice: water in the urban realm. This theme brings him as a valuable and knowledgeable resource to the Congress podium, where he will elaborate on the potentials of Green Roofs in urban water management.

A pair of workshops will take place on the second day of the Congress. These simultaneous workshops each address an important aspect of Green Roofing.

### Workshop 1: “Planning, Installation and Maintenance of Green Roofs”

This workshop will cover the physical and technical aspects of planning, installing and maintaining Green Roofs. An overview will be followed by the address of specific Green Roof aspects such as irrigation, plant selection and others. A case study in the form of the Zorlu Center itself will serve as a relevant and tangible example.

### Topics (Excerpt):

- Roofing and Vegetation Technology – The Basics
- Green Roof Design at the Architecture and Landscape Intersect
- Plant Selection for Extensive and Intensive Green Roofs

### Workshop 2: “Green Roof Policies and Research”

How can urban densification be combined with the improvement of the Green City Infrastructure? This workshop will demonstrate the possibilities of Green Roofs as an urban planning tool based on national and international case studies. In addition, new scientific findings will be presented.

### Topics (Excerpt):

- The Green Roof Strategy of Hamburg/Germany
- Adaptation to Climate Change in Urban Areas
- Energy and Stormwater Management Aspects of Green Roofs

The congress programme will be complemented by an accompanying trade show.

Succinctly, the 2015 International Green Roof Congress will be a powerhouse event of international expertise and exchange in the swiftly growing field of Green Roofing.

### Congress Venue

A beacon above the Bosphorus, positioned in the Zorlu Center, Raffles' newest hotel is a timeless fusion of inspired architecture, ravishing luxury, gastronomic innovation and serious cultural chic. With its generous events and convention area and modern multimedia technology, Raffles Istanbul offers optimal conditions for a successful congress.

### Early Bird Registration and Accommodation

The registration fee for the congress, including workshops, working materials and meals, will be EUR 450,- (plus VAT). Early bird registrants (Deadline 20<sup>th</sup> of February 2015) will receive a 20 % discount, as will members of supporting organisations. Arrangements were made with several hotels in the vicinity of the congress venue. For detailed information please visit the website [www.greenroofworld.com](http://www.greenroofworld.com).

## Spectacular Green Roof Project: "Bosco Verticale" Wins the International Highrise Award 2014

The jury of the International Highrise Award (IHP) 2014 resolved unanimously: the residential highrise Bosco Verticale in Milan/Italy has won the prize, worth EUR 50,000, for the world's most innovative highrise. The firm Boeri Studio (Stefano Boeri, Gianandrea Barreca, Giovanni La Varra), now Stefano Boeri Architetti and Barreca & La Varra, and the developer Manfredi Catella (Hines Italia SGR S.p.A.) received the prize statuette and the prize money at the awards ceremony in Frankfurt's Paulskirche. The IHP prize was awarded by Prof. Felix Semmelroth, the City of Frankfurt Deputy Mayor for Culture, and Dr. Matthias Danne, Member of the Board for Real Estate and Finance at DekaBank. Choosing for the Bosco Verticale, the IHP 2014 awarded a project that blazes the trail for greened highrises and can be considered a prototype for the cities of tomorrow. (Source: Deutsches Architekturmuseum (DAM))

**For more information please visit:**

[www.international-highrise-award.com/en/IHA\\_2014/prize\\_winner.html](http://www.international-highrise-award.com/en/IHA_2014/prize_winner.html)



Awards ceremony IHA 2014: Group picture with prize winner Boeri Studio, Hines Italia, Laura Gatti. Photo: Alexander Paul Englert

900 trees and thousands of shrubs, bushes and ground-cover plants – the sophisticated vegetation concept as well as the monitoring of the plant development will be presented by Laura Gatti at the 4<sup>th</sup> International Green Roof Congress in Istanbul / Turkey (20 – 21 April 2015): [www.greenroofworld.com](http://www.greenroofworld.com).



## GREEN ROOFS WORLDWIDE UWC Dilijan College in Armenia: Educational Facility in Accordance with Mother Nature



UWC Dilijan in autumn. Copyright: Tim Flynn Architects

**Tim Flynn Architects (TFA) is an international team of architects and designers with offices in London, Yerevan and Moscow. In 2007, TFA was commissioned to deliver the architectural design, interior design, fit-out and landscape design elements for UWC Dilijan College in Armenia. Project managing and carrying out work from the TFA London and Yerevan offices, and in collaboration with a large number of experts, engineers, suppliers and designers from Armenia and around the world, the aim was to design an inspiring educational facility built with state-of-the-art environmental principals that would be the first of its kind in Armenia.**

Back in 2006, the founders of the school, successful business entrepreneurs Ruben Vardanyan and Veronika Zonabend (RVVZ) developed a project to give back to their homeland of Armenia. A landlocked country with Turkey to the west, Georgia to the north-west, Azerbaijan to the north-east and Iran to the south-east of its borders, Armenia is a diverse yet troubled country which has suffered economically since the breakup of the Soviet Union and through the after-effects of its war with neighbouring Azerbaijan. RVVZ's dream was to build a learning facility in the Armenian town of Dilijan that would bring young people together, offering holistic educational experiences that were based on sharing and collaboration, where each student would be encouraged to act as a "Champion for Peace".

Situated on the verge of the beautiful Dilijan National park, initially the site comprised ten hectares of land, but as the ambition and size of the school grew, the masterplan was developed further to its site today of 88 hectares. Phase 1 was completed in October 2014 and includes a series of main school and residential buildings with its massing broken up to sit comfortably within its surrounds while also keeping the essence of the traditional Dilijan vernacular.

Playing fields, tennis courts and soft landscaping throughout invigorate the area. Completion of the whole campus is anticipated by 2020 and at full capacity this co-education secondary school will house 650 students and staff.



UWC Dilijan preparing the roof. Copyright: Tim Flynn Architects

For the hard and soft landscaping, TFA collaborated with Udo Dagenbach from award winning Glasser & Dagenbach landscape architects in Berlin. Together, their aim has been to design an ecologically sound building that nestles within and complements the spectacular landscape in which it sits. TFA and Glasser & Dagenbach wanted to keep the Dilijan population firmly at the centre of the project by using local labour and materials for construction – thus providing an additional environmental and economic benefit by keeping the supply chain to a minimum. The region is known for its unique biodiversity and it was a goal to make the most of the abundant natural resources that were available. There was little local expertise for landscaping works of this nature, so new standards had to be defined while finding ways to use the resources and plants which exist locally.



Native grasses of Armenia. Copyright: Tim Flynn Architects

The ethos of “putting back” has been at the heart of the design with an important concept for the school focused on restoring the natural vegetation which was disturbed during the construction phase. Therefore the former green orchard in the valley has been replaced by “putting back” the meadow on the roof and covering the vertical walls in plant modules. Volunteers and local workers helped collect native flora and fauna from neighbouring mountain meadows and along with hand cut grass sods, these have been used to frame the Green Roofs, providing the starting point for grass, flowers and herbs to flourish. Local workers



Hand cut grass sods will line the roof borders. Copyright: Tim Flynn Architects



Local volunteers collect grasses and flowers from the mountains. Copyright: Tim Flynn Architects

manufactured a blend of Dilijan soil which provides the basis for the roof and green wall substrate. There is a huge mining area for obsidian and ceolithe close to neighbouring Lake Sevan, so the mineral rich soil was mixed with local peat and lava – creating a unique and fertile soil blend for the walls and roof.

A complex system of planting schemes was created to ensure the right plant varieties for specific positions around the buildings with over 40 different species selected. A nursery of 4,000 m<sup>2</sup> has been set up within the school’s ground to mix soil and prepare the plant modules for the living walls –with the modules watered, fertilized and maintained on the ground for 6–8 months prior to installation. A key belief informing the landscape design has been that nature is indeed cyclical. Instead of engineering or forcing the maintenance of the grasses on the roof – there has been a focus to remain in-synch with the seasons of Dilijan. Due to the local conditions, 1,100 m above sea level and with 700 mm rain per year, no irrigation system was installed on the roof. As the air is often humid in the evenings, this provides ideal conditions for plants to work together with the seasonal elements of Dilijan. The roof thrives and grows along with the hot and cold seasons of Armenia.



A system of plant varieties for different areas. Copyright: Tim Flynn Architects

Nature is perfect in its imperfection and so must the plantings in time be allowed to grow and then enter a phase of dormancy– as the Byrds song from the 1960s goes: “To every season, turn, turn, turn”. By letting certain grasses and plants dry out in the hot Armenian summer, a different and more natural type of diversity is permitted to breathe and develop, in accordance with Mother Nature.



The shapely roof itself echoes its context by mirroring the curve of the mountains in the background. In time the vision is to grow full sized apple and poplar trees upon it. The hope is that by allowing the landscaping to remain as natural as possible – the indigenous species will take over one day, with the building camouflaged into its context. With this also comes a significant educational element where the students of the school will be able to help maintain and understand how and why things grow. The Green Roof will be used as an experimental field for the students. Their task will be to enrich the biodiversity of the school for generations to come, by collecting plants, implementing them on the roofs and monitoring throughout the years.

It is a proud moment for Armenia with UWC Dilijan College now one of the first schools in Europe to cover such large areas of its façade – 4,750 m<sup>2</sup> of Green Roof and 1,300 m<sup>2</sup> of vertical living walls. It is a project which proves that sustainable green architecture can be realised anywhere in the world, and without a loss of aesthetic quality.

### Project Data

**Location:** Dilijan, Armenia

**Green Roof:** 4,750 m<sup>2</sup>

**Living Wall:** 1,300 m<sup>2</sup>

**Architects:** Tim Flynn Architects

**Landscape Architects:** Glaser & Dagenbach

**Living walls provider:** ANS Group UK

### For further information:

About UWC Dilijan College: <http://dilijanschool.com/>

About the UWC movement: <http://www.uwc.org>

Tim Flynn Architects: <http://www.timflynnarchitects.com>

Glaser und Dagenbach (landscape architects)

<http://www.glada-berlin.de/framesetE.html>



UWC Dilijan Green Roof. Copyright: Tim Flynn Architects



UWC Dilijan in context. Copyright: Tim Flynn Architects

Mixed Use Space :

## The Green Roof on Mainau



The Green Roof approximately doubles the usable space of the building. Copyright: Mainau GmbH

In 2011, the managing committee of the Isle of Mainau on the European Lake of Constance opened a design competition for the construction of their new restaurant. The result was a concept for a sleeker, smoother, more modern and more environmentally integrated design. Increased seating, full uninterrupted glass façade and terrace area with a view over the water, but most importantly, the new design would host a fully developed roof garden overhead. As of 2014, the Mainau Green Roof has opened to the public to great acclaim.



The harbor area of the Island of Mainau – In the foreground is the Comturey construction site. Copyright: Mainau GmbH

Also known as the Bodensee in German, the Lake of Constance is located at the geographical intersection of Germany, Austria and Switzerland. It is located less than two hours' drive from major cities such as Strassbourg, Stuttgart and Zurich. Home to a baroque castle, rose gardens and green houses, the site has an established history of visitation and tourism, with the impressive Swiss Alps visible on the horizon across the water. Now, those views can also be enjoyed from a pristine, colorful and diversely landscaped Green Roof.



In the bottom floor is the new Comturey-Restaurant. Copyright: Mainau GmbH

Coming out of the offices of Bregenz "HEIN architects" and landscape architect Thomas Steinmann from Winterthur, Switzerland, the fully realized Green Roof and restaurant development has actually provided the garden themed Island even more landscaped space than before. The Green Roof system provided by the German firm ZinCo encompasses a complete system build-up with generous soil depth and irrigation. As a result, the landscapers at Mainau have a great deal of expressive freedom with the range of plant species possible. In addition, the Roof Garden has a designed mixture of seating and walking space, inviting the approximately 1.2 million visitors annually to stop and stay a while. Sometimes referred to as "Blumeninsel" or "Flower Island" Mainau, the lavish gardens are certainly a central attraction to many visitors, and resultantly the new Green Roof has been well received.

This concept was a clever mixed-use solution for the Mainau management committee, which has, due to its island nature, relatively few square meters of flat earth for further development. The restaurant footprint is 2,000 m<sup>2</sup>, but utilizing the roof space created an additional 1,500 m<sup>2</sup>. Situated in immediate proximity to the harbor where many tourists arrive by ferry and boat traffic, the project was seen as having great potential for impressing and serving as welcoming gesture to the Mainau Island at large. After completion, the brief slope up from the water's edge and docked piers leads to nearly 80 meters of uninterrupted glass façade, behind which the restaurant, a small bakery, beer garden space and several other gastronomical attractions find place. The Green Roof has brought a certain new flair to the traditional site.



The Green Roof offers a perfect panorama over the Lake of Constance. Copyright: Mainau GmbH



The diverse garden arrangements lies in the hands of the park management. Copyright: Mainau GmbH

The Island is already studded with attractions, including greenhouses full of exotic plant species, traditional tulip and rose gardens, a large arched glass conservatorium containing the largest butterfly house in Germany, an adventure ropes course and naturally, the medieval Comturey Tower, a stone structure built on the island shortly after the turn of the 13th century. As a matter of fact, with a project budget of 7 million Euros, the new restaurant together with the Green Roof is the greatest monetary investment to the Island of Mainau. But with that investment comes a new image, and this one is even greener.

#### Project Data

**Location:** Insel Mainau, Germany

**Green Roof:** 1,500 m<sup>2</sup>

**Architects:** HEIN architects, Bregenz

**Landscape Design:** Thomas Steinmann  
Winterthur; Mainau GmbH



The installation of the Green Roof on the island was a logistical challenge. Copyright: Mainau GmbH

#### Moshe Safdie:

### “For Everyone a Garden”

Great cities have historically evolved and emerged over time, over the course of hundreds or even thousands of years of development. Today, architects are being asked to design at an unprecedented scale and speed outpacing this former rate of urban evolution, not to mention incredible density and new boundaries of height, particularly in the Far East. The scale of building is previously unimaginable, and this accelerated pace is redefining the way urban fabric is created and inhabited. The mega-city in future years will be the destination where we turn for greater opportunity, resources, and connection. As architects, in our professional role we must not then lose sight of the principles that make a city livable. A defining principle of Safdie Architects’ practice is to study and implement those principles that humanize the relationship of the citizen and the city.

When Moshe Safdie wrote *For Everyone a Garden* in 1974, he was referring to the earliest example of these studies, the iconic Habitat ‘67 project in Montreal, Canada. Habitat was designed as a fractal-shaped

structure of prefabricated housing unit blocks, stacked to maximize openness and views, bring in streaming natural daylight, and to position an individualized “home” within a larger community. Most importantly, each unit of Habitat had its own private roof terrace garden. To live with a garden, Safdie stated, was a fundamental human desire that was required to be satisfied.

The mission of Habitat was to identify a type of urban living that transcended what Safdie called “the decades-old malaise associated with apartment living,” and provide amenities and an environment not typically matched to urban life. Habitat’s ambitious goals were to replace vertical glass and steel apartment blocks with a new fractalized language of stacked and stepping boxes and to develop collective spaces within dense urban environments. The building was the exciting central exhibit pavilion of the 1967 World Exposition in Montreal and represented the utopian optimism of the day based on its radical implementation of a new housing strategy.

Today, Safdie Architects continues to study tactics which redefine the way we situate ourselves within the city, specifically through a dedicated Research Fellowship Program. Since the concept of roof gardens, skyparks, and hanging gardens has been a central theme to the practice and to the firm's philosophy since its inception, it is no surprise that the first research fellowship studied

the impact to bridge and network tall, mixed-use buildings, while a subsequent research topic aimed to revisit and rearticulate the objectives of the original Habitat project, once again "for everyone a garden." The practice-oriented research continues to inform current building projects globally from New York City to Singapore.



Marina Bay Sands Singapore 2010. Copyright: Frank Pinckers



Habitat Montreal 1967. Copyright: Safdie Architects

Sky Habitat Singapore 2011 – The challenge of high plot ratio was solved in this condominium design by positioning one-third of the units with an individual garden terrace, and multiplying the ground plane with three commonly accessible garden bridges.  
Copyright: Safdie Architects

From Commitment to Action :

## Hamburg Starts a 3 Million Euro Programme to Promote Green Roofs

At the 3rd International Green Roof Congress 2013 in Germany the Lord Mayor of Hamburg Olaf Scholz presented his plans for a comprehensive municipal Green Roof strategy for the first time. Now Germany's second largest city has made the decisive step to realization and adopted a Green Roof strategy in the amount of 3 million Euros.



At the 3rd International Green Roof Congress 2013 Hamburg's Lord Mayor Olaf Scholz gave an exclusive overview of the city's Green Roof strategy. From left to right: Reimer Meier (President DDV), Roland Appl (President IGRA), Olaf Scholz (Lord Mayor Hamburg).

The Green Roof strategy should connect the urban development policy goal of growing a compact city with a climate-friendly construction and the political objectives of adaptation to climate change and climate protection in new and innovative ways. With the increasing number of Green Roofs, temporary water retention should be improved even during strong rain events, biotope and species diversity should be increased, and the green volume in structurally dense neighborhoods should be improved. Roof surfaces made available in the concentrated city will also offer new visiting and recreational areas for citizens of the 1.8 million metropolis in the North of Germany.



Green Roofs – A strategy for climate change adaption in the city centre



Some of Hamburg's Green Roofs date back for more than 60 years.

**Financial Incentives and Building Codes:** In order to create more Green Roofs, Hamburg will begin a support program for Green Roofs in the amount of 3 million Euros in 2015, lasting for 5 years. Also, a split wastewater fee was introduced; if they have a Green Roof, owners pay only 50 % of the stormwater charge. In addition to this funding incentives for voluntary measures a binding regulatory framework will be developed in the Hanseatic city and the available legal instruments such as the Building Code, Zoning and the Nature Conservation law will be used more to create Green Roofs.



The new headquarter of the Authority for Urban Development and Environment Hamburg is leading by example. Copyright: Sönksen

**Demonstration Projects:** The city will also act as a role model and contribute to the construction of Green Roofs. The responsible municipal authorities are encouraged to gain experience in construction, maintenance and efficiency to identify suitable properties for Green Roofing, such as school or university buildings. Through new construction and renovation of public buildings, the realization of Green Roofs has to be considered, and then to realize, when it is economically reasonable and technically feasible to do so.

**Education and Information:** To ensure a sustainable anchoring of the Green Roof strategy Hamburg seeks dialogue with the public and the scientific community. It informs citizens and businesses and promotes future cooperation with different actors (homeowners, housing associations, builders, associations of logistics industry, commercial construction workers, city planners, architects, landscape architects, administrative staff, etc.). An internet platform addressing the organization, execution and communication of the Green Roof strategy for the (professional) public as well as the realization of the Green Roof projects will be presented.

**Research:** The Green Roof strategy will be scientifically accompanied by the Hafencity University Hamburg (HCU) through the implementation of a demonstration project in the form of a measurement program on the new Green Roof (1,300 m<sup>2</sup>) of the buildings of Hafencity University. A special focus of the research programme will be laid on the effectiveness of Green Roofs in stormwater management.

**Mission Green Roof:** The vision for Hamburg is to provide Green Roofs (intensive or extensive) on all new or suitable renovated flat roofs greater than 100 m<sup>2</sup>. At least 70 % of new buildings with flat or mildly angled roofs and suitable renovated flat roofs should be greened, of which 20 % will be usable as free room by residents or employees. At present there are already 2,000 buildings in the city with a collective Green Roof area of approx. 800,000 m<sup>2</sup>. However this only represents 1 % of Hamburg's total roof surface.

Hamburg's Green Roof manager Dr. Hanna Bornholdt (Authority for Urban Development and Environment), will present the practical implementation of the Green Roof strategy at the 4<sup>th</sup> International Green Roof Congress in Istanbul (20 – 21 April 2015, [www.greenroofworld.com](http://www.greenroofworld.com)).



One of the targets: Community Green Roofs

# 4<sup>th</sup> International Green Roof Congress

20 - 21 April 2015 | Istanbul (Zorlu Center) | Turkey

- Explore the nature on rooftops – spectacular Green Roof projects and practical workshops.



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