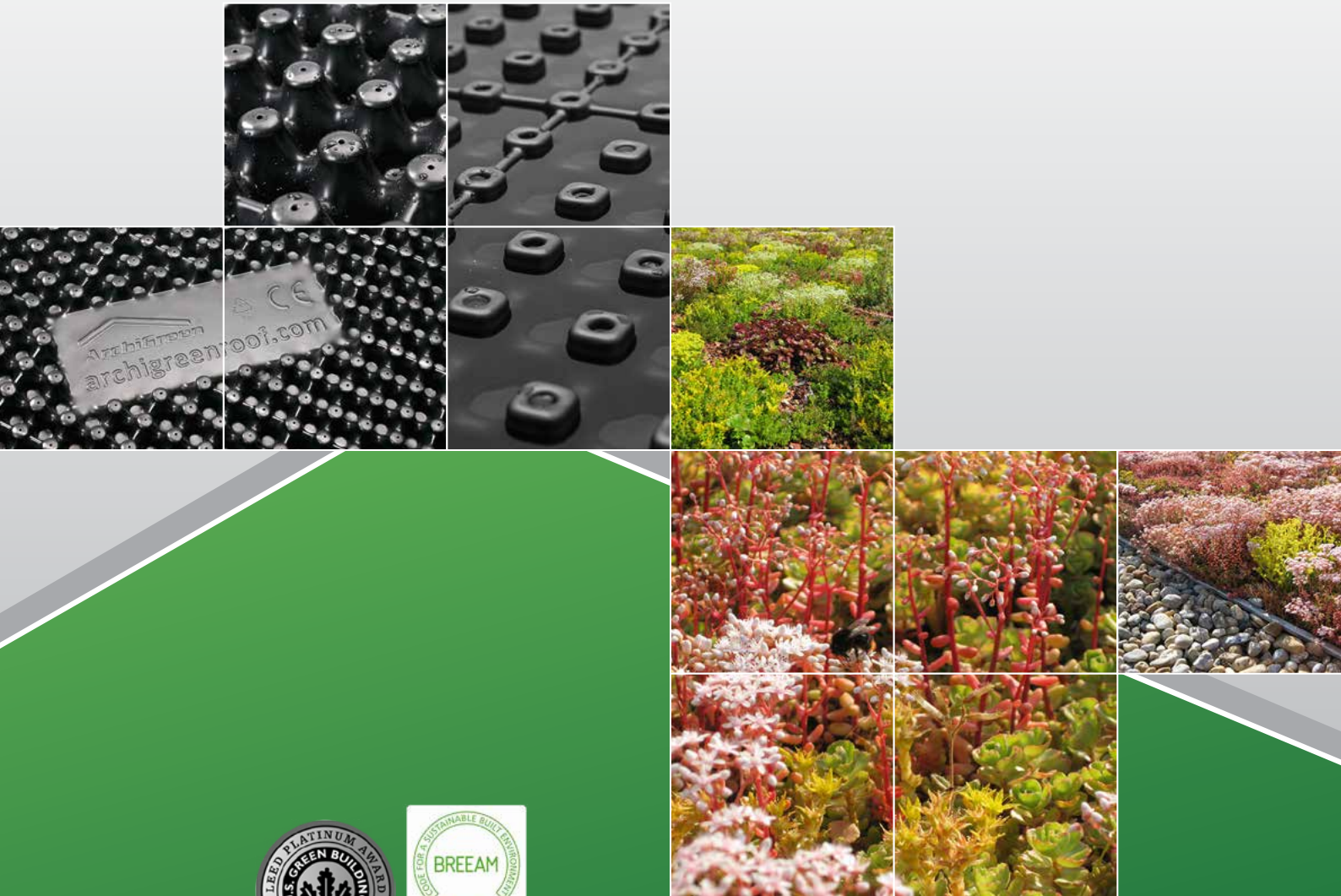




# Green roof catalogue



TESTED ▪ CERTIFIED ▪ WORKS



# Welcome to the world of green roofs

## Nature and technology

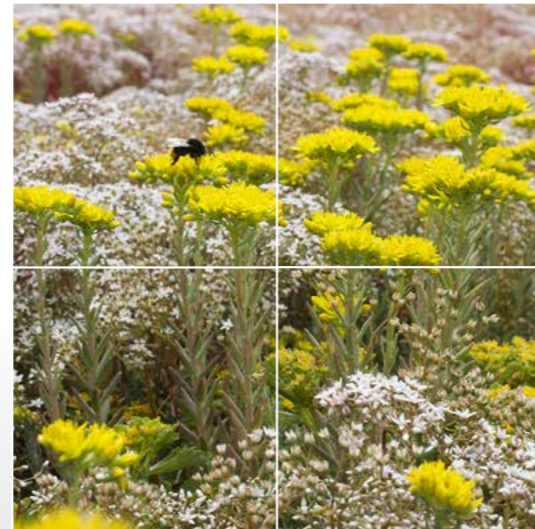
Two seemingly conflicting terms that largely influence our daily lives. In order to keep abreast of technological advances and enjoy the comfort that result from such progress, we may decide to move to crowded cities and settle there. However, after a while, the hustle and bustle of cities may seem unbearable to the extent that some of us may turn to nature for some tranquility and a breath of fresh air.

Day in day out city dwellers, especially of overpopulated cities, face growing environmental concerns including heat island effect and urban flash flooding (For further information on these topics please see page 20). In order to participate in the alleviation of such tensions, we at ArchiGreen Ltd develop, manufacture and sell green roof systems that have the benefits of mitigating summertime temperatures and also attenuating stormwater runoffs. ArchiGreen® green roof systems incorporating the SedumDrain® 25 water reservoir and drainage boards have been installed on many award winning buildings including the Green House (LEED Platinum award winner) in Budapest as well as The GSK Carbon Neutral Laboratories for Sustainable Chemistry (LEED Platinum and BREEAM Outstanding awards winner) in the University of Nottingham, England.

The global distribution network of ArchiGreen Ltd is continuously expanding since its establishment in 2011 owing to the outstanding quality of the products and their unmatched competitive prices.

## What is a green roof?

Green roofs often referred to as vegetated roofs, eco-roofs, living roofs or planted roofs are rooftops where plants are used to enhance the roof's performance, it's appearance or both. Green roofs fall into one of two basic categories: The minimal maintenance extensive green roof providing an ecological carpet of drought resistant vegetation and the high maintenance intensive green roof providing a full natural garden-like experience.



# Extensive green roofs

Extensive green roofs usually have a shallow substrate – the growing medium on green roofs – depth of 150 mm or less of coarse, mineral-based aggregate and are planted primarily with drought-tolerant herbaceous perennial plants and sedum species that are selected to suit the local conditions. For this reason, extensive green roofs are sometimes referred to as sedum roofs. This type of green roofs require regular irrigation and maintenance only in their initial phase of establishment but following their second summer these extremely sturdy plants should be able to get through drier periods quite well.

Once established, extensive green roofs require only minimal maintenance (2 to 3 times annually), limited to occasional weeding. They are not normally designed to provide access for leisure use but rather to provide a 'back to nature' look and offer strong ecological benefits. Owing to their lightweight, minimal maintenance and modest construction costs, extensive green roofs are the most popular type of green roofs in Europe. Some urban developers believe if built on a large scale in cities, extensive green roofs can deliver significant energy savings and other environmental benefits that improve the quality of urban life.



PROMOTING NATURE WITH GREEN ROOFS!



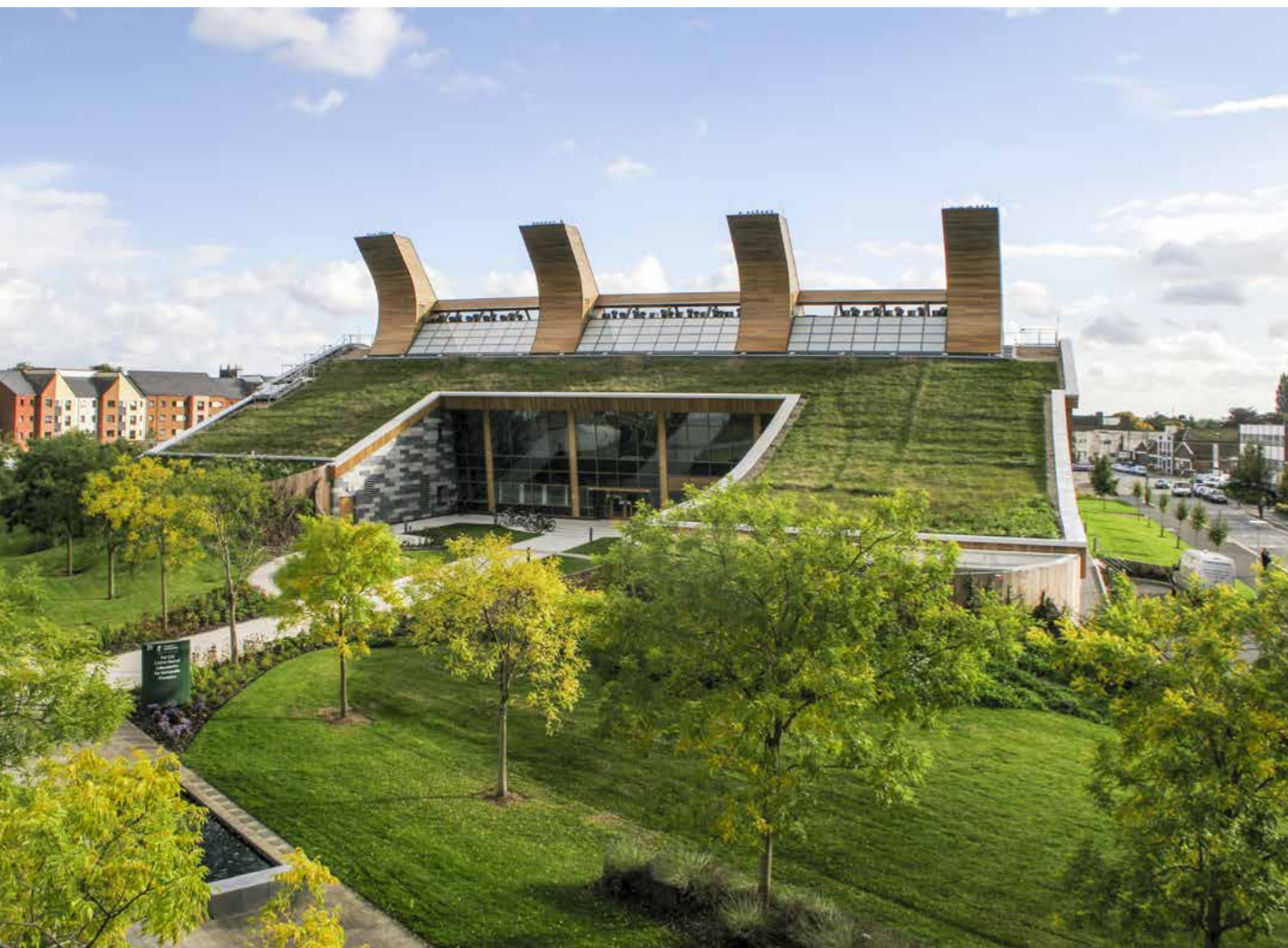


Petz Aladár county teaching hospital  
Healing environment



SUMMARY	
Year of construction	2012
Location	Győr Hungary
Type of green roof	120 m <sup>2</sup> of extensive green roof (plug planting and broadcast of sedum cuttings)
ArchiGreen® products installed	SL-I 125 separation layer for inverted roofs • SedumDrain® 25 water retention and runoff-delay drainage boards • FL 150 filter layer • IC-S 150 inspection chambers • SP-C AL 120/80 prefabricated ballast retention corner pieces • SDS engineered substrate for extensive green roofs





The University of Nottingham  
**Outstanding Architecture – Amazing Sustainability!**



SUMMARY	
Year of construction	2016
Location	The University of Nottingham, Great Britain
Type of green roof	1250 m <sup>2</sup> of extensive green roof (local wild flowers)
ArchiGreen® products installed	PL 300 protection layer • SedumDrain® 25 water retention and runoff-delay drainage boards • FL 150 filter layer Images related to the Nottingham University are courtesy of ICB (Waterproofing) Ltd which is an official UK distributor of the ArchiGreen® product range and SedumDrain® drainage solutions distributed under the brands EvaGreen® and EvaDrain® respectively in the United Kingdom





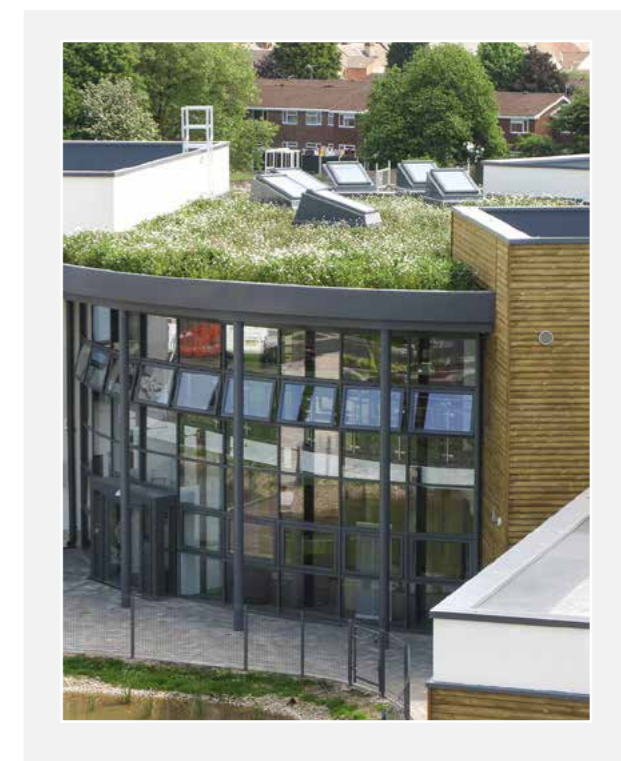


# Staffordshire - Scientia Academy

**Science and nature beautifully blend!**



SUMMARY	
Year of construction	2014
Location	Staffordshire, Great Britain
Type of green roof	55 m <sup>2</sup> of extensive green roof (wild flowers)
ArchiGreen® products installed	PL 300 protection layer • SedumDrain® 25 water retention and runoff-delay drainage boards • FL 150 filter layer Images related to the Scientia Academy are courtesy of ICB (Waterproofing) Ltd which is an official UK distributor of the ArchiGreen® product range and SedumDrain® drainage solutions distributed under the brands EvaGreen® and EvaDrain® respectively in the United Kingdom







## Győr - Multi-storey townhouse

**Green Quarter**



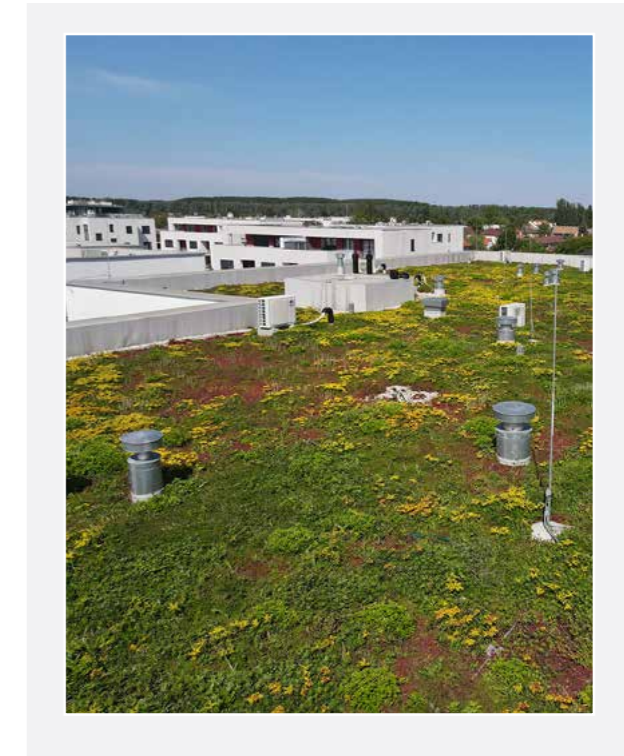
SUMMARY	
Year of construction	2020
Location	Győr, Hungary
Type of green roof	145 m <sup>2</sup> extensive green roof (sedum cuttings were broadcast over the substrate)
ArchiGreen® products installed	PL 300 protection layer SedumDrain® 25 water retention and runoff-delay drainage boards FL 150 filter layer SP AL 120/80 prefabricated ballast retention trims SDS engineered substrate for extensive green roofs





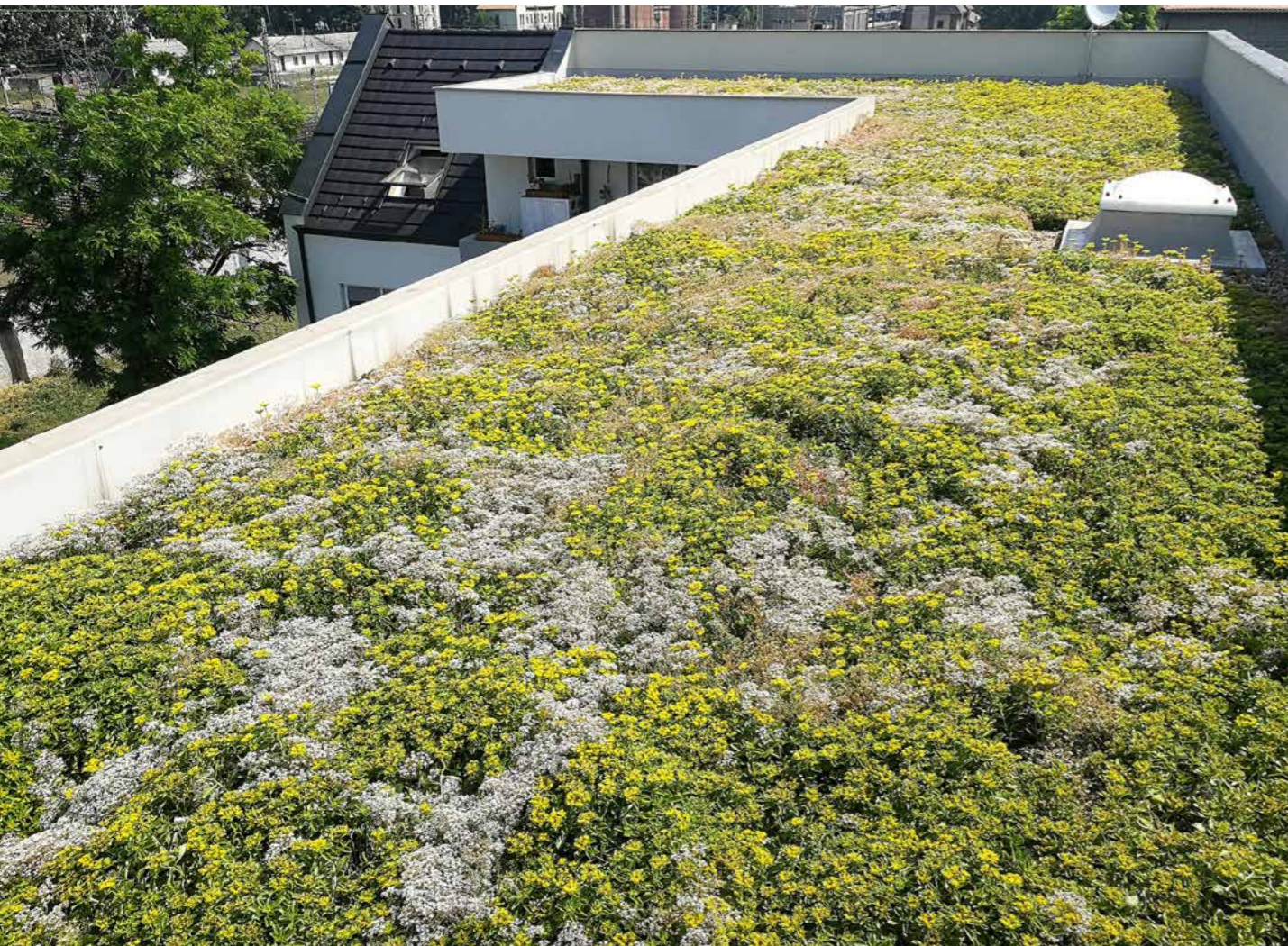


Győr - Detached house  
Green living community



SUMMARY	
Year of construction	2017
Location	Győr, Hungary
Type of green roof	803 m <sup>2</sup> extensive green roof (sedum cuttings were broadcast over the substrate)
ArchiGreen® products installed	PL 300 protection layer SedumDrain® 25 water retention and runoff-delay drainage boards FL 150 filter layer SP AL 120/80 prefabricated ballast retention trims SDS engineered substrate for extensive green roofs

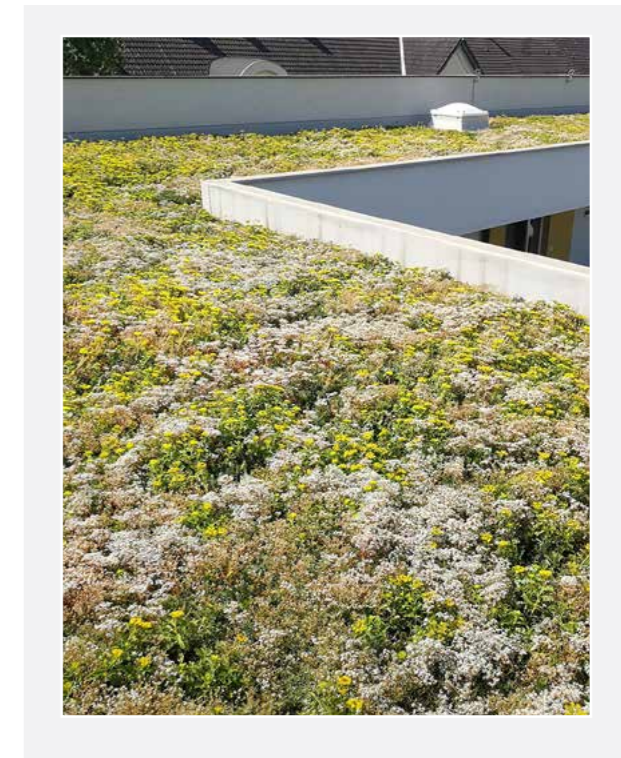




Győr - Multi-storey townhouse  
City centre



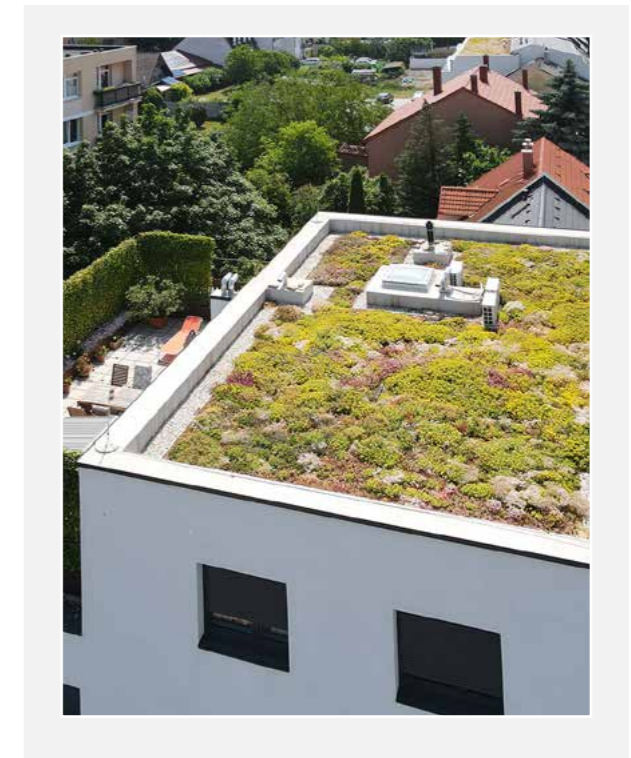
SUMMARY	
Year of construction	2016
Location	Győr, Hungary
Type of green roof	130 m <sup>2</sup> of extensive green roof (sedum cuttings were broadcast over the substrate)
ArchiGreen® products installed	PL 300 protection layer • SedumDrain® 25 water retention and runoff-delay drainage boards • FL 150 filter layer • IC-P 100 inspection chambers, near parapets • SP AL 120/80 prefabricated ballast retention trims • SP-C AL 120/80 prefabricated ballast retention corner pieces • SDS engineered substrate for extensive green roofs







Győr - Multi-storey townhouse  
**Roof with terrace**



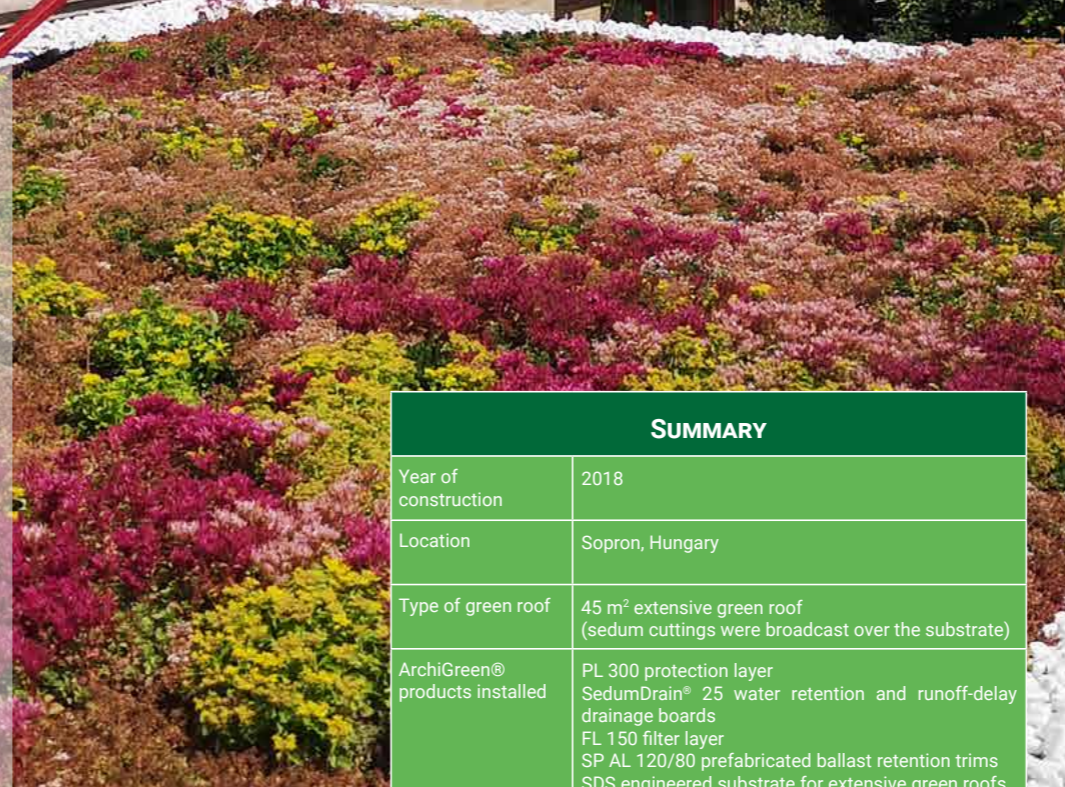
SUMMARY	
Year of construction	2020
Location	Győr, Hungary
Type of green roof	145 m <sup>2</sup> extensive green roof (sedum cuttings were broadcast over the substrate)
ArchiGreen® products installed	PL 300 protection layer SedumDrain® 25 water retention and runoff-delay drainage boards FL 150 filter layer SP AL 120/80 prefabricated ballast retention trims SDS engineered substrate for extensive green roofs





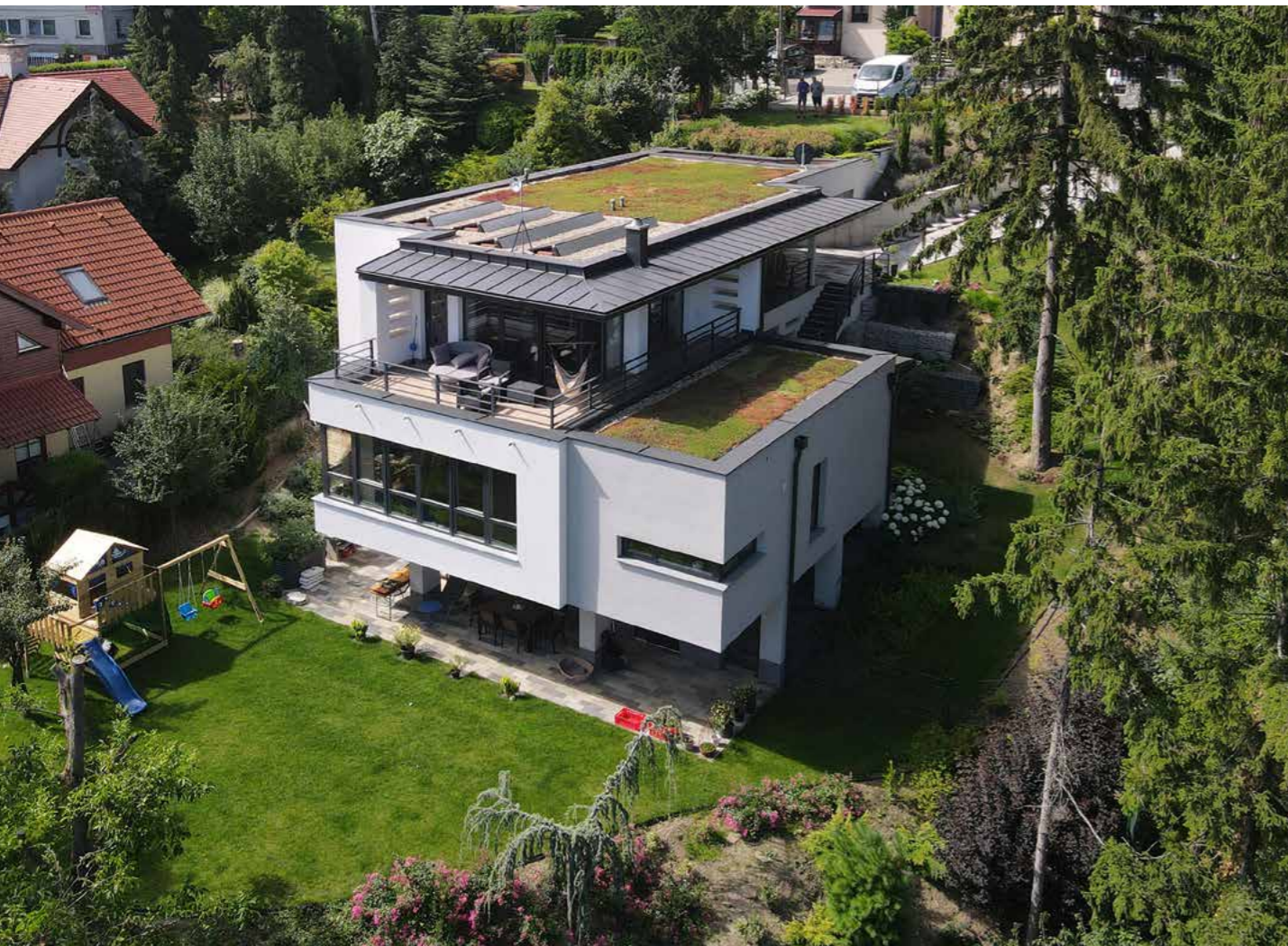
## Sopron - Detached house

**All in place**



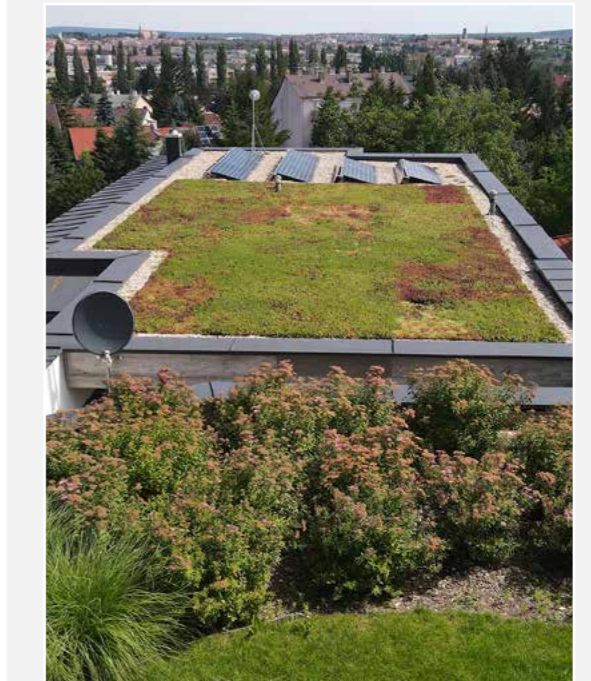
SUMMARY	
Year of construction	2018
Location	Sopron, Hungary
Type of green roof	45 m <sup>2</sup> extensive green roof (sedum cuttings were broadcast over the substrate)
ArchiGreen® products installed	PL 300 protection layer SedumDrain® 25 water retention and runoff-delay drainage boards FL 150 filter layer SP AL 120/80 prefabricated ballast retention trims SDS engineered substrate for extensive green roofs





## Sopron - Detached house

**A perfect fit**

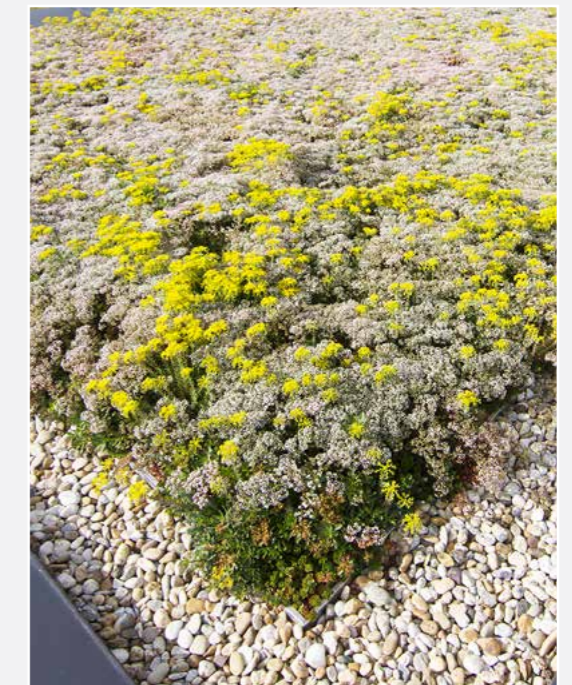


SUMMARY	
Year of construction	2016
Location	Sopron, Hungary
Type of green roof	120 m <sup>2</sup> of extensive green roof (pre-vegetated sedum mat)
ArchiGreen® products installed	PL 300 protection layer • SedumDrain® 25 water retention and runoff-delay drainage boards • FL 150 filter layer • IC-P 100 inspection chambers, near parapets • SP AL 120/80 prefabricated ballast retention trims • SP-C AL 120/80 prefabricated ballast retention corner pieces • SDS engineered substrate for extensive green roofs





Feketeerdő - Detached house  
**Sustainability and minimalism blend well**



SUMMARY	
Year of construction	2016
Location	Feketeerdő, Hungary
Type of green roof	70 m <sup>2</sup> extensive green roof (sedum cuttings were broadcast over the substrate)
ArchiGreen® products installed	PL 300 protection layer • SedumDrain® 25 water retention and runoff-delay drainage boards • FL 150 filter layer • IC-P 100 inspection chambers, near parapets • SP AL 120/80 prefabricated ballast retention trims • SP-C AL 120/80 prefabricated ballast retention corner pieces • SDS engineered substrate for extensive green roofs





Törökbálint - Detached house

Nature in a frame



SUMMARY	
Year of construction	2017
Location	Törökbálint, Hungary
Type of green roof	61 m <sup>2</sup> extensive green roof (sedum cuttings were broadcast over the substrate)
ArchiGreen® products installed	PL 300 protection layer SedumDrain® 25 water retention and runoff-delay drainage boards FL 150 filter layer SP AL 120/80 prefabricated ballast retention trims SDS engineered substrate for extensive green roofs



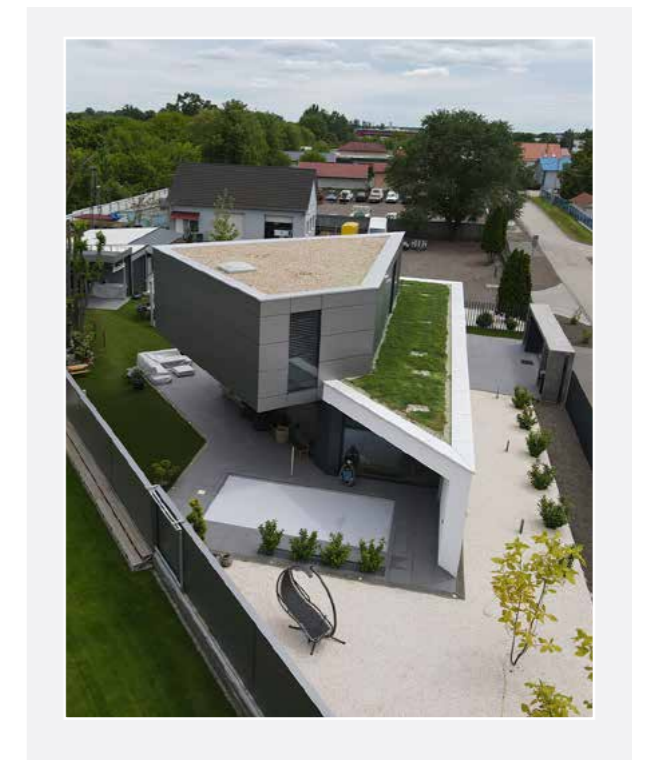


## Jászberény - Detached house

### Angles and shadows



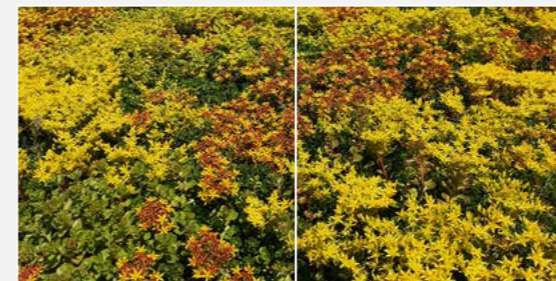
SUMMARY	
Year of construction	2019
Location	Jászberény, Hungary
Type of green roof	72 m <sup>2</sup> extensive green roof (sedum cuttings were broadcast over the substrate)
ArchiGreen® products installed	PL 300 protection layer SedumDrain® 25 water retention and runoff-delay drainage boards FL 150 filter layer SP AL 120/80 prefabricated ballast retention trims SDS engineered substrate for extensive green roofs







Börcs - Detached house  
**Flowers wherever I look**



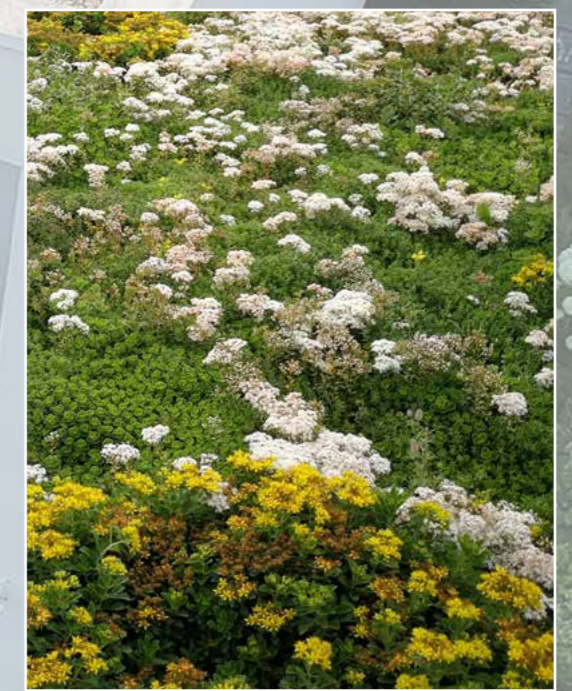
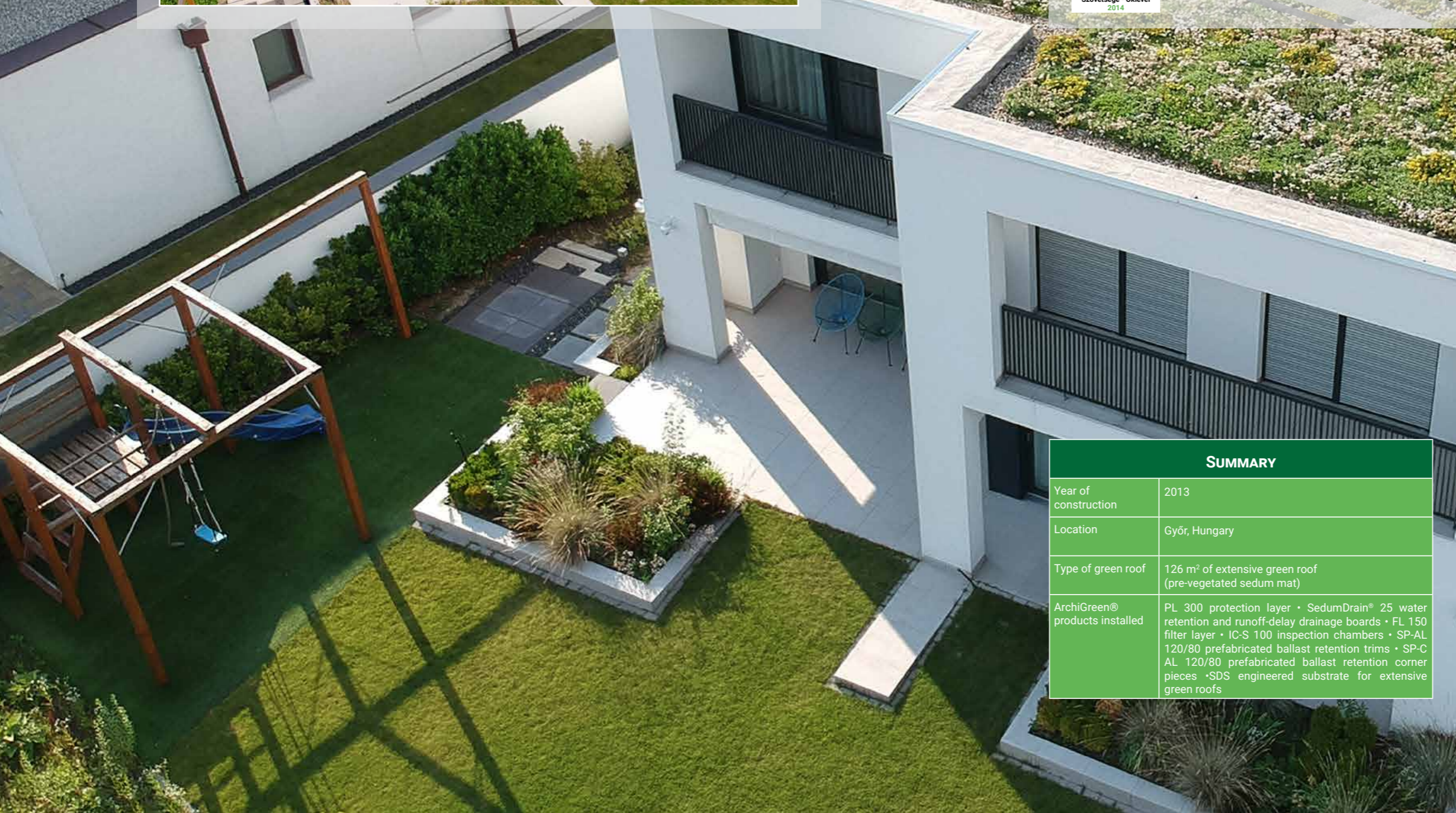
SUMMARY	
Year of construction	2019
Location	Börcs
Type of green roof	40 m <sup>2</sup> extensive green roof (sedum cuttings were broadcast over the substrate)
ArchiGreen® products installed	PL 300 protection layer SedumDrain® 25 water retention and runoff-delay drainage boards FL 150 filter layer SP AL 120/80 prefabricated ballast retention trims SDS engineered substrate for extensive green roofs





Győr - Detached house

We love promoting nature



SUMMARY	
Year of construction	2013
Location	Győr, Hungary
Type of green roof	126 m <sup>2</sup> of extensive green roof (pre-vegetated sedum mat)
ArchiGreen® products installed	PL 300 protection layer • SedumDrain® 25 water retention and runoff-delay drainage boards • FL 150 filter layer • IC-S 100 inspection chambers • SP-AL 120/80 prefabricated ballast retention trims • SP-C AL 120/80 prefabricated ballast retention corner pieces • SDS engineered substrate for extensive green roofs



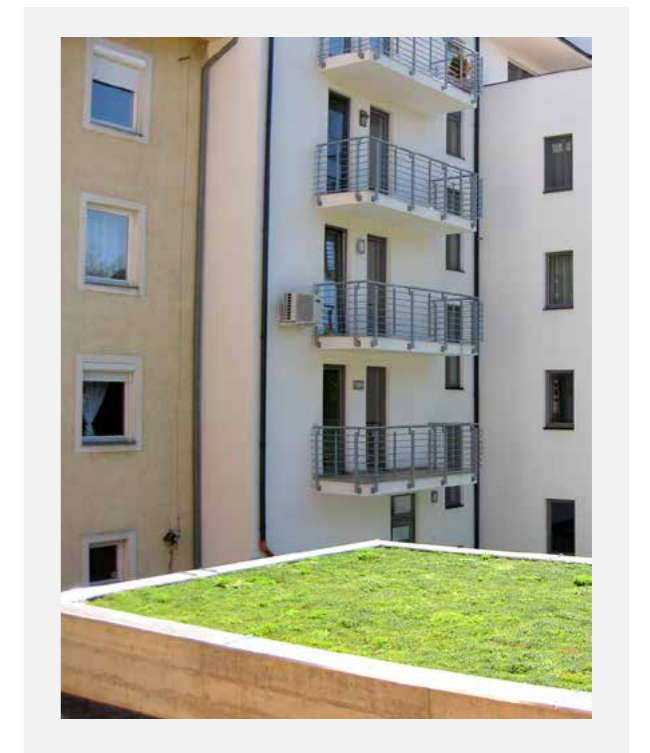


# Győr - Garage rooftop

## Plants all around



SUMMARY	
Year of construction	2014
Location	Győr, Hungary
Type of green roof	68 m <sup>2</sup> extensive green roof (pre-vegetated sedum mat)
ArchiGreen® products installed	PL 300 protection layer • SedumDrain® 25 water retention and runoff-delay drainage boards • FL 150 filter layer • IC-S 100 inspection chambers • SP-C AL 120/80 prefabricated ballast retention corner pieces SDS engineered substrate for extensive green roofs



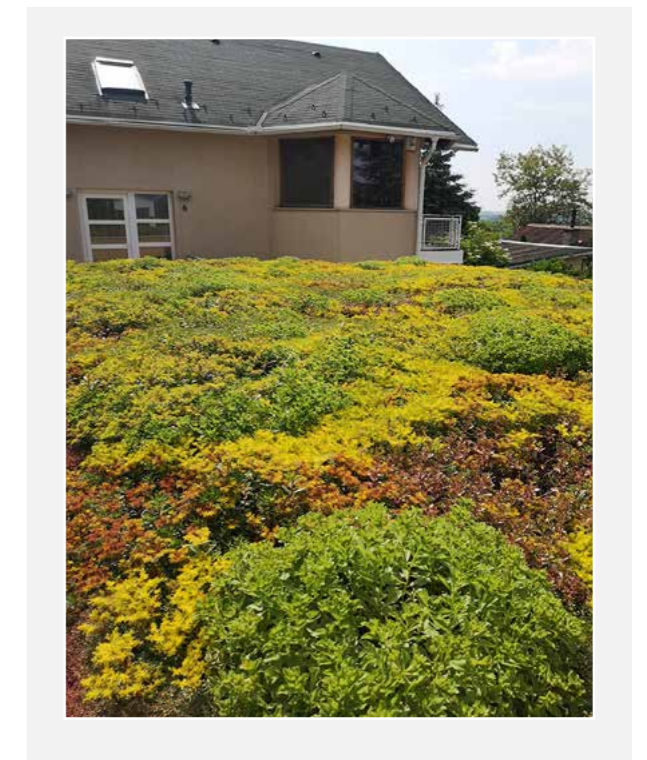




Fót - Garage rooftop  
It holds value



SUMMARY	
Year of construction	2018
Location	Fót, Hungary
Type of green roof	40 m <sup>2</sup> extensive green roof (sedum cuttings were broadcast over the substrate)
ArchiGreen® products installed	PL 300 protection layer SedumDrain® 25 water retention and runoff-delay drainage boards FL 150 filter layer SP AL 120/80 prefabricated ballast retention trims SDS engineered substrate for extensive green roofs





# The role of green roofs in urban development

## Urban flash flooding

Sudden intense, torrential rains known as flash floods are becoming more common. Handling such large volumes of precipitation in a well preserved natural environment is easily solved by nature since a significant portion of the water is absorbed and consumed by the vegetation, whereas the rest is percolated into the ground and stored as groundwater. However, in an urban setting, both permeable surfaces where water can freely drain and natural plants are scarcely available. Moreover, many cities are ill-equipped to deal with these unprecedented amounts of precipitation due to their insufficient and outdated stormwater infrastructure. Consequently, the amount of stormwater in the sewer pipes can easily reach capacity and overflow onto the impervious street surfaces wreaking havoc. Urban developers were quick to recognise the significant role that green roofs can play in mitigating flash-flood disasters due to the following factors:

- a significant proportion of the rainfall is stored by the vegetation and the layers of the green roof
- excess water is released into the sewer system with significant delay in a process known as horizontal detention. (For further information please see page 33 under 'Operational Principle')
- effectively filters the runoff from a lot of contaminating particles

Changing existing impervious ground surfaces to permeable ones or establishing special stormwater storage units or perhaps even establishing a systematic method of implementing new green fields in cities are some of the challenges that urban developers may have to solve in the long-run.

Meanwhile, green roofs can perfectly fit on the already established urban constructions, thereby capitalising on the benefits of green roofs on unprotected roof membranes.

## Urban heat island

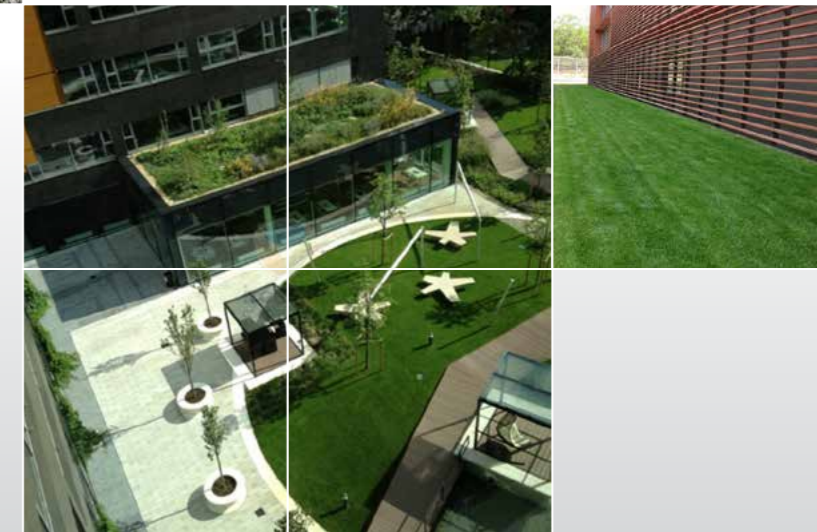
An urban heat island (UHI) is an urban area that is significantly warmer than its surrounding rural areas. The basic materials commonly used in urban areas for pavement and roofs, such as concrete and asphalt, have significantly different thermal bulk properties and surface radiative properties than the surrounding rural areas. This causes a change in the energy budget of the urban area, often leading to higher temperatures than surrounding rural areas. Another major reason is the lack of evapotranspiration (for example, through lack of vegetation) in urban areas. Other causes of a UHI are due to geometric effects. The tall buildings within many urban areas provide multiple surfaces for the reflection and absorption of sunlight, increasing the efficiency with which urban areas are heated. This is called the «urban canyon effect». Another effect of buildings is the blocking of wind, which also inhibits cooling and prevents pollutants from dissipating. Waste heat from automobiles, air conditioning, industry, and other sources also contributes to the UHI. High levels of pollution in urban areas can also increase the UHI, as many forms of pollution change the radiative properties of the atmosphere. A meaningful method of mitigating the urban heat island effect in cities is through the construction of professional green roofs on a large scale.

# Intensive green roofs

Intensive green roofs can function as natural gardens providing access for recreational use as well as providing an appealing sustainable design element on a rooftop. With their unrivalled appearance ArchiGreen® intensive green roofs can help in generating a unique vibe when merged with a roof terrace, a swimming pool, a pitch or a restaurant. Intensive green roofs, commonly referred to as roof gardens, are full-fledged gardens with at least a depth of 300 mm build-up installed often on underground parking lots.

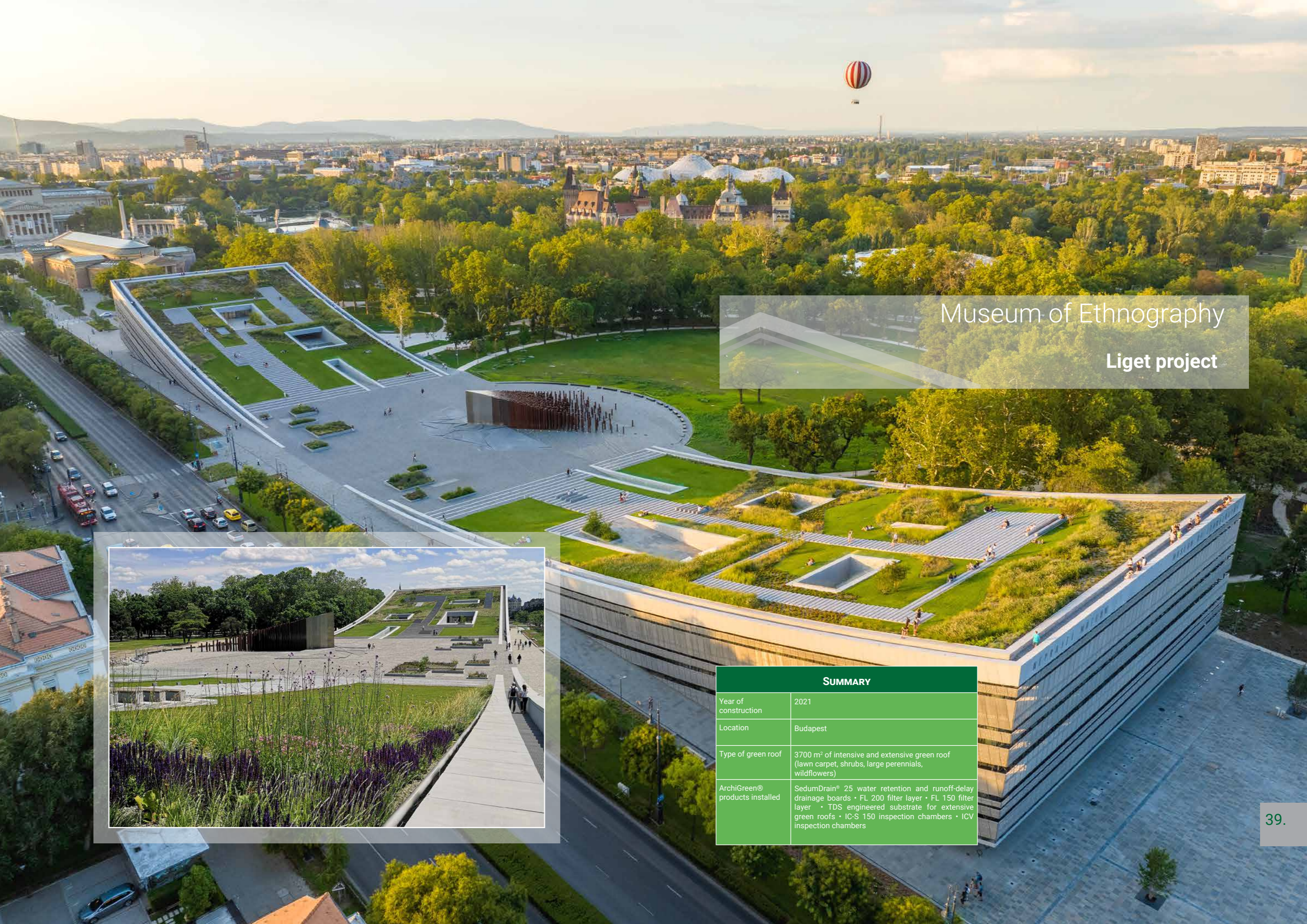
The depth of the engineered substrate is determined by the range of species to be planted and the load-bearing capacity of the roof deck. Intensive green roofs require regular irrigation and high maintenance to preserve their grandeur and longevity.

Owing to the above, the depth of the build-up of an intensive green roof varies largely from build-up to build-up in line with the load bearing capacity of the roof deck plus the function and landscape design of the roof garden.



PROMOTING NATURE WITH GREEN ROOFS!





Museum of Ethnography  
Liget project



SUMMARY	
Year of construction	2021
Location	Budapest
Type of green roof	3700 m <sup>2</sup> of intensive and extensive green roof (lawn carpet, shrubs, large perennials, wildflowers)
ArchiGreen® products installed	SedumDrain® 25 water retention and runoff-delay drainage boards • FL 200 filter layer • FL 150 filter layer • TDS engineered substrate for extensive green roofs • IC-S 150 inspection chambers • ICV inspection chambers



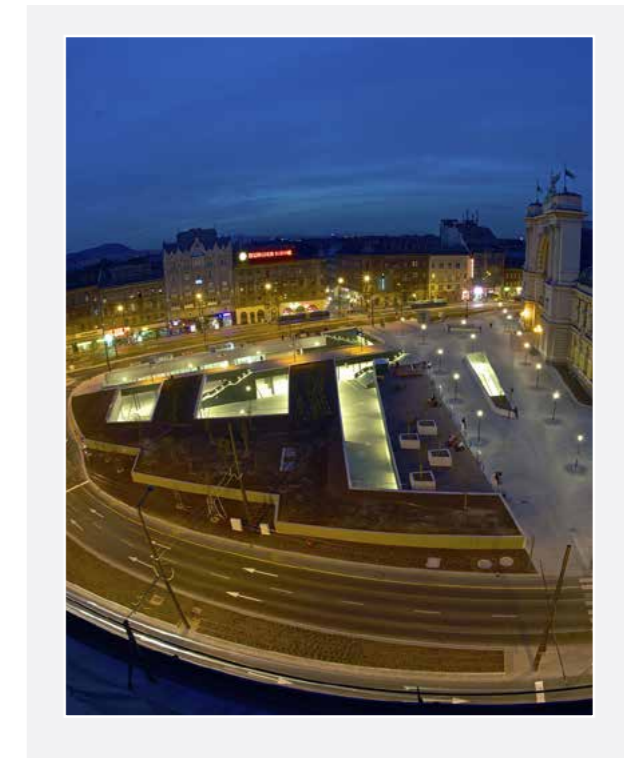


## Budapest - Keleti Railway Station

### Sustainable urban meeting point



SUMMARY	
Year of construction	2013
Location	Budapest, Hungary
Type of green roof	1200 m <sup>2</sup> of intensive green roof (lawn carpet and shrubs)
ArchiGreen® products installed	SedumDrain® 25 water retention and runoff-delay drainage boards • FL 200 filter layer







## Pécs - Zoological garden

### Green wildlife



SUMMARY	
Year of construction	2015
Location	Pécs, Hungary
Type of green roof	600 m <sup>2</sup> of intensive green roof (lawn carpet)
ArchiGreen® products installed	PL 500 protection layer • SedumDrain® 25 water retention and runoff-delay drainage boards • FL 200 filter layer • IC-S 700 inspection chambers





Budapest - Office Complex  
Creative environment



SUMMARY	
Year of construction	2012
Location	Budapest, Hungary
Type of green roof	3700 m <sup>2</sup> of intensive and extensive green roof (lawn carpet, shrubs, large perennials, wildflowers)
ArchiGreen® products installed	SL-I 125 separation layer for inverted roofs • SedumDrain® 25 water retention and runoff-delay drainage boards • FL 200 filter layer • IC-S 100 inspection chambers • SP-AL 120/80 prefabricated ballast retention trims • SP-C AL 120/80 prefabricated ballast retention corner pieces





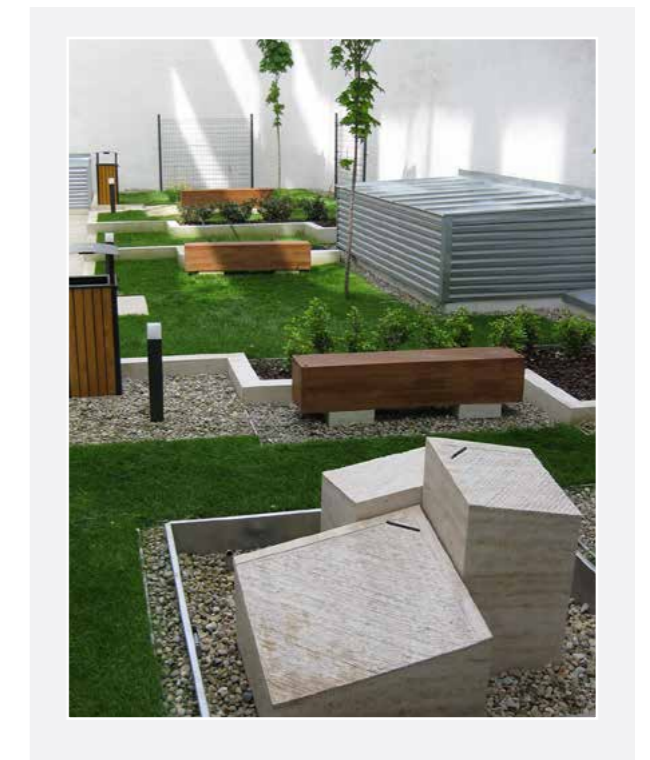


## Budapest - Office Complex

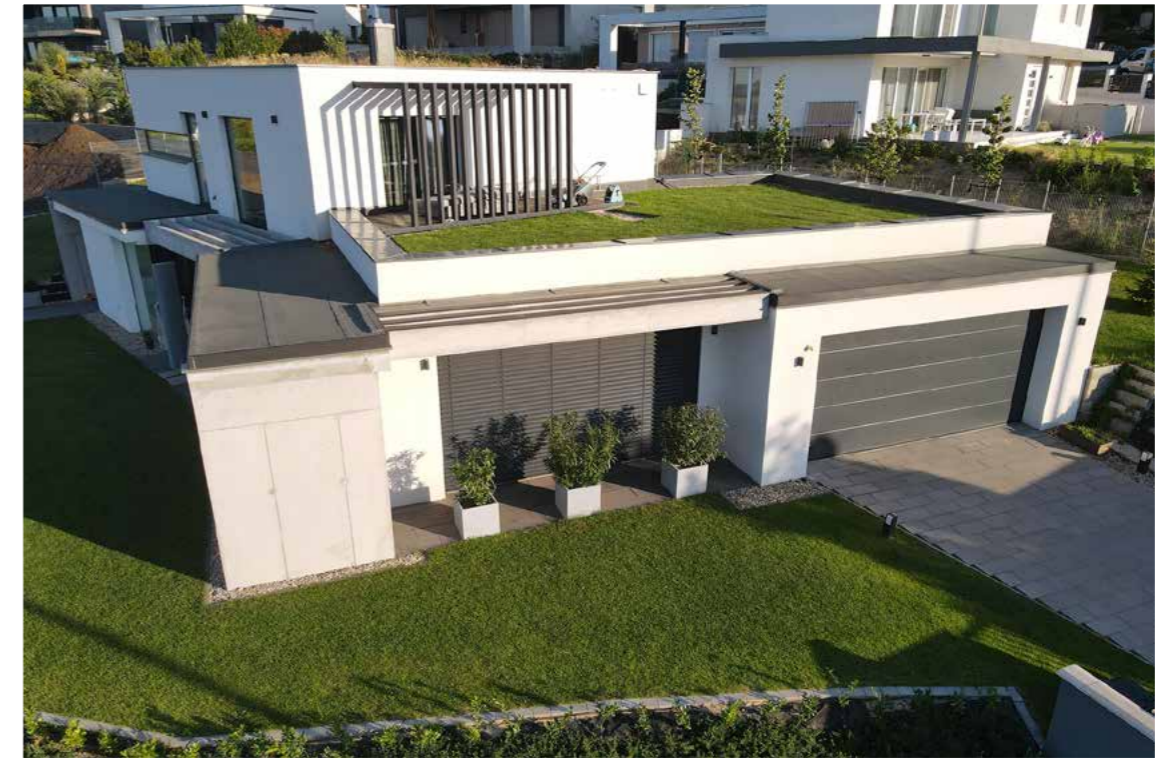
### Neatness at the workplace



SUMMARY	
Year of construction	2011
Location	Budapest, Hungary
Type of green roof	90 m <sup>2</sup> of intensive green roof (turf and shrubs) 40 m <sup>2</sup> of extensive green roof (sedum plug plants)
ArchiGreen® products installed	PL 500 protection layer • SedumDrain® 25 water retention and runoff-delay drainage boards • FL 200 filter layer • IC-S inspection chambers • SP-AL 120/80 prefabricated ballast retention trims • SP-C AL 120/80 prefabricated ballast retention corner pieces



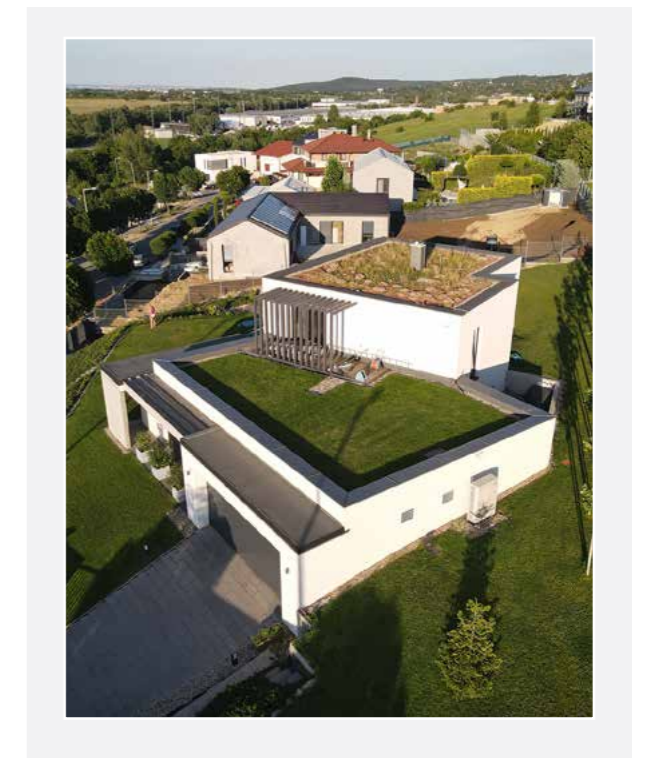




Detached house  
**Maximising green space**



SUMMARY	
Year of construction	2017
Location	Törökbálint, Hungary
Type of green roof	70 m <sup>2</sup> of intensive green roof (lawn carpet) 40 m <sup>2</sup> extensive green roof (sedum plug plants)
ArchiGreen® products installed	PL 300 protection layer • SedumDrain® 25 water retention and runoff-delay drainage boards • FL 150 filter layer • IC-S 100 inspection chambers • SP-AL 120/80 prefabricated ballast retention trims • SP-C AL 120/80 prefabricated ballast retention corner pieces





# Technological description

## Benefits of green roofs

- Improvement of air quality
- Production of oxygen
- Enhancement of climatic conditions
- Protection of both the waterproofing and thermal insulation from climate extremes, UV exposure and mechanical damage
- Reduction in reflective sound and improvement in both sound and thermal insulation properties
- Improves the building's energy performance
- Increase in stormwater retention and runoff-delay properties
- Economical advantages - Environmentally conscious construction with sustainability in mind
- Creation of wildlife habitat in urban areas by hosting the appropriate vegetation types
- Providing a tool that enables buildings to blend in with their surrounding landscapes

## 1. Protection and separation of the waterproofing

### PL 300 protection layer

In accordance with the FLL guidelines, the protection mat, in the case of an extensive green roof build-up, must weigh at least 300 g/m<sup>2</sup> to properly guard the waterproofing. The PL 300 protection mat is thermally treated on both sides with a robustness class of GRK3 to protect the root barrier or the root-resistant waterproofing from mechanical damage. Moreover, these mats also absorb a portion of the excess water that they release afterwards to the plants in a process known as diffusion during dry periods. (For further information on the technical data of these mats please see page 34)

### PL 500 protection layer

In the case of an intensive green roof build-up, the protection mat has to have a higher puncture resistance. Therefore, the use of PL 500 with a surface weight of 500 g/m<sup>2</sup> and a robustness class of GRK 4 is advised in this case.

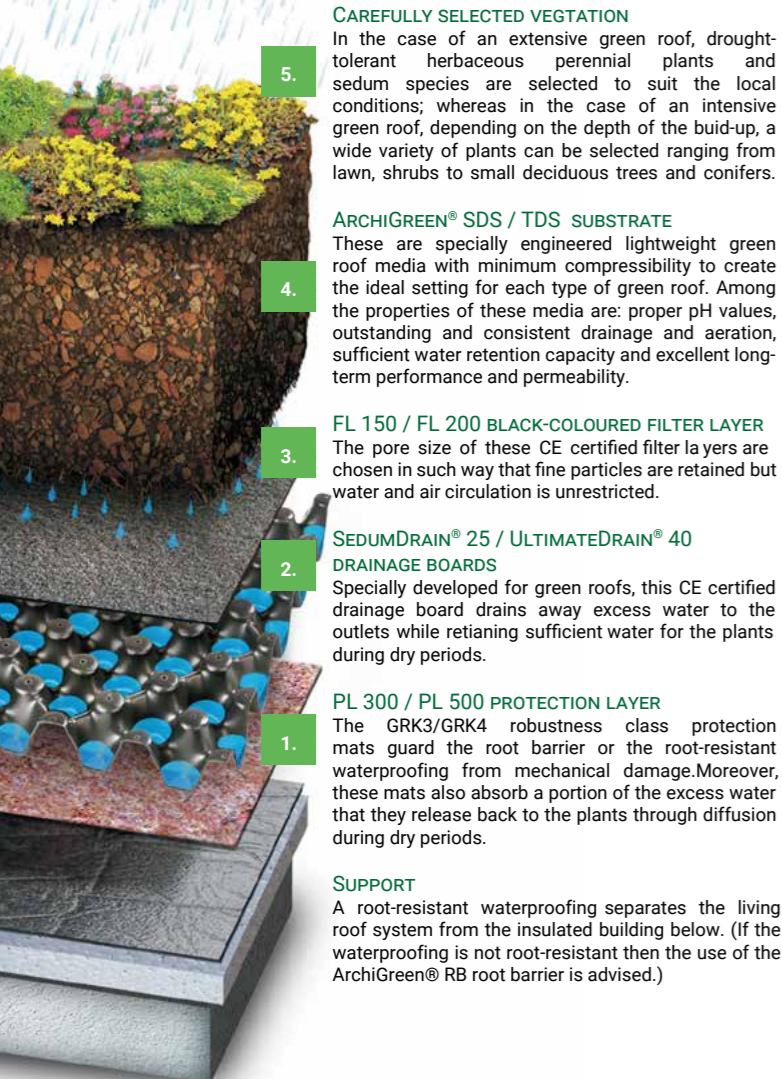


### SL-I 125 separation layer for inverted roofs

In the case of an inverted roof build-up, a separation sheet – with a surface weight of 125g/m<sup>2</sup> and high permeability properties – is rolled out over the closed cell thermal insulation separating it from the rest of the green roof build-up while contributing to the proper aeration of the whole system.



## The ArchiGreen® build-up for green roofs



**CAREFULLY SELECTED VEGETATION**  
In the case of an extensive green roof, drought-tolerant herbaceous perennial plants and sedum species are selected to suit the local conditions; whereas in the case of an intensive green roof, depending on the depth of the build-up, a wide variety of plants can be selected ranging from lawn, shrubs to small deciduous trees and conifers.

**ARCHIGREEN® SDS / TDS SUBSTRATE**  
These are specially engineered lightweight green roof media with minimum compressibility to create the ideal setting for each type of green roof. Among the properties of these media are: proper pH values, outstanding and consistent drainage and aeration, sufficient water retention capacity and excellent long-term performance and permeability.

**FL 150 / FL 200 BLACK-COLOURED FILTER LAYER**  
The pore size of these CE certified filter layers are chosen in such way that fine particles are retained but water and air circulation is unrestricted.

**SEDUMDRAIN® 25 / ULTIMATEDRAIN® 40 DRAINAGE BOARDS**  
Specially developed for green roofs, this CE certified drainage board drains away excess water to the outlets while retaining sufficient water for the plants during dry periods.

**PL 300 / PL 500 PROTECTION LAYER**  
The GRK3/GRK4 robustness class protection mats guard the root barrier or the root-resistant waterproofing from mechanical damage. Moreover, these mats also absorb a portion of the excess water that they release back to the plants through diffusion during dry periods.

**SUPPORT**  
A root-resistant waterproofing separates the living roof system from the insulated building below. (If the waterproofing is not root-resistant then the use of the ArchiGreen® RB root barrier is advised.)

## 2. Water retention and drainage layers

### SedumDrain® 25 water reservoir and drainage board

A great advantage of green roofs is their huge water retention capacity. Owing to the specially engineered green roof substrate (in accordance with the FLL guidelines at least 35%) and the high water retention capacity of SedumDrain® 25 drainage board (more than 10 l/m<sup>2</sup>) ArchiGreen® green roofs are capable of storing more than 30 litres per square metre with a build-up of only 120 mm depth. Thus ArchiGreen® green roofs capitalise dearly on stormwater reducing water run-off by up to 90 % in some cases and delaying the water that flows off from the roof – contributing to the reduction of the negative consequences caused by urban flash floods – while using up the retained precipitation in improving the microclimate on rooftops in urban cities. Drainage boards specially developed for green roofs differ from regular drainage boards on the market in that they are thermoformed on both sides and also in that they possess good drainage properties besides their high water retention capacity.



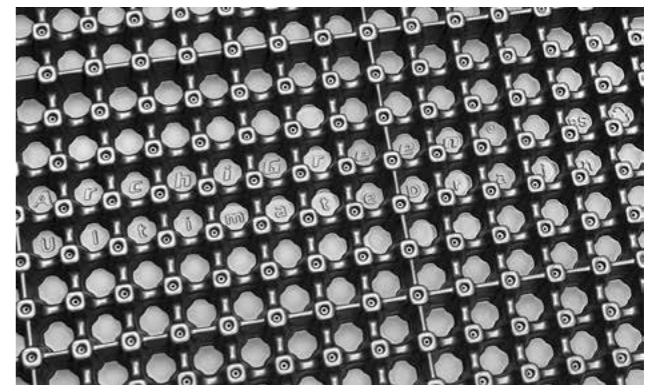
The double-sided SedumDrain® 25 board, owing to its two-plane channeling feature, ensures the flow of the water, that is not retained by the substrate, over its upper plane from one board to the other. In the case of larger amounts of rainfall, excess water percolates between the joint gaps of adjacent boards to the protection and waterproofing layers in which case the lower plane of the board channels away the excess water to the outlet contributing to the prevention of waterlogging in the build-up. In the case of an extensive green roof the emphasis is more on the retention properties of the drainage board in order to ensure sufficient water uptake by the plants in dry periods; as opposed to the case of a regularly irrigated intensive green roof where the emphasis is on the drainage properties rather than the retention properties of the drainage board.



TECHNICAL DATA		
	SedumDrain® 25	UltimateDrain® 40
<b>Material: Recycled high impact polystyrene (HIPS)</b>		
Height	25 mm	40 mm
Board size / area	1,92x0,96 m/1,84 m <sup>2</sup>	2,102x0,98 m/2,06 m <sup>2</sup>
Mass (empty)	1,36 kg /m <sup>2</sup>	2,26 kg /m <sup>2</sup>
Diffusion perforation	2 mm	3 mm
Water retention capacity	10,1 l/m <sup>2</sup>	21,26 l/m <sup>2</sup>
Filling volume	12,2 l/m <sup>2</sup>	23,73 l/m <sup>2</sup>
<b>Maximum compressive strength EN ISO 25619-2:2009</b>		
Empty	347 kN /m <sup>2</sup>	345 kN /m <sup>2</sup>
Infilled (grain size 4-8mm)	> 500 kN /m <sup>2</sup>	> 500 kN /m <sup>2</sup>
<b>Horizontal water discharge capacity ENISO12958 at 20 kPa</b>		
i = 0,001 (1% fall)	0,80 l/(m · s)	0,73 l/(m · s)
i = 0,003 (3% fall)	1,85 l/(m · s)	1,41 l/(m · s)
i = 1	15,38 l/(m · s)	14,56 l/(m · s)
<b>Rate of drainage through perforations</b>		
5 mm	0,092 l/(m · s)	0,32 l/(m · s)

### UltimateDrain 40 water reservoir and drainage board

UltimateDrain® 40 is a highly versatile, multi-functional drainage board for virtually any form of green roof landscaping. UltimateDrain® 40 board are very popular among contractors in Europe and overseas because of its extremely high water storage capacity (more than 21 litre), exceptionally high compressive strength (345 kN/m<sup>2</sup>), and its excellent drainage and ventilation properties. The technical details of these 40 mm boards are far better, than its competitor's, it might be used to change the 60 mm high drainage boards.





### 3. Separation of the substrate

#### FL 150 filter sheet

This filter sheet inhibits the leaching of fine particles from the substrate into the drainage layer thereby preventing any reduction in the drainage properties of the double-sided SedumDrain® 25. It is made of rot-proof polypropylene fibres. Among the properties of this filter sheet are: high permeability, proper pore size, rot resistance, durability and long-term performance.



#### FL 200 filter sheet

The thicker 200g/m<sup>2</sup> filter sheet is incorporated in the build-ups of intensive green roofs.

	PL 300 Protection layer	PL 500 Protection layer	SL-I 125 Separation layer	FL 150 Filter layer	FL 200 Filter layer
Material	100% synthetic fibres		Virgin polypropylene		
Weight per unit area (g/m <sup>2</sup> ) EN ISO 9864	300	500	125	150	200
Thermal treatment	Treated on both sides	Treated on both sides	Treated on both sides	Non-treated	Non-treated
Robustness class (GRK)	3	4	2	3	3
Tensile strength warp (MD) (kN/m <sup>2</sup> ) EN ISO 10319	6	10	10	10.3	15
Tensile strength weft (CMD) (kN/m <sup>2</sup> ) EN ISO 10319	7	15	10	10.3	15
Elongation at break warp (MD) (%) EN ISO 10319	45	45	40	45	60
Elongation at break weft (CMD) (%) EN ISO 10319	40	40	45	55	60
Static puncture – CBR test (kN) EN ISO 12236	1.5	3	1.6	1.7	2.9
Pore size O <sub>90</sub> EN ISO 12956	0.078	0.079	0.09	0.11	0.1
Water permeability (l/m <sup>2</sup> *s) VIH <sub>50</sub> EN ISO 11058	80	80	100	100	80
Roll dimensions Width / Length / Area	2/50/100	2/50/100	2/100/200	2/100/200	2/100/200
Gross weight (complete roll) (kg)	32	52	32	31	41

### 4. Engineered substrate

#### SDS substrate for extensive green roofs / TDS substrate for intensive green roofs

The growing environment on a roof differs from the plant's natural environment on the ground owing to the lack of subsoil on the roof and a lack in natural soil looseners (insects, worms etc). Growing medium on green roofs (often referred to as substrate) is discussed in the FLL\* guidelines' section under "vegetation support course". This section includes helpful information on granulometric distribution (grain size), pH value, compaction resistance, water permeability and other properties that a green roof substrate must possess in order to provide an ideal basis for a healthy and permanent plant growth. It is worth noting that green roof substrate is not equivalent to topsoil which is the reason that extensive green roofs require minimal maintenance due to the low organic content of the SDS substrate (approx. 50 g/l). In other words, owing to this low organic mineral based aggregate known as substrate the spread of weed and the rise of waterlogged areas are kept at bay on an ArchiGreen® extensive green roof.

Properties	SDS substrate for extensive green roofs	TDS substrate for intensive green roofs
Saturated mass	ca. 1250 kg/m <sup>3</sup>	ca. 1500 kg/m <sup>3</sup>
Grain size	max. 12 mm	max. 16 mm
Water permeability	min. 0.001 cm/s, ill. 0.6 mm/min	min. 0.0005 cm/s, ill. 0.3 mm/min
Water retention / max. water capacity	min. 35 vol. % max. 65 vol. %	min. 45 vol. % max. 65 vol. %
Mud portion (d>0.063 mm)	max. 15 m %	max. 20 m %
Air content / max. water capacity	min. 25 vol. % / min. 10%	min. 20 vol. % / min. 10%
pH value	7 - 8	7-8.5
Organic content	max. 50 g/l	max. 300 g/l

On the other hand, the substrate of an intensive green roof will contain a great deal more organic matter (approx. 300 g/l) than its extensive counterpart discussed above to support a wide variety of plants and even trees. Substrate depth can range from 150 – 1500 mm on an intensive green roof versus a shallow substrate depth of 50 – 150 mm in an extensive green roof build-up.

### Waterflow and inspection of the outlets

#### Inspection chambers within the planted area (IC-S) / near the parapet (IC-P)

According to the FLL guidelines, regardless of the size of the roof surface, roofs with drainage facilities located within the vegetation area must have at least one outlet and at least one emergency overflow. The emergency overflow may penetrate the parapet wall / facade. The emergency overflow which is a gutter running through the facade serves as a visual detector in pointing out any possible failure of the drainage system. "As a rule, roof outlets should be located away from vegetation areas and free from gravel. Where roof outlets are located within vegetation areas an inspection shaft will need to be installed, to allow inspections to be carried out, to prevent contamination and to stop plants from growing over the outlet." – FLL guidelines. Upon installing the IC inspection chambers, it is advised to form around them a 300 to 500 mm wide gravel strips in which case the depth of a gravel strip matches that of its surrounding substrate.



IC-S 100 inspection chamber (Cross-section no. 1)



IC-P 100 near parapet inspection chamber (Cross-section no. 2)

#### IC-EX 50 / IC-EX 100 extension elements

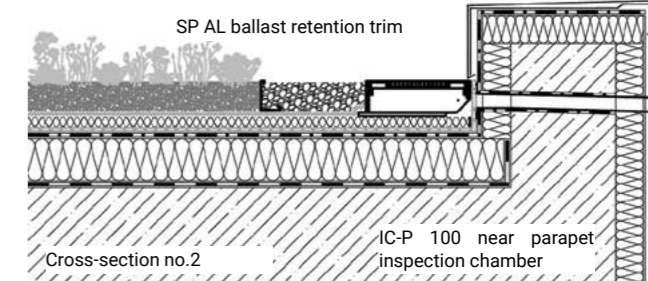
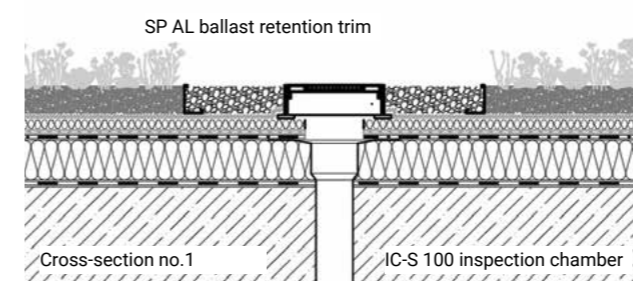
Inspection chambers can be produced up to any height below 1,200 mm at the customer's request. However, with the aid of the 50 and 100 mm prefabricated IC-EX extension elements the height of the already installed inspection chambers can also be adjusted to fit flush into their surroundings.



IC-EX 50 extension element for inspection chamber



IC-S extensive and intensive inspection chambers



\* FLL (Forschungsgesellschaft Landschaftsentwicklung Landschaftsbau e.V) is the German based Landscaping and Landscape Development Research Society located in Bonn, which is currently the recognised European voice for green roof standards. www.fll.de



## Edge-pieces

### SP AL aluminium and SP GS steel retention trims

In a green roof setting, the 300 to 500 mm wide gravel strips composed of washed river pebble (16 to 32 mm diameter) installed along the edge of the roof and round the roof penetrations provide fast drainage of surface water into the drainage layer. Other important functions of gravel strips include: aeration of the drainage system at the edges, keeping rainwater and vegetation away from the building's structure, providing protection against wind suction, fulfilling fire prevention regulations and functioning as traffic routes during maintenance works.

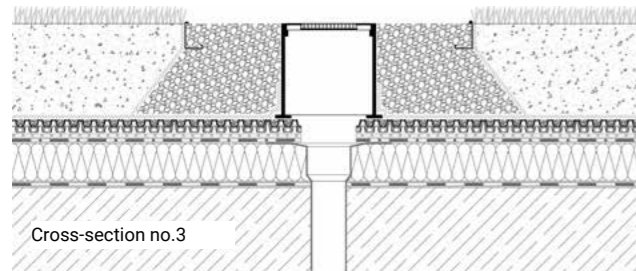
For vertical separation between gravel strips and their surroundings, the use of SP AL trims are recommended on extensive green roofs whereas on intensive green roofs we recommend the use of lawn edging elements or the use of SP GS steel trims produced to heights specified to fit the requirements of the project. These metal balast trims serve as an aesthetic separation and demarcation tool between the gravel strip and the substrate while preventing the two from mixing together and simultaneously preventing strong plant growth in the gravel strip area.



SP AL ballast retention trim



SP GS ballast retention trim for intensive green roofs



Cross-section no.3



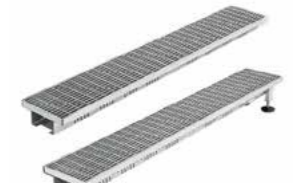
TG-F fixed height terrace drain grille



TG-A height adjustable terrace drain grille



DC-F fixed height drainage channels with UV-resistant polypropylene casings



DC-F fixed height and DC-A height adjustable drainage channels with perforated steel casings

## Drainage channels, terrace grilles and paving spacers

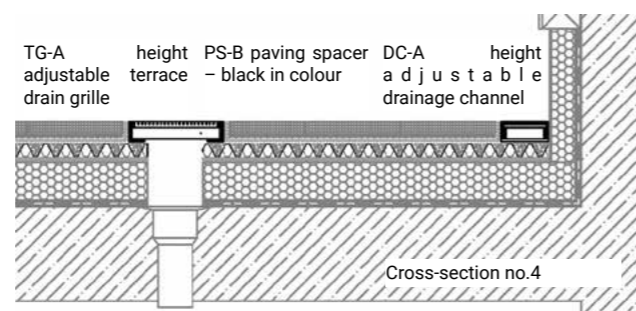
On ground level, surface drainage can be created by grading an area so that water collects and flows to a lower elevation away from the site. However, on a rooftop, owing to the fact that the depth of the insulation and thresholds are fixed, drainage channels and terrace grilles differ from their conventional counterparts installed in regular gardens. Moreover, it is also essential to maximise the drainage of the surface water on the flooring of the terrace that is to be installed.

As there is no need for water retention beneath the flooring layer of the terrace but rather for proper drainage, SedumDrain® 25 is installed with the diffusion holes lying down on the protection mat in case of a conventional roof build-up or in the case of an inverted roof build-up the diffusion holes are lying down on the separation sheet. SedumDrain® 25 is infilled with graded gravel (recommended non-carbonate aggregate) that can help to level the slope on the roof. In the case that paving slabs are chosen as flooring option, PS-B / PS-T spacers are used to keep the joints permanently open between the slabs for effective water drainage. (Cross-section no.4)

Rainwater running down the facades can often amount to that accumulating from the horizontal roof surface. It is therefore crucial that at the junction of these planes water is prevented from building up using multi-directional drainage channels and terrace grilles with open or perforated undersides that enhance the channeling of the surface water to the drainage board beneath the flooring layer. Fixed (TG-F) and adjustable (TG-A) height terrace grilles inserted in UV-resistant polypropylene casings with open undersides or inserted in perforated steel casings are all available in our product range. We also produce them in stainless steel.

### Drainage channels with fixed height (DC-F) / with adjustable height (DC-A)

At upstands the waterproofing must be taken up 150 mm above the finished surface of the roof – 100 mm if the pitch is above 5%. Providing a 150 mm upstand beneath door thresholds is often difficult to achieve. The installation of a fixed (DC-F) or adjustable (DC-A) height drainage channel can solve the problem because the depth of the upstand in this case is calculated from the bottom of the drainage channel's underside. Fixed (DC-F) and adjustable (DC-A) height drainage channels inserted in UV-resistant polypropylene casings with open undersides or inserted in perforated steel casings are available in our product range. We also produce them in stainless steel.



Cross-section no.4

## Lawn edging / Edging restraint

The ArchiGreen® LE 175 lawn edging metal profiles are installed by professional gardeners to provide an aesthetic and permanent solution in establishing neat demarcations between the various media and aggregates present in the garden. Due to its bendable feature, this product is an excellent choice where curves are common in pathways and borders.



	Height	Width	Length	Weight
LE 175	175 mm	20 mm	1495 mm	2.21 kg/m

The metal profiles are available in galvanised and stainless steel. Material thickness of the galvanised steel plate is 1 mm which is bent back on top to blunt the upper edge of the profile to 2 mm. Vehicles are prohibited to cross the lawn edging profiles.

For further technical data visit [www.archigreenltd.com](http://www.archigreenltd.com)



## Installation of the ArchiGreen® LE 175

Following the appropriate preparation of the soil, the demarcation line where the edging product needs to be installed is marked with a string; then, using a spade, a narrow rift is dug along the track set by the string to fit the LE 175 metal profiles to their desired depth (130 to 150 mm deep, so that the upper edge of the product is either flush with the lawn or max. 20 mm above the ground). The profiles are abutted via the metal connectors at the ends and installed upright in the rift. With the aid of a snips tool the triangular perforations along the stiffening flange can be easily clipped off to form curves or even right angles from the profiles. A rubber-headed mallet is used for fine positional adjustments of the profiles which are then fixed in place using anchoring nails of size Ø8 x 300 mm. This fixing method needs 2 anchoring nails / profile when forming straight demarcations whereas 3 to 5 nails / profile are required when forming curves.

## Benefits of the LE 175 and the PER-P

- Simple border edging.
- Quick easy installation.
- Professional, unobtrusive finish.
- Lightweight
- Easily edges corners and curves
- Easily cut to size.
- Helps secure pavers and prevents them from moving horizontally.
- Can be installed before or after the pavers have been installed.





The **ArchiGreen® PER-P** is a quick and simple paving restraint system. It provides an aesthetically appealing finish to almost any application, including block pavements, garden paths or gravel strips. The 100 mm depth paver edge restraint is also suitable to fulfil the role of ballast edge trims on extensive green roofs.



	Height	Width	Length	Weight
PER-P 45	45 mm	80 mm	1000 mm	0.45 kg
PER-P 100	100 mm	85 mm	1000 mm	0.75 kg

PER-P is made from UV & frost resistant recycled polyethylene. It is resistant to various acids that can be found in the soil. The wall thickness of the restraint profile is 4 mm.

For further information visit [www.archigreenltd.com](http://www.archigreenltd.com)

## Installation of the PER-P restraint

The paver edge restraint profiles (PER-P) are abutted via the connectors located at the end of each profile. Following the appropriate preparation of the foundation, these abutted profiles or borders are then fixed in place using anchoring spikes (dia.16x250 mm) made of plastic that can be additionally ordered. With the aid of a snips tool the stiffening flange can be easily cut to form curves quickly. The plastic borders are suitable to retain the edges of various pavers on terraces and patios. In the case of establishing linear retention schemes (i.e forming straight lines) the number of anchoring spikes required to fix each plastic restraint profile is 3 whereas in the case of forming retention curves the number of anchoring nails increases to 4 - 5 nails per restraint. Once installed, the edge restraints are covered and the demarcation line between turf and other types of ballast is virtually invisible. Vehicles are prohibited to cross the paver edge restraints unless installed at least 2 cm the pavers' level.







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