ICOPAL GOES GREEN
GREEN ICOPAL

Icopal Green Roof

Immediately after installation
Light and maintenance-free

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ZŁOTY MEDAL 2014

System nagrodzony
Złotym Medalem
Międzynarodowych Targów Budownictwa
BUDMA 2014

Edition: April 2015

Design editor
for Icopal Extensive Green Roofs

ZŁOTY MEDAL 2014

System nagrodzony
Złotym Medalem
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BUDMA 2014

CAD and PDF
drawings for architects

COMPACT disc

April 2015

ISO 14001

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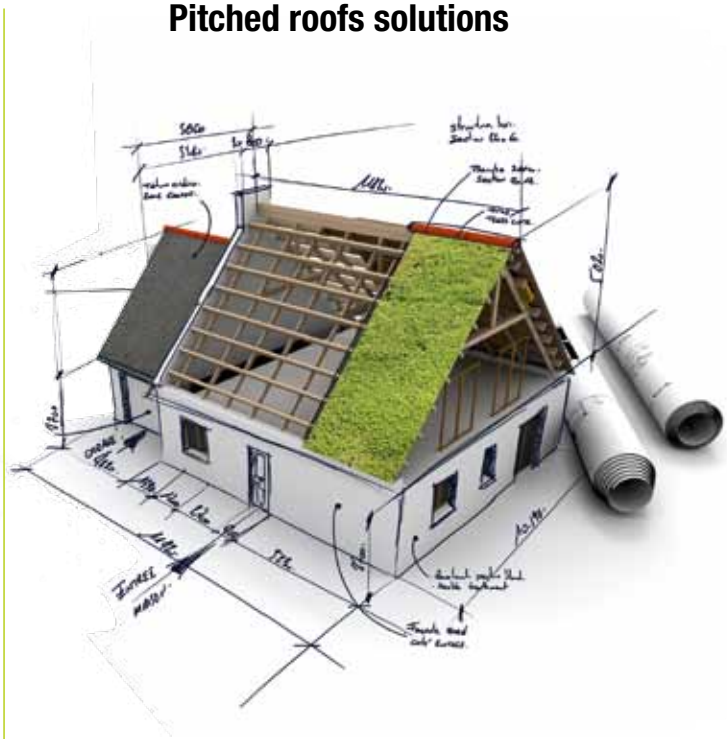
Pitched roofs solutions



Icopal Green Roof

Immediately after installation

THREE EXPERTS' ALLIANCE – green roof from one source

Przemysław Rasz
President of the Board

ICOPAL S.A. Zduńska Wola

4 research and development centers in the U.S. and in Europe,
38 factories and 97 sales offices in the world
Established in 1876

Roofing technique and waterproofing:

- Comprehensive solutions, and market offer for the entire system,
- Project and architectural consultation,
- Root barriers waterproofing systems,
- Unique retention mat with microdrainage,
- Thermal insulation, ventilation and roofing accessories.

Stanisław Woźniak
President of the Board

XEROFLOR

Established in 1996
Plantation area: 250 ha
The annual production: 150 thousand m^2 of vegetation materials

Soil substrates and greenery:

- Technology and experience in cultivating plants for green roofs,
- Know-how, patented system of extensive vegetation mats,
- Vegetation substrate.

Gerbe van den Top
President of the Board

COLBOND

Established in 1953
Global manufacturer of drainage and geotextile materials
Manufacturing plants in: the Netherlands, Germany and in the U.S.

Drainage and retention:

- Roof drainage and retention,
- Calculations for drainage or water demand,
- Polyamide drainage mats.

ISO 14001

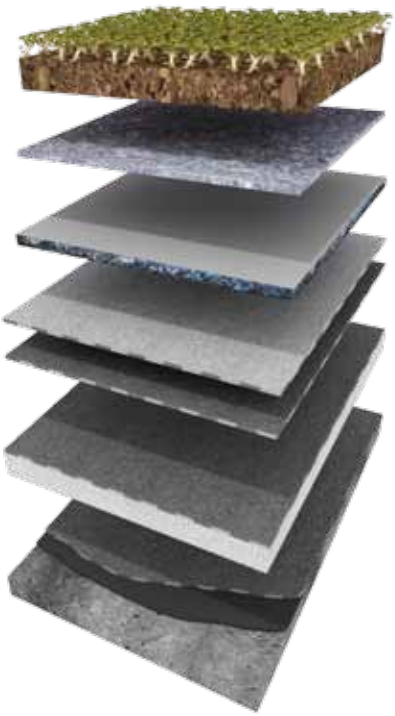
Icopal Green Roof

Light and maintenance-free

ICOPAL S.A. Zduńska Wola provides and delivers:

- green roof, including plants, ready immediately after installation,
- maintenance-free roof, resistant to the spread of weeds, does not require mowing – once a year technical review,
- secure green roof, resistant to external fire exposure – classification B_{Roof} (t_1) Fire Research Institute of Building Research Institute in Warsaw,
- all elements of a green roof on the basis of experience and cooperation of three global experts: Icopal S.A., Xeroflor, Colbond / Bonar,
- complete green roof from one source,
- easy and quick installation,
- technical advice,
- written Personal Quality Guarantee of Icopal S.A. on waterproofing and the green part of the vegetation.

Comprehensive service and offer
ICOPAL S.A. Zduńska Wola



XEROFLOR
VEGETATION MATS

COLBOND
DRAINAGE AND RETENTION

ROOFING TECHNIQUE
WATERPROOFING
THERMAL INSULATION

Personal Quality Guarantee of Icopal S.A.
Waterproofing part
20-40 years
Vegetation part
1 year or more (*)

* There is a possibility of extending a guarantee after concluding Guarantee Agreement

Personal Registration – Your guarantee is registered in the database of Icopal Group and has its identification number.

Openness and clarity – we grant a guarantee in writing, we do not use "fine print".

Simplicity and accessibility – ou do not have to ask anybody for a guarantee, by registration on www.gwarancje.icopal.pl you decide if and when you obtain a guarantee.

Safety – 130 years of technological experience and awareness of the highest quality products.

Register your guarantee online at www.gwarancje.icopal.pl within 45 days from date of purchase

ISO 14001

Icopal Green Roof

Immediately after installation

Excerpt from the Regulation of the Minister of Infrastructure of 12 April 2002

Regulation of the Minister of Infrastructure of 12 April 2002 on the technical conditions to be met by buildings and their location, defines:

§3 clause 22
area considered to be biologically active:

"biologically active area – it should be understood as an area with ground surface providing a natural vegetation, aa well as 50% of the area of terraces and flat roofs with such a surface, however, not less than 10 m², and surface water in the area."
(in the wording of the Regulation of 12 March 2009)

§39
obligates to maintain its appropriate size:

"On the building sites, intended for multifamily housing, health care buildings (excluding regional health centre) and education buildings, at least 25% of the building site should be arranged as biologically active area, if different percent is not stipulated in the local area development plan."

Legal opinion of the Attorney-at-law of Icopal Group:

The minimum percentage of biologically active area in relation to the area of each building site (i.e. on which construction or expansion can be made) must be specified in the local area development plan. As far as multi-family buildings intended for health care and education are concerned the minimum percentage is 25%. Percentage of biologically active area for building plots intended for one family is usually much higher.

It is essential, especially for small, however densely built-up plots of land, to use up, to the maximum, flat surfaces of buildings: terraces, buildings roofs or roofs of underground parking lots and to create green areas on them (which provide natural plant growth), which shall be classified as biologically active surfaces, in accordance with the guidelines of the local area development plan and Regulation of the Minister of Infrastructure of 12 April 2002 on the technical conditions to be met by buildings and their location.

Ph. D. Magdalena Rytwińska-Rasz
Attorney-at-law
International Legal Consulting in Business
Attorney-at Law Office
www.b2blegal.pl

Roofs installed in green roof technology:

- mitigate the urban climate,
- receive and retain about 50% of precipitation water,
- reduce traffic noise,
- absorb up to 20% of dust and harmful gases from the air,
- increase biologically active city surface,
- increase air humidity and enrich air with oxygen.

Icopal Extensive Green Roof

On the basis of many years of experience of international Icopal Group in implementation of green roofs in France, Scandinavia, Germany, the Netherlands, Poland and the United States, and installation over 35 million m^2 of green roofs in accordance with technical norms of these countries, the guidelines for design and implementation of Icopal Green Roof System have been developed.

EXTENSIVE ROOFS. Green roofs covered with plants of large regenerative capacity and adapted to the extreme conditions of the habitat. These plants come from natural arid conditions of Central Europe. These are mainly mosses, sedums and herbs. The weight of Icopal extensive roofs system is approximately 55 kg/m^2. Vegetation mats used in Icopal extensive roof are resistant to spreading of weeds. Icopal extensive roof is not intended for grass as its seeds often spreads weeds, and it does not require mowing.

Innovation of Icopal Green Roof System consist in delivery and installation of all components, including ready green vegetation layer, unwounded on the roof directly from the roll.

Pre-cultivated rolls of vegetation mat ready to be transported to the place of installation

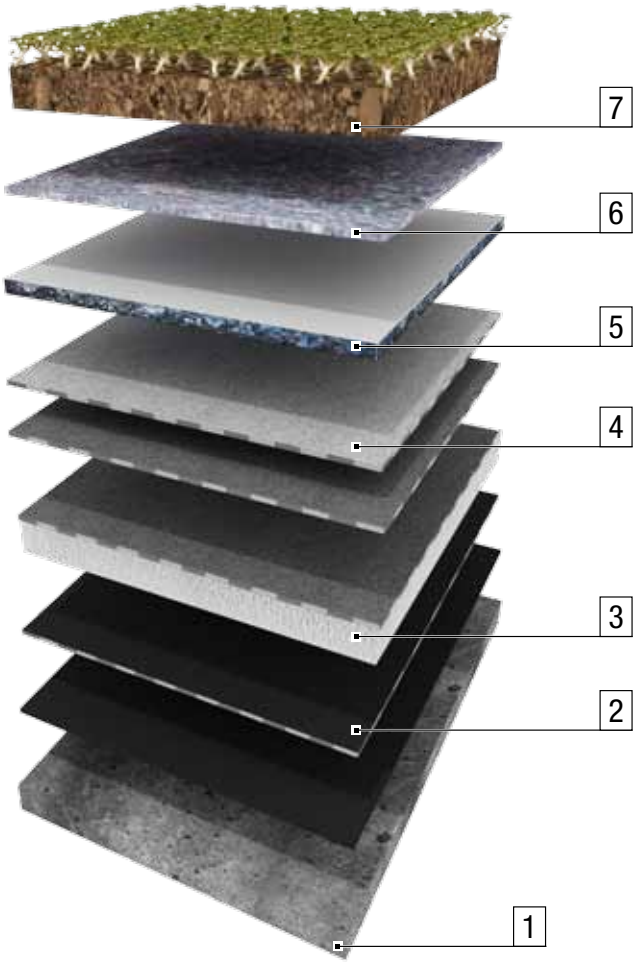
Vegetation mat on a roof, promptly after installation

Icopal Green Roof

Immediately after installation

Extensive flat roof – classical system

Classification of roof resistance to external fire exposure B_{Roof} (t_1) of Fire Research Institute of Building Research Institute in Warsaw: no 976.2/13/R38NP



7 **Ready vegetation layer** of green vegetation Icomat Green 317 (roof angle inclination up to 6°)

6 **Retention and microdrainage layer** – 7x Icomat 140

5 **Drainage** (intended for flat roofs) drainage layer Icodren 10 Szybki Drenaż® SBS

4 **Waterproofing with root barrier function** – base membrane modified in Speed Profile® SBS technology, roofing top membrane produced by Icopal, resistant to root penetration Graviflex 4.2 SBS / Green Roof or Graviflex 5.2 SBS / Green Roof

3 **Thermal insulation,** e.g. polystyrene boards Icopal EPS-100 (system fastened mechanically or glued) or Icopal EPS boards one-side laminated with base membrane (system glued with Siplast Glue® Szybki Styk SBS)

2 **Vapor control layers,** such as modified bitumen primer Siplast Primer® Speed Primer SBS + bitumen membrane, e.g. Icopal Foalbit Al S40 or PE foil

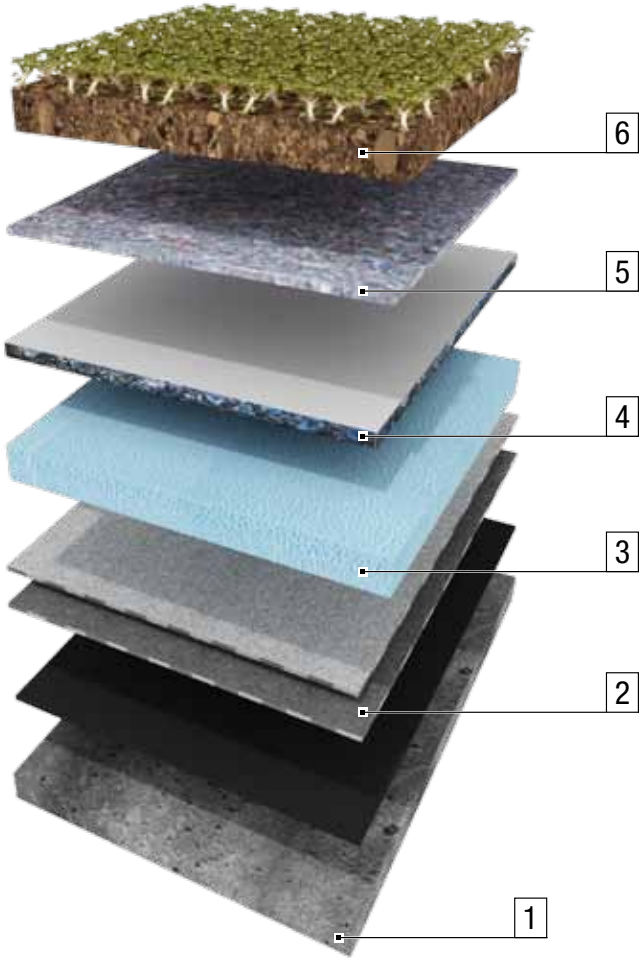
1 **Construction** – in most cases shaped ceiling made of reinforced concrete or light steel construction with trapezoidal roofing sheet

NOTE: For roofs with slopes higher than 6°, the type of vegetation mats depends on its angle inclination and shape, thus the appropriate choice requires consultation with the representative of Icopal.

ISO 14001

Extensvie flat roof – reversed system

Classification of roof resistance to external fire exposure B_{Roof} (t_1) of Fire Research Institute of Building Research Institute in Warsaw: no 976.4/13/R38NP



6 **Ready vegetation layer** of green vegetation Icomat Green 317 (roof angle inclination up to 6º)

5 **Retention and microdrainage layer** – 7x Icomat 140

4 **Drainage** (intended for flat roofs) drainage layer Icodren 10 Szybki Drenaż® SBS

3 **Thermal insulation** – extruded polystyrene boards XPS (system glued with Siplast Glue® Szybki Styk SBS)

2 **Waterproofing with root barrier function** – modified bitumen primer Siplast Primer® Speed Primer SBS + base membrane modified in Speed Profile® SBS technology + roofing top membrane produced by Icopal, resistant to root penetration Graviflex 4.2 SBS / Green Roof or Graviflex 5.2 SBS / Green Roof

1 **Construction** – in most cases shaped ceiling made of reinforced concrete or light steel construction with trapezoidal roofing sheet

NOTE: For roofs with slopes higher than 6°, the type of vegetation mats depends on its angle inclination and shape of the roof, thus the appropriate choice requires consultation with the representative of Icopal.

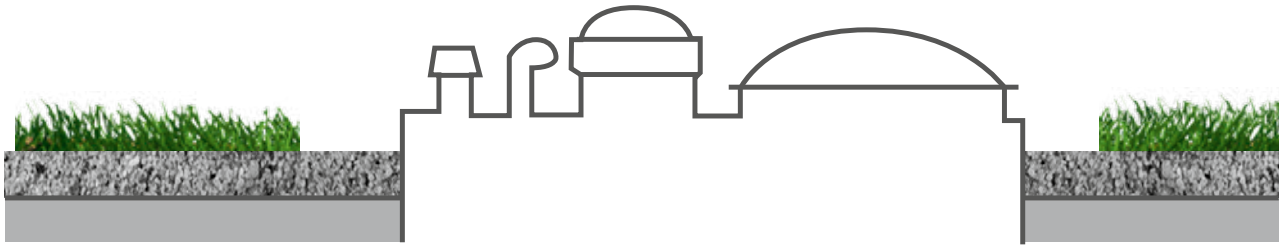
Design Guidelines

Design guidelines – roof angle inclination

In case of flat roofs it is recommended to construct roof angles up to 6°. As far as pitched roofs are concerned additional elements need to be installed – thresholds to prevent sliding of the top layer of vegetation. The area should be designed in such a way that the roof angle inclination is towards drainage points.

Design guidelines – roof installations, roof hatches

Roofing equipment as breather vents, antennas, air conditioners, electric cables passes etc. should be grouped in such a way to minimize the number of roof punching. In addition, these devices, as well as roof hatches, skylights, vents, etc., should be placed on pedestals, higher than all the layers of a green roof in order to be properly insulated and surrounded by other layers of a green roof. Green roofs should be easily accessible for maintenance. It is highly recommended to design water connection on the top of the roof or somewhere close to it.



Featured grouping of roofing details

Design guidelines – wind suction forces

For each roof, individually, an architect should calculate suction power depending on wind zone, shape and height of the roof and the roof area. Calculations must be made on the basis of PN-EN 1991-1-4:2008 *Impact on structures. General Effects – Impact of wind*. Having made appropriate calculations, appropriate spaces on the roof should be loaded, using correspondingly thick mineral substrate, concrete boards or aggregated gravel. Icopal S.A. offers technical consultancy rendered by building engineers: see contact at page 87 of this catalog.

Design guidelines – green roof resistance to external fire.

All Icopal Extensive Green Roof Systems described in this catalog are classified as resistant to external fire exposure $B_{Roof}(t_1)$. Thus Icopal Extensive Green Roof is a roof system resistant to external fire spread.

Classification of roof resistance to external fire exposure B_{Roof} (t1) of the Department of Fire Research of Institute of Building Technology in Warsaw for:

Extensive Roof – Classical system: no 976.2/13/R38NP
Extensive Roof – Reversed System: no 976.4/13/R38NP

Design Guidelines

Design guidelines – retention and drainage

• In Icopal Green Roof System retention and drainage part is made in the technological system of:

– drainage mat Icodren 10 Szybki Drenaż® SBS,

– retention and microdrainage layer Icomat 140 – the geotextiles structure developed at Icopal's commission. Each individual geotextile consists of two layers: tangled glass fleece functioning as microdrainage and cotton--polyester reinforcement which retains precipitation water. The ratio of cotton fibers to polyester ones is equal and is 50%.

• Retention and microdrainage layer Icomat 140 consists of:

– 7 layers of geotextiles intended for flat roofs,

– 10 layers of geotextiles intended for pitched roofs.

The uniqueness of the retention layer Icomat 140 consist in simultaneous retention and microdrainage functions and internal circulation of air. In addition, the unique design provides three times longer drying time than substrate, ensuring therefore, more water supplies for the plants.

• Properties of retention layer Icomat 140

	7 LAYERS (laid on a flat roof alternately at an angle of 90°)	10 LAYERS (laid alternately on a pitched roof perpendicularly to the eaves)
Intended use	flat roof of angle up to 6°	pitched roof of angle from 7° to 35°
Type of vegetation	cooperation with Icomat Green 317 mat: mosses, sedums, herbs	cooperation with Icomat Green 300 mat: mosses, sedums, herbs
Layer height	3.5 mm	5.1 mm
Dry weight	980 g/m^2	1400 g/m^2
Width	100 cm	100 cm

• Design guidelines – roof weight – list of loads along with irrigation:

ROOF CONSTRUCTION	CLASSICAL SYSTEM	REVERSED SYSTEM
Flat roof **Waterproofing:** Glasbit G200 S40 Speed Profile® SBS Graviflex 5.2 SBS / Green Roof **Drainage:** Icodren 10 Szybki Drenaż® SBS **Retention:** Icomat 140: 7 layers **Vegetation:** Icomat Green Roof 317	**Vapor control layers:** Siplast Primer® Speed Primer SBS Foalbit Al S40 **Thermal insulation:** PSK 18 cm **57 kg/m^2**	**Thermal Insulation:** XPS 18 cm **50 kg/m^2**
Pitched roof (without thermal insulation) **Waterproofing:** Glasbit G200 S40 Speed Profile® SBS Graviflex 5.2 SBS / Green Roof **Drainage and retention:** Icomat 140: 10 layers **Vegetation:** Icomat Green Roof 300	**51 kg/m^2**	**–**

For comparison, in case of using an ordinary mineral or soil substrate of 10 cm height, loads are as follow:

ROOF CONSTRUCTION	CLASSICAL SYSTEM	REVERSED SYSTEM
Flat roof	**235 kg/m^2**	**227 kg/m^2**

Icopal Green Roof System eliminates the use of heavy mineral substrate, thereby preventing excessive load on structures at the design stage.

Icopal Green Roof

Immediately after installation

Siplast Primer® Speed Primer SBS

Siplast Primer® Speed Primer SBS produced by Icopal – bitumen primer, modified by synthetic rubber SBS, highly-efficient and deep penetrating primer developed on the basis of exceptional formula based on brittle bitumen obtained from the unique natural deposits and organic solvent of a very high quality and volatility. It is used to primer: concrete, mortar concrete, ceilings, surfaces of trapezoidal sheets, old and new steel sheets, galvanized sheets. Ideal for priming surfaces under each type of membranes.

The product is recommended by
Building Research Institute in Warsaw:

Technical Recommendation RT ITB No. – 1075/2007

Instytut Techniki Budowlanej

Intended use:

For priming concrete surface and trapezoidal sheets under torch-on vapor barrier membranes, as well as basic waterproofing for Icopal Green Roof systems, both classical and reversed.

Properties:

- the product is safe for the aquatic environment – does not react with precipitation water,
- is not classified as dangerous substances marked with N symbol,
- does not contain any harmful heavy metals,
- does not emit irritable odor (after evaporation),
- deeply penetrates concrete surface (up to 2 mm), increasing adhesion of membranes,
- dries very quickly, depending on the ambient temperature (in summer temperatures it takes about 30 minutes).

Technical Documentation:

- Reference document: PN-B 24620:1998 + PN-B 24620:1998/Az1:2004
- Reference document: AT IBDiM – AT/ 2008-03-1470
- Reference document: AT IBDiM – AT/ 2008-03-1470: amendment No 1/2008
- Reference document: AT IBDiM – AT/ 2010-02-0825
- Technical Recommendation: RT ITB 1075/2007
- Technical Recommendation: RT ITB 1170/2010
- Declaration of Conformity: 1/G/2012
- Declaration of Conformity: 3/G/2012
- Hygienic Approval: HK/B/0812/01/2010
- National Certificate of Conformity: KCZ/65/04/2012
- National Certificate of Conformity: KCZ/65/05/2009
- Data Sheet of the Product Properties: update of 2011
- Product Technical Data Sheet: 04/2010

ISO 14001

Icopal Green Roof

Light and maintenance-free

Icopal Vapour control layer: Foalbit Al S40 membrane or PE foil

Icopal bitumen membrane, vapor control layer on aluminum foil reinforcement. Mounted to the surface by torching-on. Top surface covered with fine sand, bottom side with anti-adhesion foil.

Intended use:
As a vapor control layer on concrete surface or on trapezoidal sheets in classical Icopal Green Roof system.

Properties:

Membrane type	Reinforcement type	Membrane thickness	Tearing strength	Average extending	Flexibility at low temperatures	Flow resistance
		[mm]	[N/5 cm]	[%]	[°C/Ø30 mm]	[°C]
Foalbit Al S40	Aluminium foil	4.0	250/250	2/2	0	70

Technical Documentation:
- Technical Recommendation: RT ITB 1170/2010
- Reference document: EN-13970
- Reference document: EN-13707
- Reference document: EN-13969
- Declaration of Conformity: CE

Due to the high diffusion resistance of bituminous materials it is permitted to use other torch-on membranes of Icopal production as a vapor control layer.
PE FOIL – for objects that do not require a vapor control layer of high Sd factor PE foil can be used, however, this decision always requires confirmation of an architect.

Icopal Green Roof

Immediately after installation

Siplast Klej® Szybki Styk SBS

Siplast Klej® Szybki Styk SBS is a bitumen glue modified by synthetic rubber SBS, based on organic solvent appropriate for polystyrene boards EPS and XPS, as well as for polyurethane boards PIR and PUR. It is used for bonding thermal insulation boards, including e.g. polystyrene boards made of expanded polystyrene EPS and extruded polystyrene XPS for bituminous, concrete or metal surface. The glue retains flexibility and effectiveness of bonding at reduced temperatures. It can be applied in the form of adhesive strips or patches. Moreover, it can be used to create individual waterproofing coats and for sealing.

The product is recommended by
Building Research Institute in Warsaw:

Technical Recommendation RT ITB No. – 1075/2007

Instytut Techniki Budowlanej

Intended use:

Siplast Klej® Szybki Styk SBS is used for bonding polystyrene thermal insulation EPS, XPS boards, and polyurethane PIR and PUR boards on concrete surfaces, primed with bitumen primer Siplast Primer® Speed Primer SBS for roofs, including green roofs. In Icopal Extensive Green Roof System it is also used for bonding polystyrene PSK boards as vapor control layer (classical system).

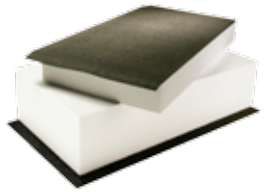
Properties:

- Siplast Klej® Szybki Styk SBS has a double tearing strength capacity,
- retains flexibility and effectiveness of bonding even at low temperatures (up to -10°C),
- is resistant to weak acids and alkali,
- easy to apply – can be applied with a putty knife, trowel or squeezed out of the applicator.

Technical Documentation:

- Declaration of Conformity: 9/B/2010
- Hygienic Attest: HK/B/1551/01/2012
- Product Technical Data Sheet: 05/2011
- Dangerous Product Data Sheet of 3 November 2008

Thermal insulation – expanded polystyrene EPS



Icopal thermal insulation boards PSK – polystyrene boards of Icopal production, with polystyrene core EPS100-038, one side veneered with base membrane in order to protect polystyrene against the effect of flame from a gas burner during membrane torching-on. Thickness of PSK board – in accordance with technical design, edges finished with overlaps or straight.

Icopal Polystyrene EPS100-038 – boards of hard expanded polystyrene of Icopal production of thickness in accordance with technical design. Edges finished with overlaps or straight. In Icopal Extensive Green Roof System it is intended for classical systems fastened mechanically.

Intended use:
Used for thermal insulation layer of roofs in the classical system.
Properties:
- compressive stress at 10% deformation: ≥100 kPa,
- thermal conductivity factor: 0.037 W/mK,
- bending strength: ≥150 kPa.

Technical Documentation:
Icopal Expanded Polystyrene EPS 100-038:
- Reference document: PN/EN 13163/2009
- Declaration of Conformity: EC/T/3/2010
- Hygienic Attest: HK/B/0425/01/2009

Icopal layered boards PSK:
- Reference document: Technical approval – AT/2000-11-0041, amendment of November 2007
- Reference document: Technical approval – Appendix 1 to AT/2000-11-0041
- Declaration of Conformity: 2/T/2012
- Hygienic Attest: HK/B/0651/02/2007

Thermal insulation – extruded polystyrene XPS

Polystyrene XPS – boards of hard extruded polystyrene of thickness based on thermal insulation calculations, with edges finished with overlaps or straight. In Icopal Extensive Green Roof System it is intended for reversed systems.

Intended use:
Used for thermal insulation layer of roofs in the reversed system.
Properties:
- compressive stress at 10% deformation: ≥250 kPa,
- thermal conductivity factor: value λ declared by the manufacturer: 0.03–0.04 W/mK,
- bulk density: declared value of the bulk density is: 28-32 kg/m^3,
- typical volume absorption after long-term total immersion – not more than 3.0%.

Technical Documentation:
Extruded Polystyrene XPS:
- Reference documents and other technical documentation available from manufacturer.

Icopal Green Roof

Immediately after installation

Waterproofing with root barriers function

Waterproofing layer with root barrier function in Icopal Extensive Green Roof System is always made as two-layers system.

Variants of the waterproofing layers:

IN THE CLASSICAL SYSTEM WITH:

1. **Thermal insulation of Icopal EPS polystyrene boards on concrete surface or trapezoidal sheet and mechanically fastened waterproofing:**

   layer 1: membrane for mechanical fastening Icopal Glasbit G200 S40 Speed Profile® SBS
   layer 2: torch-on membrane with root barrier function Graviflex 4.2 SBS / Green Roof
   or Graviflex 5.2 SBS / Green Roof

2. **Thermal insulation of Icopal EPS polystyrene panels on concrete surface or trapezoidal sheet and self-adhesive waterproofing:**

   layer 1: self- adhesive membrane Icopal Plaster P180/2000
   layer 2: torch-on membrane with root barrier function Graviflex 4.2 SBS / Green Roof
   or Graviflex 5.2 SBS / Green Roof

3. **Thermal insulation of Icopal layered boards PSK on concrete surface or trapezoidal sheet and torch-on waterproofing:**

   layer 1: Icopal membrane torch-on in Speed Profile® SBS technology
   layer 2: torch-on membrane with root barrier function Graviflex 4.2 SBS / Green Roof
   or Graviflex 5.2 SBS / Green Roof

IN REVERSED SYSTEM WITH:

1. **Waterproofing on concrete surface fastened by torching-on and with polystyrene XPS thermal insulation:**

   layer 1: Icopal membrane torch-on in Speed Profile® SBS technology
   layer 2: torch-on membrane with root barrier function Graviflex 4.2 SBS / Green Roof
   or Graviflex 5.2 SBS / Green Roof

2. **Waterproofing on wooden surface or trapezoidal sheet fastened mechanically and with polystyrene XPS thermal insulation:**

   layer 1: mechanically fastened Icopal membrane Glasbit G200 S40 Speed Profile® SBS
   layer 2: torch-on membrane with root barrier function Graviflex 4.2 SBS / Green Roof
   or Graviflex 5.2 SBS / Green Roof

Glasbit G200 S40 Speed Profile® SBS

Icopal torch-on, base membrane, modified with synthetic rubber SBS, on the glass fleece of 200 g/m² and of 4.0 mm thickness, as well as good physical and mechanical parameters.

Membrane type	Reinforcement type and gramming	Membrane thickness	Tearing strength	Average extending	Flexibility at low temperatures	Flow resistance
	[g/m²]	[mm]	[N/5 cm]	[%]	[°C/Ø30 mm]	[°C]
Glasbit G200 S40 Speed Profile® SBS	glass fleece, 200	4.0	1200/2500	8/8	-8	80

Guarantee periods depending on system choice:

Icopal S.A. Personal Quality Guarantee on waterproofing

30 years Base membrane: Glasbit G200 S40 Speed Profile® SBS
Membrane with root barrier function: Graviflex 5.2 SBS / Green Roof

25 years Base membrane: Glasbit G200 S40 Speed Profile® SBS
Membrane with root barrier function: Graviflex 4.2 SBS / Green Roof

Register your guarantee online at www.gwarancje.icopal.pl within 45 days from date of purchase

Technical Documentation:

- Reference document: PN-EN 13707+A2:2012
- Declaration of Conformity: EC/41.4/2006
- Certificate of Factory Production Control: 1434-CPD-0049
- Technical Information Product: IT-50/2006 rev. 5
- Hygienic Attest: HK/B/0543/01/2011
- Classification B_{Roof} (t_1)
- Technical Recommendation: RT ITB 1170/2010

Plaster P 180/2000

Self-adhesive, modified with synthetic rubber SBS base membrane, on a polyester reinforcement of 180 g/m² and thickness of 2.6 mm, as well as excellent physical and mechanical parameters.

Memebrane type	Reinforcement type and gramming	Membrane thickness	Tearing strength	Average extending	Flexibility at low temperatures	Flow resistance
	[g/m²]	[mm]	[N/5 cm]	[%]	[°C/Ø30 mm]	[°C]
Plaster P 180/2000	polyester reinforcement,180	2.6	900/700	60/60	-25	100

Guarantee periods depending on system choice:

Icopal S.A. Personal Quality Guarantee on waterproofing

25 years elf-adhesive, base membrane: Plaster P 180/2000
Membrane with root barrier function: Graviflex 5.2 SBS / Green Roof

20 years Self-adhesive, base membrane: Plaster P 180/2000
Membrane with root barrier function: Graviflex 4.2 SBS / Green Roof

Register your guarantee online at www.gwarancje.icopal.pl within 45 days from date of purchase

Technical Documentation:

- Reference document: PN-EN 13707+A2:2012
- Declaration of Conformity: EC/14.2/2006
- Certificate of Factory Production Control: 1486-CPD-0258
- Technical Information Product: IT-10/2006 rev. 3
- Hygienic Attest: HK/B/0457/04/2007
- Classification B_{Roof} (t_1)
- Technical Recommendation: RT ITB 1170/2010

Icopal Green Roof

Immediately after installation

Polbit Baza 5.0 Speed Profile® SBS
Extradach Baza 4.0 Speed Profile® SBS
Junior Baza 3.0 Speed Profile® SBS

Icopal torch-on, base membranes modified with synthetic rubber SBS, on polyester reinforcement of 250 g/m^2 or glass fleece (for concrete surfaces) and a guaranteed thickness, as well as excellent physical and mechanical parameters.

FLAGSHIP MEMBRANES OF ICOPAL

Membrane type	Reinforcement type and gramming	Membrane thickness (range)	Tearing strength in range	Average extending	Flexibility at low temperatures	Flow resistance
	[g/m^2]	[mm]	[N/5 cm]	[%]	[°C/Ø30 mm]	[°C]
Polbit Baza 5.0 Speed Profile® SBS	Polyester reinforcement 250	5.0÷5.2	Longitudinal: 1000÷1200 Transverse: 800÷1000	50/50	-25	105
Extradach Baza 4.0 Speed Profile® SBS	Polyester reinforcement 250	4.0÷4.2	Longitudinal: 1000÷1200 Transverse: 800÷1000	50/50	-20	100
Junior Baza 3.0 Speed Profile® SBS	Glass fleece, enhanced 80	3.0÷3.2	Longitudinal: 550÷650 Transverse: 350÷450	5/5	-25	105

Guarantee periods depending on system choice:

Icopal S.A. Personal Quality Guarantee on waterproofing

40 years Base membrane: Polbit Baza 5.0 Speed Profile® SBS
Membrane with root barrier function: Graviflex 5.2 SBS / Green Roof

35 years Base membrane: Extradach Baza 4.0 Speed Profile® SBS
Membrane with root barrier function: Graviflex 5.2 SBS / Green Roof

25 years Base membrane: Junior Baza 4.0 Speed Profile® SBS
Membrane with root barrier function: Graviflex 5.2 SBS / Green Roof

35 years Base membrane: Polbit Baza 5.0 Speed Profile® SBS
Membrane with root barrier function: Graviflex 4.2 SBS / Green Roof

30 years Base membrane: Extradach Baza 4.0 Speed Profile® SBS
Membrane with root barrier function: Graviflex 4.2 SBS / Green Roof

20 years Base membrane: Junior Baza 4.0 Speed Profile® SBS
Membrane with root barrier function: Graviflex 4.2 SBS / Green Roof

Register your guarantee online at www.gwarancje.icopal.pl within 45 days from date of purchase

Technical Documentation:
- Reference document: PN-EN 13707+A2:20
- Technical Recommendation: RT ITB 1170/2010

Polbit Baza 5.0 Speed Profile® SBS
- Declaration of Conformity: EC/6.1/2006
- Certificate of Factory Production Control: 1486-CPD-0258
- Technical Information: IT 30/2006 rev. 2
- Classification B_{Roof} (t_1)

Extradach Baza 4.0 Speed Profile® SBS
- Declaration of Conformity: EC/2.2/2006
- Certificate of Factory Production Control: 1486-CPD-0258
- Technical Information: IT 6/2006 rev. 3
- Classification B_{Roof} (t_1)

Junior Baza 3.0 Speed Profile® SBS
- Declaration of Conformity: EC/12.2/2006
- Certificate of Factory Production Control: 1486-CPD-0258
- Technical Information: IT 32/2006 rev. 3
- Classification B_{Roof} (t_1)

ISO 14001

Icopal Green Roof

Light and maintenance-free

Graviflex 4.2 SBS / Green Roof and Graviflex 5.2 SBS / Green Roof

Torch-on, modified with synthetic rubber SBS membrane with root barrier function of Icopal production, on polyester reinforcement of 4.2 mm/5.2 mm, and excellent physical and mechanical parameters.

Membrane type	Guarantee	Reinforcement type and gramming	Membrane thickness	Tearing strength	Average extending	Flexibility at low temperature	Flow resistance
	years	[g/m^2]	[mm]	[N/5 cm]	[%]	[°C/Ø30 mm]	[°C]
Graviflex 4.2 SBS / Green Roof	20-35*	Polyester reinforcement 200	4.2	950/700	50/50	-20	100
Graviflex 5.2 SBS / Green Roof	25-40*	Polyester reinforcement 250	5.2	1100/900	50/50	-25	100

Icopal S.A. Personal Quality Guarantee
on waterproofing

20 – 40 years

*** depending on waterproofing system**

Register your guarantee online at www.gwarancje.icopal.pl within 45 days from date of purchase

Technical Documentation:

- Reference document: PN-EN 13707+A2:2012
- Technical Recommendation: RT ITB 1170/2010

Graviflex 4.2 SBS / Green Roof

- Declaration of Conformity: EC/8.1/2012
- Certificate of Factory Production Control: 434-CPD-0049
- Certificate of Factory Production Control: 1434-CPD-0057
- Technical Information: IT-8/2012 rev. 1
- Classification B_{Roof} (t1)

Graviflex 5.2 SBS / Green Roof

- Declaration of Conformity: EC/7.1/2012
- Certificate of Factory Production Control: 1434-CPD-0049
- Certificate of Factory Production Control: 1434-CPD-0057
- Technical Information: IT-7/2012 rev. 1
- Classification B_{Roof} (t1)

Icopal Green Roof

Immediately after installation

Drainage layer

Icodren 10 Szybki Drenaż® SBS – drainage mat of 10 mm thickness with entangled polyamide fibers core secured on both sides with polyester filtering geotextile. Mat width is 100 cm, length 45 m. The inner core, on connection areas with another belt of material is in direct contact with the adjacent mat, is additionally protected with 10 cm geotextile overlap that prevents entry of substrate particles into a mat.

Intended use:

- protection of roots of green vegetation part against water retention and rotting during prolonged and heavy rainfall,
- acquisition of excess water and drainage it to the receivers,
- mechanical protection of waterproofing layer,
- filtering of soil from clay particles and protection of water receivers against silt accumulation.

Parameters:

Water drainage properties

Pressure	Hydraulic gradient	Water drainage to the surface q w l/(s·m)*		
[kPa]	–	Mean value	Tolerancy	Norm
20	1,0	2.0	-0.6	EN ISO 12958

* Results of Colbond Geosynthetics laboratory in accordance with EN ISO 12958 standards.
Substrate: soft / hard
Pressure corresponding to the pressure of the ground was simulated by a layer of flexible foam.

Hydraulic properties of the filtering layer

		Mean value	Tolerancy	Norm
Water permeability VI_{H50}	**mm/s**	**100**	**-30**	**EN ISO 11058**
Contractual pore size O_{90}	**µm**	**170**	**+/-40**	**EN ISO 12956**

CE

The notified body
Notification No 0799
(Institut für textile Bau- und Umwelttechnik GmbH)
Germany

Technical Documentation:

- CE Declaration of Conformity
- Certificate of Factory Production Control: 0799-CPD-11
- Product Technical Information
- Technical Recommendation: RT ITB 1130/2008

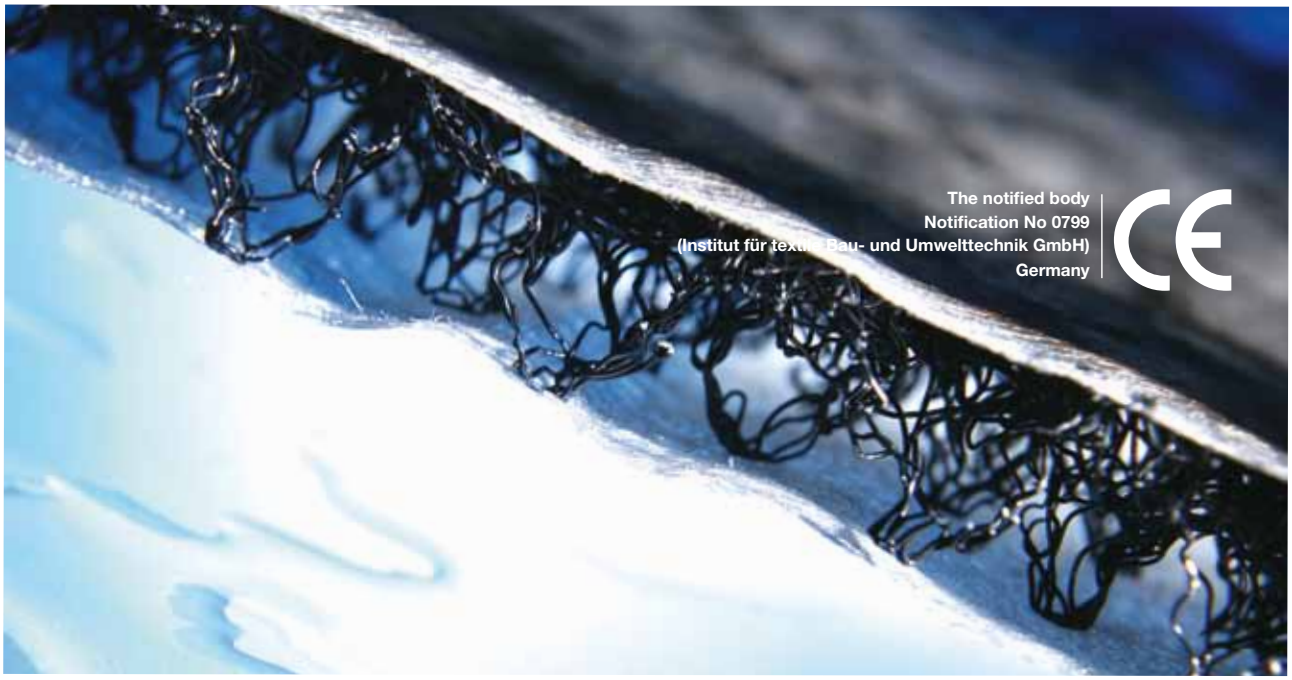
ISO 14001

Comparison of Icodren 10 Szybki Drenaż® SBS with bubble foil

Icodren 10 Szybki Drenaż® SBS	Bubble foil
It is properly constructed drainage mat – with all-surface water filtration function, and with geotextile used on both its sides it separates substrate particles.	Bubble foil does not have water filtering function – is not intended for drainage.
Geotextile used on both sides, as well as tangled structure of polyamide fibers, it evenly distributes pressure of the layers of a green roof on waterproofing.	Pressure of the bubbles at high pressure can cause damage to waterproofing – see picture below.
Icodren 10 is a flexible, easy-installed and easy-formed drainage mat, perfectly coherent to the the curvature of the substrate.	Bubble foil is rigid, has sharp edges and is difficult to form – it does not adhere evenly to the entire surface.
System solutions Icodren 10 protects drainage area against silt accumulation, keeping it in good condition.	Precipitation water penetrates foil on leaky joints, leading to rapid silt accumulation of drainage area by fine substrate particles – water overflows on top.
Icodren 10 combines drainage, separating and filtering functions.	In order to give bubble foil a drainage properties, an extra layer of geotextile of 250 g/m^2 need to be laid on it.

Icodren 10 Szybki Drenaż® SBS provides:

- a high rate of filtration,
- complete protection of waterproofing layer,
- full protection of drainage core against silt accumulation of clay substrate particles,
- high flexibility and adhesion to all parts and the entire surface of the substrate,
- easy installation – can be cut with shears.



Retention layer

Retention and microdrainage layer Icomat 140 – retention geotextile with microdrainage – geotextiles system developed at the commission of Icopal. Each of the individual geotextiles consists of two layers: tangled glass fleece with microdrainage function and cotton-polyester reinforcement with function of precipitation water retention. The ratio of cotton to polyester fibers is equal and is 50%. Due to this solution internal circulation of air between geotextiles is maintained.

Retention and microdrainage layer Icomat 140 is composed of:
– 7 layers of geotextiles for flat roofs,
– 10 layers of geotextiles for pitched roofs.
Icomat 140 made of 7 layers (flat roofs): about 980 g/m^2.
Icomat 140 made of 10 layers (pitched roofs): 1400 g/m^2.
Width of Icomat 140:100 cm.

Intended use:
The uniqueness of the retention and microdrainage layer Icomat 140 consist in simultaneous retention and microdrainage functions and inner circulation of air. In addition, the unique design provides three times longer drying time than mineral substrate, therefore, ensuring more water supplies for the plants. The internal air circulation and aeration are also preserved.
It is used directly underneath the vegetation mat. Due to the high content of natural components (cotton fibers) it perfectly corresponds to the green part, ensuring good rooting of the plants.

Parameters:

Name	Gramming	Thickness	Width	Packaging
Icomat 140 7 layers	980 g/m^2	3.6 mm	100 cm	Roll width: 100 cm Length: 100 mb (linear metre) Weight: 15 kg
Icomat 140 10 layers	1400 g/m^2	5.1 mm	100 cm	Roll width: 100 cm Length: 100 mb (linear metre) Weight: about 15 kg

Technical Documentation:
• Hygienic Attest of National Institute of Hygiene in Warsaw

Ordinary mineral substrate (soil): a combination of mineral and organic-origin products. It functions as a vegetation, retention and drainage layer. Weight about 160 kg/m2 for a layer of 10 cm. It is applied for extensive flat roofs and as a filling material of irregularities of substrate.

Comparison of the Icodren 10 Szybki Drenaż® SBS + Icomat 140 with mineral substrate

	Geotextile 200g/m² + mineral substrate	**Icodren 10 Szybki Drenaż® SBS + Icomat 140**
INTENDED USE	retention, drainage and vegetation layer	drainage and retention layer and internal air circulation and aeration
ROOF TYPE	flat	flat and pitched (*)
TYPES OF VEGETATION	mosses, sedums, herbs or grasses	mosses, sedums, herbs or grasses
WEIGHT	160 kg/m² (for 10 cm substrate thickness)	flat roof: about 1.6 kg/m² pitched roof: about 1.4 kg/m²
THICKNESS	from 100 mm upwards	flat roof: 13.6 mm pitched roof: 5.1 mm
PACKAGING	big bag of 1 m³ (1600 kg) 50 kg bags	a roll of 100 linear metre (15 kg)

(*) Icodren 10 Szybki Drenaż® SBS mat is not intended for pitched roofs.

Comparison of the roof assembly of 1000 m²

	Separating geotextile 1 layer + mineral substrate	**Icodren 10 Szybki Drenaż® SBS + Icomat 140 (7 layers)**
LAYER THICKNESS	100 mm for a roof of 1000 m² estimated volume of substrate is 100 m³	13.6 mm
NUMBER OF PALLETS	substrate: 100 pallets geotextile 1 pallet total: 101 pallets	Icodren 10 Szybki Drenaż® SBS: 23 pallets retention mat – 7 layers: 2 pallets total: 25 pallets
HORIZONTAL TRANSPORT	4-5 full truckload transports	1 full truckload transport
VERTICAL TRANSPORT	equipment: 8 h – 2400 PLN net workers: 4 pers. x 8 man-hour: 1386 PLN net	equipment: 2 h – 600 PLN net workers: 4 pers. x 2 man-hour: 347 PLN net
NUMBER OF MAN-HOUR NECESSARY TO COMPLETE INSTALLATION OF A LAYER ON A ROOF	employees: 6 pers. x 16 man-hour: 4158 PLN net	employees: 6 pers. x 8 man-hour: 2079 PLN net
TOTAL	**7944** PLN net	**3026** PLN net

Assumptions: The roof at a height of 10 m and an area of 1000 m². Vertical transport by crane. For the vertical transport of the substrate onto the roof four employees is needed (2 persons loading at the bottom, 2 persons unloading on the roof). During uploading a partial distribution of the substrate from big bags on the surface of the roof takes place. Further distribution of the substrate with alignment of 10 cm layer takes place within 2 working days and is carried out by six workers.

Source: Actual data obtained from contractors in 2013.

Note: Estimation of layers installation costs of a green roof does not include the cost of finishing works and installation of other layers (e.g., waterproofing, thermal insulation, etc.) other than those specified in the table.

Icopal Green Roof

Immediately after installation

Icomat Green 317 – extensive vegetation mat for flat roofs

Consists of a looped mat made of polypropylene, with appropriately selected mineral substrate and plants growing on it. Mineral substrate provides an appropriate amount of nutrient substances necessary for life and development of plants, and due to looped mat plant roots grow properly between the three-dimensional fibers. Vegetation located on the mat is a combination of moss, flowering herbs and multicolored sedums.

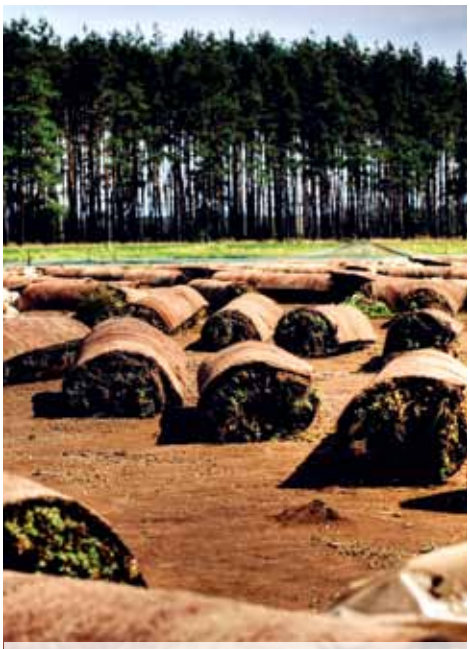
Mats during winter and early spring

Intended use:

Ready to install a flat vegetation layer of green roof, cultivated during 1.5 years, expanded from a roll directly on the roof. Delivered to the installation site as 70-100% green.
Installation of individual rolls by mutual tying.

Parameters:

- vegetation part: moss, sedum, herbs,
- structural layer: polypropylene looped mat with properly selected substrate along with vegetation,
- flat roof of angle inclination up to 6°,
- core thickness of a mat without vegetation: up to 2.5 cm,
- delivery: in rolls, partially green, of width of 1 meter and length of 2 meters or in parts 1 x 1 m,
- delivery time: no more than 24 hours from loading,
- maintenance free roof – technical review and fertilization is recommended once a year.



Rolls of green vegetation layer ready for transportation to the installation site

Technical Documentation:

- XEROFLOR catalog sheet, XF 317

Icomat Green 300 – extensive vegetation mat for pitched roofs

Consists of a looped mat made of polypropylene, with appropriately selected mineral substrate and plants growing on it. Mineral substrate provides an appropriate amount of nutrient substances necessary for life and development of plants, and due to looped mat plant roots grow properly between the three-dimensional fibers. Vegetation located on the mat is a combination of moss, flowering herbs and multicolored sedums.

Mats during summer and early autumn

Intended use:
Ready to install vegetation layer of green pitched roof, cultivated during 1.5 years, expanded from a roll directly on the roof. Delivered to the installation site as 70-100% green.
Installation of individual rolls by mutual tying.

Parameters:
- vegetation parts: moss, sedum, herbs,
- structural layer: polypropylene looped mat with properly selected substrate along with vegetation,
- pitched roof of angle inclinatio: 7°-35°,
- core thickness of a mat without vegetation: up to 3 cm,
- delivery: in rolls, partially green, of width of 1 meter and length of 2 meters or in parts 1 x 1 m,
- delivery time to the installation site: no more than 24 hours from loading,
- maintenance free roof – technical review and fertilization is recommended once a year.

Technical Documentation:
- XEROFLOR catalog sheet, XF 300

A palette with vegetation mats ready for transportation to the installation site

Icopal Green Roof

Immediately after installation

Accessories

Eaves resistance battens (perforated, acid proof, stainless steel)
Battens are used to finish eaves edges of extensive green roof. They remain permanently mounted to the surface, and on eaves side it has a perforation to allow drainage of excess of precipitation water from retention layer. Available from Icopal.

Available standard offer:
– 10 x 10 x L200 cm
– 10 x 30 x L200 cm
Eaves resistance battens are also available at Customer's individual order.

Inspection boxes (perforated, acid proof stainless steel)
They are used to protect roof drains from mechanical damage. They remain permanently mounted to the surface and are perforated to allow drainage of excess of precipitation water from retention layer. Available from Icopal.

Available standard offer:
– 25 x 25 x H15 cm
– 25 x 25 x H35 cm
Inspection boxes are also available at Customer's individual order.

Filtering geotextile
Polypropylene geotextile of 120 g/m^2, 100-300 cm width, of any length, used as a filtering layer, and in justified cases, it functions as separation of gravel layer or edge protection of green roof and surrounding drains and inspection boxes.

Aggregated gravel 16-32 mm
Aggregated gravel consists of 16-32 mm fractions. Used on flat roofs as drainage of a minimum thickness of 5 cm and as a backfill around the edges of the roof, skylights, chimneys, walls, etc. It can constitute a pressure layer in the reversed roof system. Gravel is not in Icopal's offer – is is delivered from local mines. Weight of 1.8 t/m^3.

Logistic information concerning products included in Icopal Green Roof System

Item no.	Product Type	Consumption unit	Packaging unit	Packaging weight unit	Amount on the pallet	Pallet weight with pallet (25 kg)
		m^2		kg	piece	kg
PRIMER AND BITUMEN GLUE						
1	Siplast Primer® Speed Primer SBS – 10 l	0.2 l/m^2	can 10 l	10.5	70	760
2	Siplast Primer® Speed Primer SBS – 30 l	0.2 l/m^2	can 30 l	29.5	28	851
3	Siplast Glue® Szybki Styk SBS – 5 kg	0.1-0.4 kg/m^2	can 5 kg	5.4	100	565
MEMBRANES						
4	Foalbit Al S40	1.12*	roll 7.5 m^2	42	20 (150 m^2)	865
5	Glasbit G200 S40 Speed Profile® SBS	1.12*	roll 7.5 m^2	42	20 (150 m^2)	865
6	Plaster P 180/2000	1.12*	roll 10.0 m^2	27	24 (240 m^2)	673
7	Polbit Baza 5.0 Speed Profile® SBS	1.12*	roll 5.0 m^2	34	24 (120 m^2)	841
8	Extradach Baza 4.0 Speed Profile® SBS	1.12*	roll 7.5 m^2	41	20 (150 m^2)	845
9	Junior Baza 3.0 Speed Profile® SBS	1.12*	roll 10.0 m^2	42	20 (200 m^2)	865
10	Graviflex 5.2 SBS / Green Roof	1.15*	roll 5.0 m^2	37	24 (120 m^2)	913
11	Graviflex 4.2 SBS / Green Roof	1.15*	roll 7.5 m^2	46	20 (150 m^2)	945
THERMAL INSULATION BOARDS						
12	Layered boards PSK thickness 5 cm 50 cm x 100 cm x 5 cm	1.02*	50 cm x 100 cm	1.7	-	-
13	Layered boards PSK thickness 10 cm 50 cm x 100 cm x 10 cm	1.02*	50 cm x 100 cm	2.1	-	-
14	Layered boards PSK thickness 15 cm 50 cm x 100 cm x 15 cm	1.02*	50 cm x 100 cm	2.5	-	-
15	Layered boards PSK thickness 20 cm 50 cm x 100 cm x 20 cm	1.02*	50 cm x 100 cm	2.9	-	-
16	Layered boards PSK thickness 25 cm 50 cm x 100 cm x 25 cm	1.02*	50 cm x 100 cm	3.4	-	-
17	Polystyrene EPS 100-038 thickness 5 cm 50 cm x 100 cm x 5 cm	1.02*	0.3 m^3 (12 boards)	4.8	-	-
18	Polystyrene EPS 100-038 thickness 10 cm 50 cm x 100 cm x 10 cm	1.02*	0.3 m^3 (6 boards)	4.8	-	-
19	Polystyrene EPS 100-038 thickness 15 cm 50 cm x 100 cm x 15 cm	1.02*	0.3 m^3 (4 boards)	4.8	-	-
20	Polystyrene EPS 100-038 thickness 20 cm 50 cm x 100 cm x 20 cm	1.02*	0.3 m^3 (3 boards)	4.8	-	-
DRAINAGE AND RETENTION PRODUCTS						
21	Icodren 10 Szybki Drenaż® SBS	1.00*	45.0 m^2	27	1	70
22	Icomat 140	1.00	100.0 m^2	15	11 (1100 m^2)	190
23	Aggregated gravel	-	big bag 1.0 m^3	1600	1	1600
24	Filtering geotextile 120 g/m^2	1.12*	150.0 m^2	19	8 (1200 m^2)	177
PRE-CULTIVATED VEGETATION MATS						
25	Vegetation mat Icomat Green 317 100 cm x 200 cm x 2.5 cm	1.00*	roll 2 m^2	40-50 kg	18-20 rolls	max. 1050 kg**
26	Vegetation mat Icomat Green 317 100 cm x 100 cm x 2.5 cm	1.00*	mat 1 m^2	20-25 kg	36-40 m^2	max. 1050 kg**
27	Vegetation mat Icomat Green 300 100 cm x 200 cm x 3.0 cm	1.00*	roll 2 m^2	50-60 kg	16-18 rolls	max. 1130 kg**
28	Vegetation mat Icomat Green 300 100 cm x 100 cm x 3.0 cm	1.00*	mat 1 m^2	25-30 kg	32-36 m^2	max. 1130 kg**
ACCESSORIES						
29	Eaves resistance batten 10 x 10 x L200	1.00	1 batten (2.15 kg)	10 battens (21.5 kg)	-	-
30	Eaves resistance batten 10 x 30 x L200	1.00	1 batten (4.04 kg)	10 battens (40.4 kg)	-	-
31	Inspection box 25 x 25 x H15	-	1 piece	1.3 kg	-	-
32	Inspection box 25 x 25 x H35	-	1 piece	2.4 kg	-	-

(*) Consumption ratio is the amount of material (e.g. m^2 of membrane), which should be used to cover 1 m^2 of roof effectively. Ratio amount consists of area of longitudinal and transverse overlaps, as well as certain amount of waste generated during installation of the material on the roof.

(**) Estimated weight of a pallet with soaked vegetation mat, however, pallet weight may be lower, if it is transported less soaked. Measurements of a palette for transport of vegetation mats: 110 cm x 110 cm. Number of rolls of vegetation mats on the pallet depends on the mat vegetation state and its thickness. Fully-loaded transport contains 24 pallets of vegetation mats.

Icopal Green Roof

Immediately after installation

Technical inspections

Icopal Extensive Green Roof is, in fact, self-sustaining and self-maintaining system. Natural environment processes in the soil supply nutrient substances for plant growth. State of stress in plants, such as lack of water, is leveled out by specially selected biological mechanisms. On one hand, there are dying away process of old plants, and growth of young ones, on the other, and the whole process takes place in a closed system with continuous biological renewal and regeneration of plants. This biological cycle, usually takes place without human interference however, it can be cautiously supported with periodic fertilization. The use of herbicides is forbidden. Vegetation can also be damaged by introduction to the vegetation system of extraneous plants. The only care treatments are annual seeding of appropriate fertilizers and one-time inspection and cleaning of roof drains. Under a separate guarantee contract it is possible to obtain paid maintenance of green roof along with one-time technical review.

Watering

During the growth phase, immediately after planting a roof with extensive green, the whole area should be watered to allow the mat and ground absorb the maximum amount of water (practically the roof should be flooded). During long periods of drought and drying-out of the layers of a green roof, within four weeks from installing, the roof it should be flooded again. During the first weeks of the vegetation season a roof should be moist. Extensive roof, after growth phase generally does not require watering, however, during a prolonged drought a single flooding of the whole surface of the roof is recommended in order to achieve full saturation with water.

NOTE: If the plants are over-dry they come into hibernation state. After re-hydration, plants are reborn and their further development takes place. Repetitive flooding of plant root system for long period of time poses a a danger to the plants. Hence there is need for proper drainage.

Fertilization

After planting extensive green, fertilization can be reduced to spreading fertilizer in the spring or autumn. Prolonged – release fertilizer should be used. Amount of fertilizer should be from 5 to 30 g/m^2, depending on the type of fertilizer.

Control of drainage systems

The recesses on the roof and places next to the roof drains are critical points of an increased danger of water accumulation. Due to increased susceptibility of development of unwanted vegetation, such places should be particularly closely monitored, and the weeds and plants growing around these areas need to be removed.

Production hall – France

Office building Combs La Ville – France

ISO 14001

The production plant Ford River Rouge Complex – Dearborn, Michigan, USA

ISO 14001

ISO 14001

Extensive vegetation during spring

ISO 14001

Extensive vegetation during early-summer period

European Parliament – Strasbourg, France

ISO 14001

Office building Combs La Ville – France

School building – Nolslel, France

Green terrace of residential building – Boulogne, France

ISO 14001

Office building XEROFLOR – Poland

ISO 14001

ISO 14001

TECHNICAL DRAWINGS

NOTE:
This catalog contains a complete set of drawings of major solutions together with details solutions for each of them. In addition, all drawings contained in the following table are available in editable version on CD, attached hereof, and on the website: www.zielonydach.icopal.pl

TECHNICAL DRAWINGS

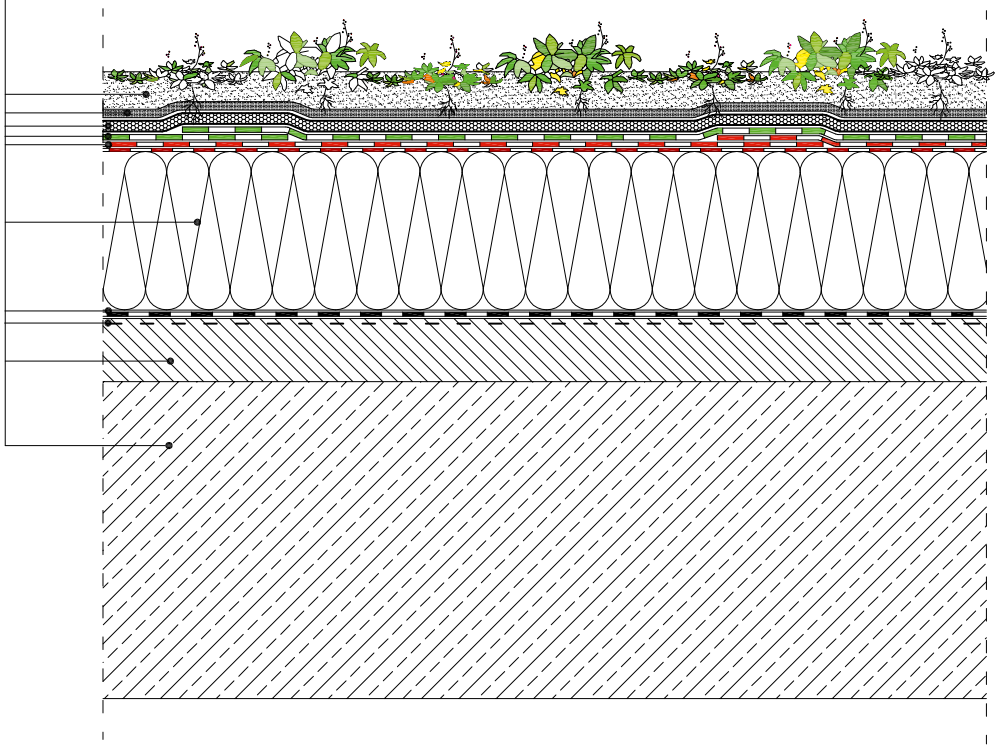
If you need to select a different layer system, we recommend contacting with technical advisor of Icopal (contact details of all advisors of Icopal on page 87).

Icopal Green Roof

Immediately after installation

Extensive green flat roof in classical system, on a concrete surface

- pre-cultivated vegetation mat, e.g. **ICOMAT GREEN 317,** thickness 2.5 cm
- retention and micro-drainage mat **ICOMAT 140** (7 layers)
- drainage mat **ICODREN 10 Szybki Drenaż® SBS**
- membrane with root barrier function **GRAVIFLEX 5.2. SBS / GREEN ROOF** or **GRAVIFLEX 4.2 SBS / GREEN ROOF**
- base membrane torched-on in ICOPAL **Speed Profile® SBS** technology: **POLBIT BAZA 5.0 Speed Profile® SBS** or **EXTRADACH BAZA 4.0 Speed Profile®** SBS or **JUNIOR BAZA 3.0 Speed Profile® SBS**
- thermal insulation - polystyrene layered board **ICOPAL PSK**
- bitumen vapor control layer e.g Icopal membrane **FOALBIT AI S40** or other base membrane Icopal or PE foil
- priming layer: **Siplast Primer® Speed Primer SBS**
- concrete downward layer
- reinforced concrete construction



Disclaimer

GGŁ 06.2013

Extensive green flat roof of angle up to 6 grades in classical system, on concrete surface.

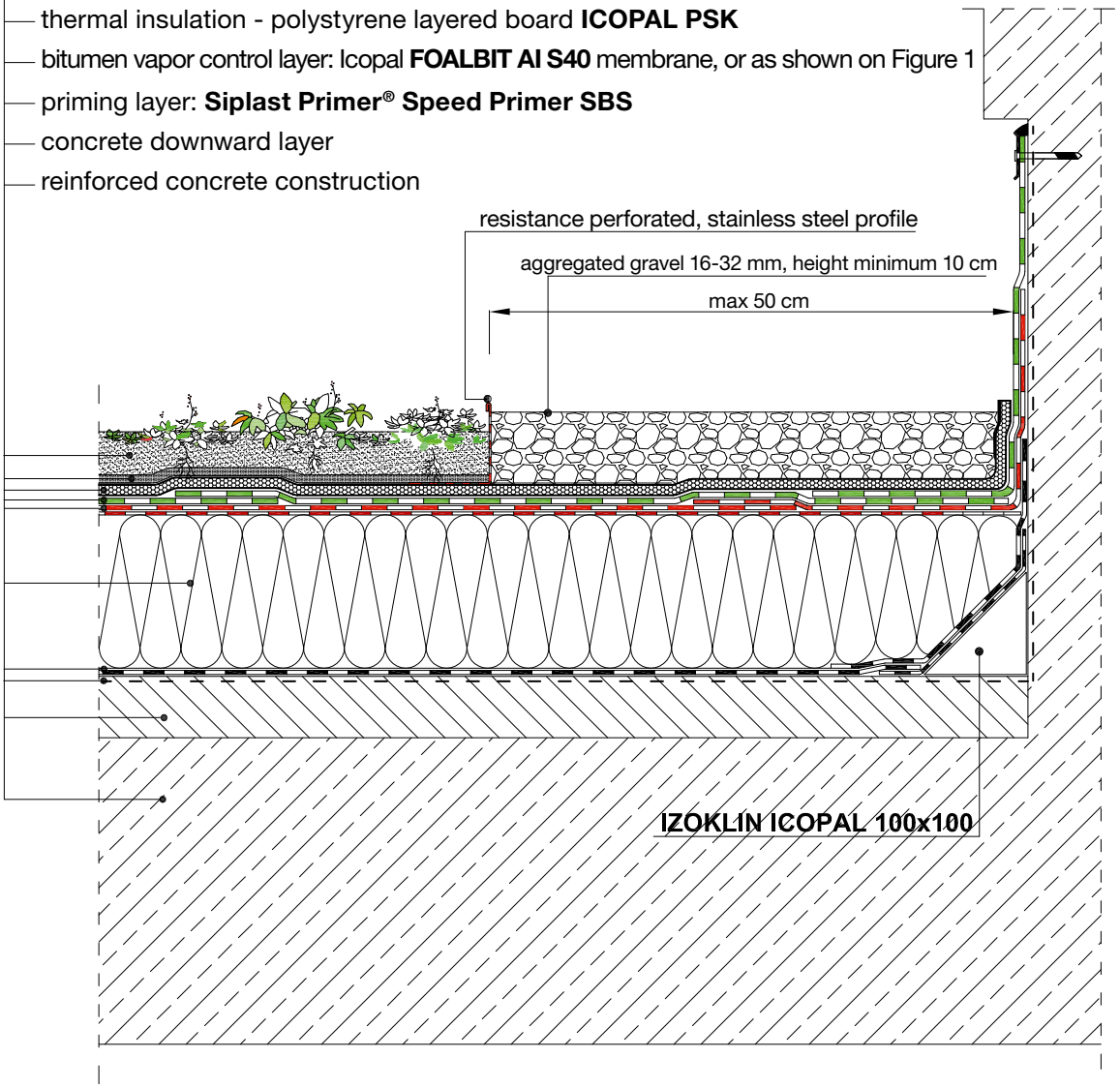
Figure 1

1-1-1

ISO 14001

Detail of attic, chimney, walls finishing

- pre-cultivated vegetation mat, e.g. **ICOMAT GREEN 317,** thickness 2.5 cm
- retention and micro-drainage mat **ICOMAT 140** (7 layers)
- drainage mat **ICODREN 10 Szybki Drenaż® SBS**
- membrane with root barrier function **GRAVIFLEX SBS / GREEN ROOF** as shown on Figure 1
- base membrane torched-on in ICOPAL **Speed Profile® SBS** technology, as shown on Figure 1
- thermal insulation - polystyrene layered board **ICOPAL PSK**
- bitumen vapor control layer: Icopal **FOALBIT AI S40** membrane, or as shown on Figure 1
- priming layer: **Siplast Primer® Speed Primer SBS**
- concrete downward layer
- reinforced concrete construction



NOTE: Width of gravel layer adjacent to a wall should be 50 cm maximum, its depth 10 cm minimum and granulation of aggregated gravel from 16 to 32 mm.

Disclaimer

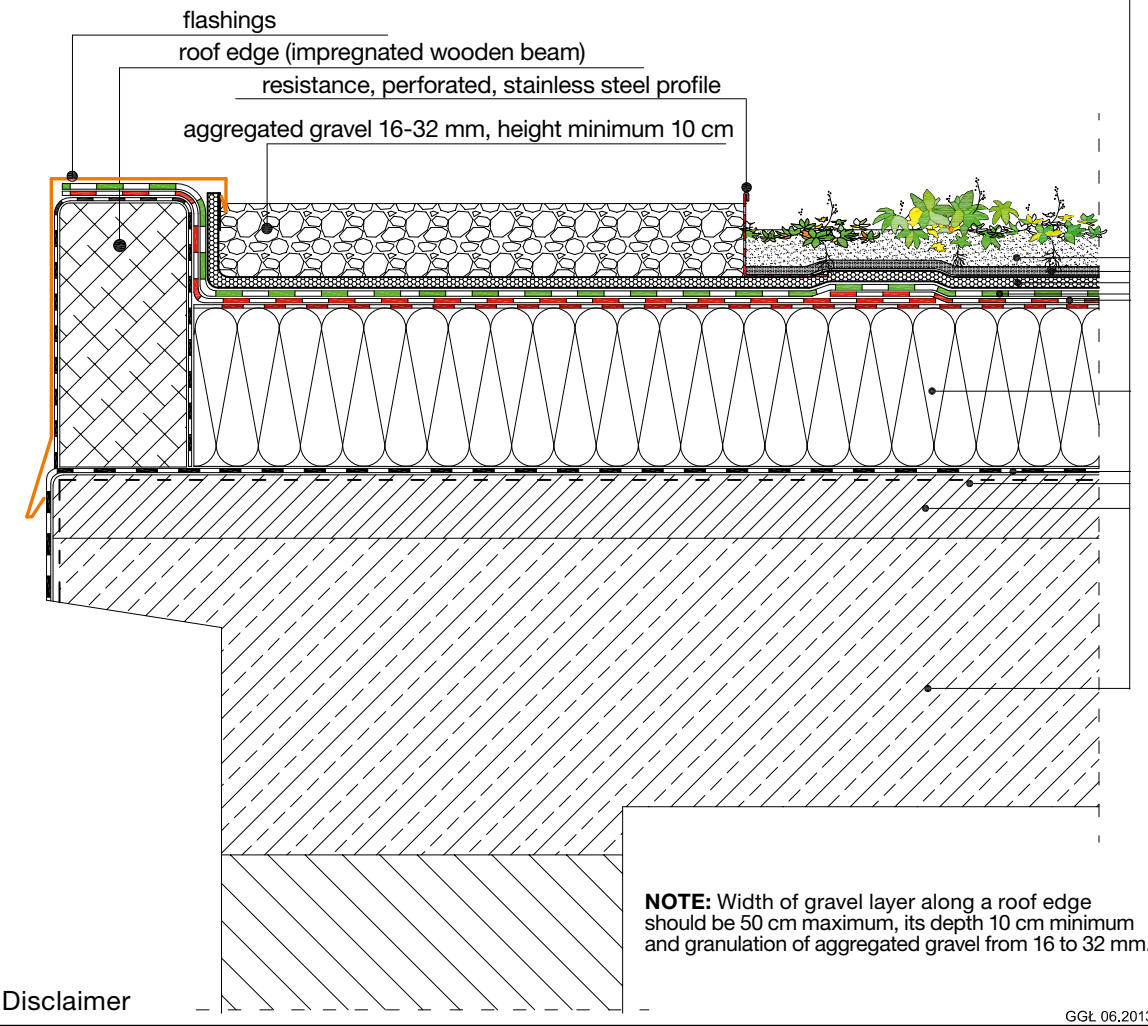
GGŁ 06.2013

Extensive green flat roof of angle up to 6 grades in classical system, on concrete surface.
Detail of attic, chimney, walls finishing.

Figure 1a
1-1-1-a

Detail of the roof edge finishing

pre-cultivated vegetation mat, e.g. **ICOMAT GREEN 317,** thickness 2.5 cm
retention and micro-drainage mat **ICOMAT 140** (7 layers)
drainage mat **ICODREN 10 Szybki Drenaż® SBS**
membrane with root barrier function **GRAVIFLEX SBS / GREEN ROOF,** as shown on Figure 1
base membrane torched-on in ICOPAL **Speed Profile® SBS** technology, as shown on Figure 1
thermal insulation - polystyrene layered board **ICOPAL PSK**
bitumen vapor control layer: Icopal **FOALBIT AI S40** membrane, or as shown on Figure 1
priming layer: **Siplast Primer® Speed Primer SBS**
concrete downward layer
reinforced concrete construction



NOTE: Width of gravel layer along a roof edge should be 50 cm maximum, its depth 10 cm minimum and granulation of aggregated gravel from 16 to 32 mm.

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Extensive green flat roof of angle up to 6 grades in classical system, on concrete surface.
Detail of the roof edge finishing.

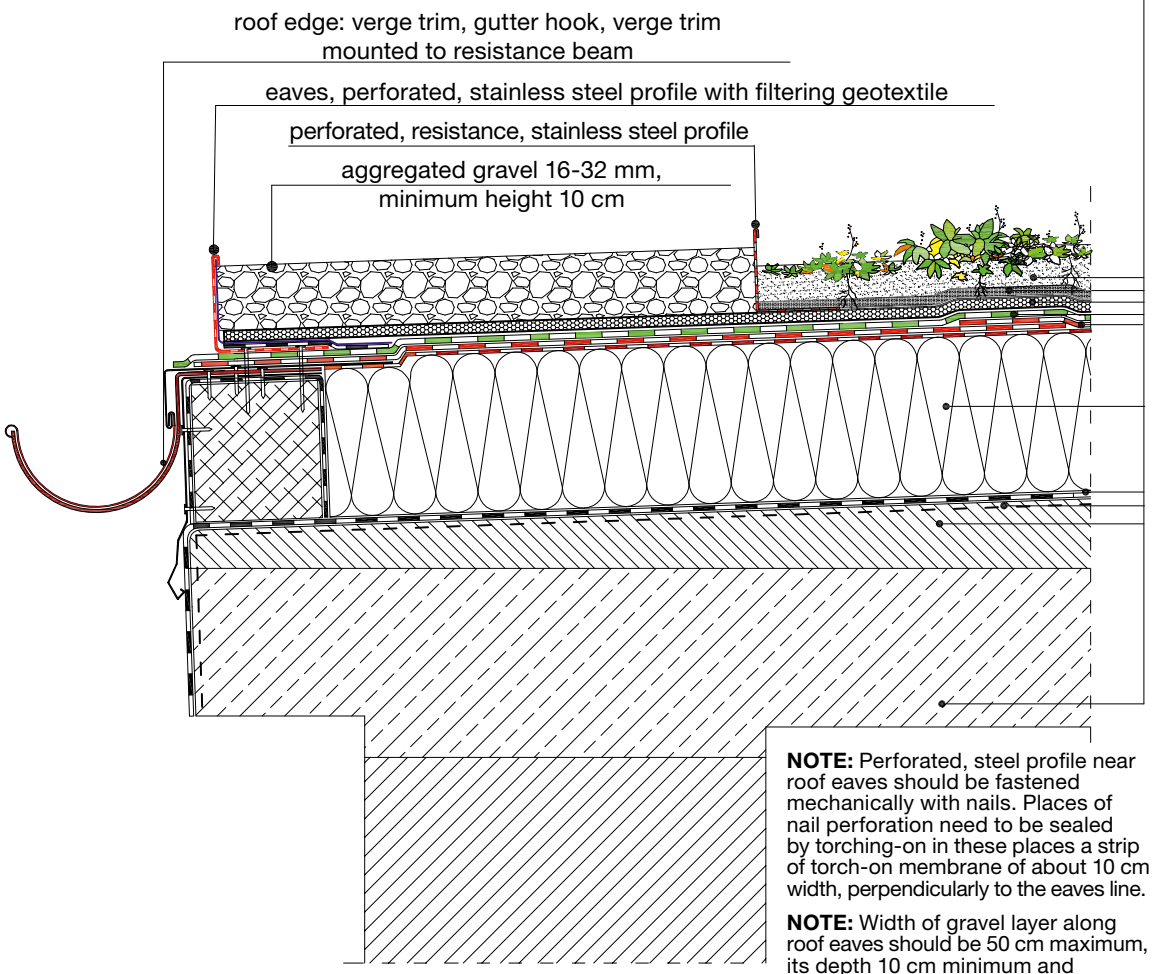
Figure 1b

1-1-1-b

ISO 14001

Detail of eaves finishing

pre-cultivated vegetation mat, e.g. **ICOMAT GREEN 317,** thickness 2.5 cm
retention and micro-drainage mat **ICOMAT 140** (7 layers)
drainage mat **ICODREN 10 Szybki Drenaż® SBS**
membrane with root barrier function **GRAVIFLEX SBS / GREEN ROOF,** as shown on Figure 1
base membrane torched-on in ICOPAL **Speed Profile® SBS** technology, as shown on Figure 1
thermal insulation - polystyrene layered board **ICOPAL PSK**
bitumen vapor control layer: Icopal **FOALBIT AI S40** membrane, or as shown on Figure 1
priming layer: **Siplast Primer® Speed Primer SBS**
concrete downward layer
reinforced concrete construction



NOTE: Perforated, steel profile near roof eaves should be fastened mechanically with nails. Places of nail perforation need to be sealed by torching-on in these places a strip of torch-on membrane of about 10 cm width, perpendicularly to the eaves line.

NOTE: Width of gravel layer along roof eaves should be 50 cm maximum, its depth 10 cm minimum and granulation of aggregated gravel from 16 to 32 mm.

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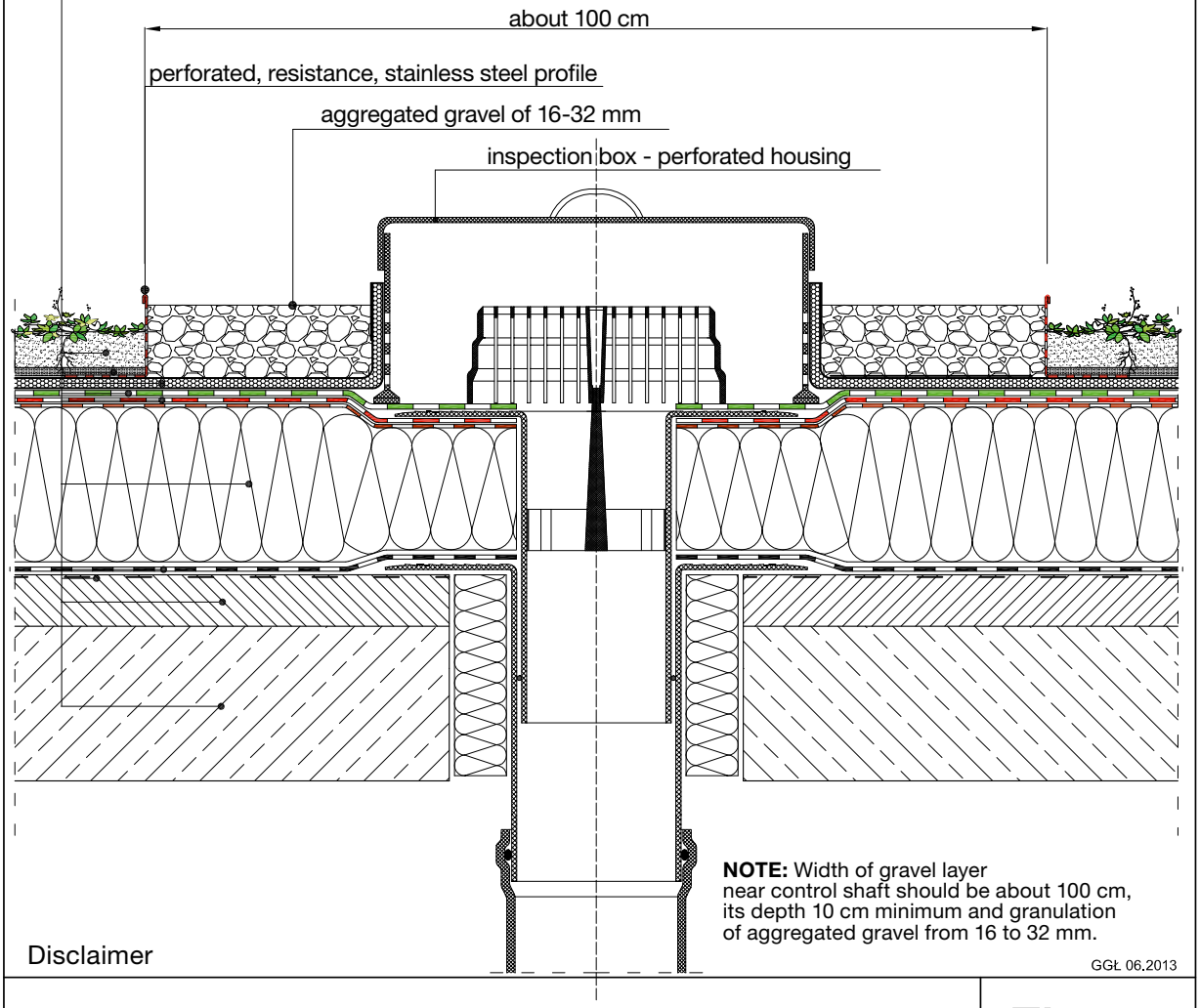
Extensive green flat roof of angle up to 6 grades in classical system, on concrete surface.
Detail of eaves finishing.

Figure 1c

1-1-1-c

Detail of the roof drain with inspection box

- pre-cultivated vegetation mat, e.g. **ICOMAT GREEN 317,** thickness 2.5 cm
- retention and micro-drainage mat **ICOMAT 140** (7 layers)
- drainage mat **ICODREN 10 Szybki Drenaż® SBS**
- membrane with root barrier function **GRAVIFLEX SBS / GREEN ROOF,** as shown on Figure 1
- base membrane torched-on in ICOPAL **Speed Profile® SBS** technology, as shown on Figure 1
- thermal insulation - polystyrene layered board **ICOPAL PSK**
- bitumen vapor control layer: Icopal **FOALBIT AI S40** membrane, or as shown on Figure 1
- priming layer: **Siplast Primer® Speed Primer SBS**
- concrete downward layer
- reinforced concrete construction



NOTE: Width of gravel layer near control shaft should be about 100 cm, its depth 10 cm minimum and granulation of aggregated gravel from 16 to 32 mm.

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Extensive green flat roof of angle up to 6 grades in classical system, on concrete surface.
Detail of the roof drain with inspection box.

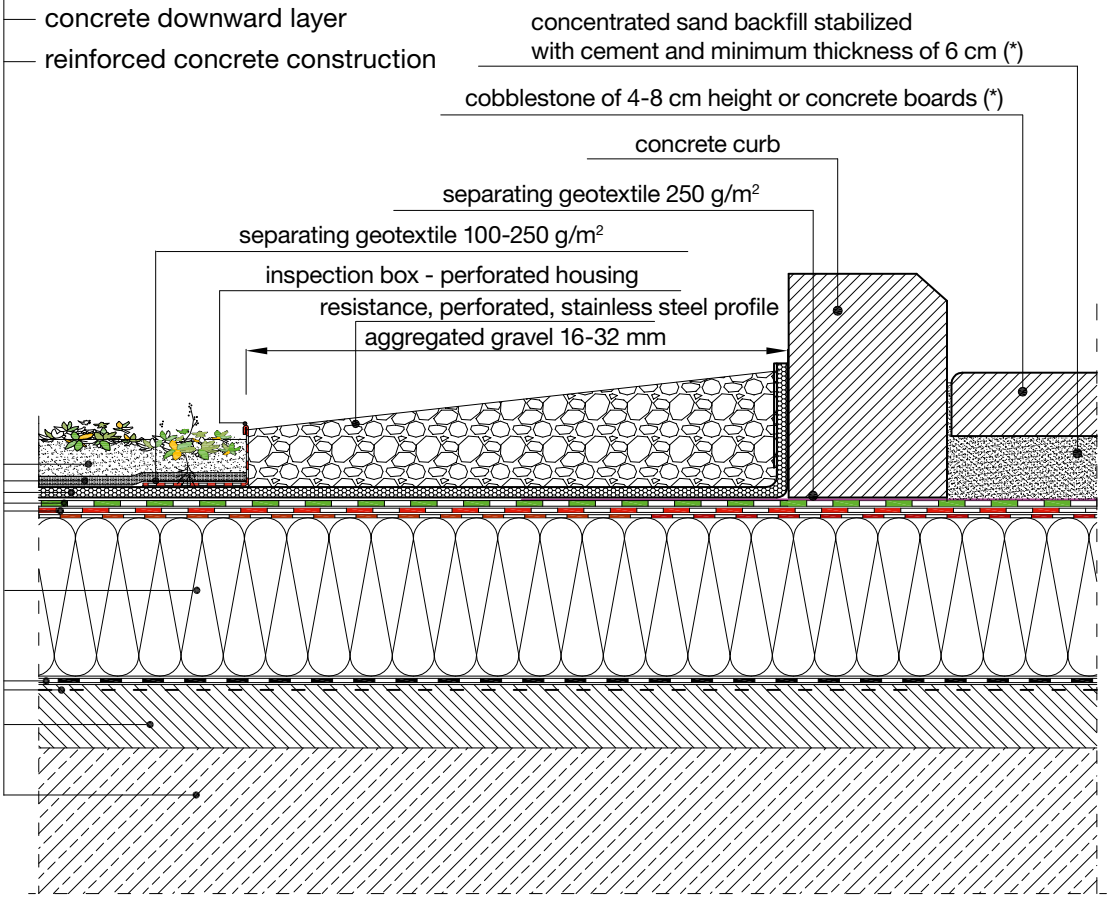
Figure 1d

1-1-1-d

ISO 14001

Pedestrian route

- pre-cultivated vegetation mat, i.e. **ICOMAT GREEN 317,** thickness 2.5 cm
- retention and micro-drainage mat **ICOMAT 140** (7 layers)
- drainage mat **ICODREN 10 Szybki Drenaż® SBS**
- membrane with root barrier function **GRAVIFLEX SBS / GREEN ROOF,** as shown on Figure 1
- base membrane torched-on in ICOPAL **Speed Profile® SBS** technology, as shown on Figure 1
- thermal insulation - polystyrene layered board **ICOPAL PSK**
- bitumen vapor control layer: Icopal **FOALBIT AI S40** membrane, or as shown on Figure 1
- priming layer: **Siplast Primer® Speed Primer SBS**
- concrete downward layer
- reinforced concrete construction



NOTE: (*) The pedestrian route between curbs can be filled with aggregated gravel of 16-32 mm laid on separating geotextile 250 g/m² lying directly on Icopal Graviflex Green Roof membrane. Thickness of gravel layer of minimum 15 cm.

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Extensive green flat roof of angle up to 6 grades in classical system, on concrete surface.
Pedestrian route.

Figure 1e

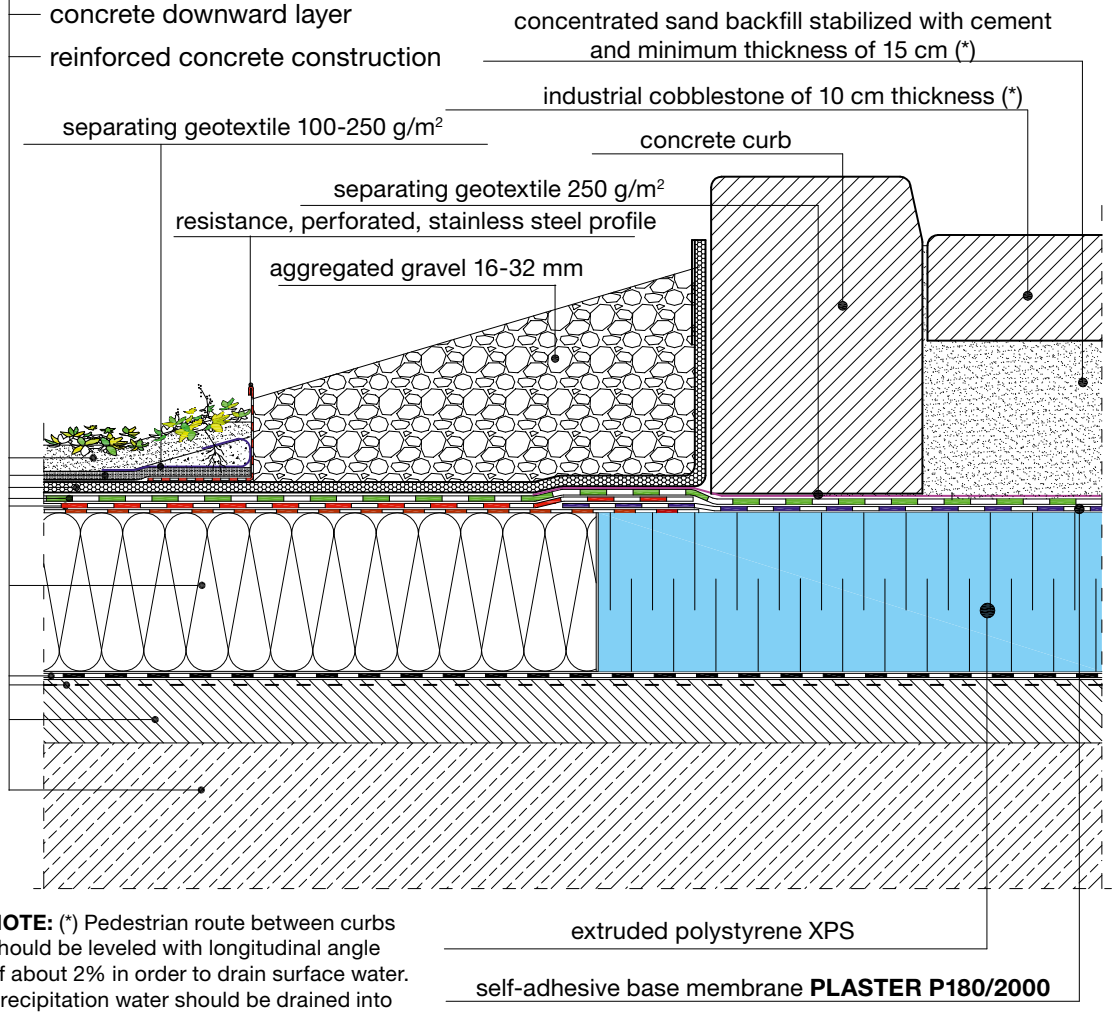
1-1-1-e

Icopal Green Roof

Immediately after installation

Traffic route

- pre-cultivated vegetation mat, e.g. **ICOMAT GREEN 317,** thickness 2.5 cm
- retention and micro-drainage mat **ICOMAT 140** (7 layers)
- drainage mat **ICODREN 10 Szybki Drenaż® SBS**
- membrane with root barrier function **GRAVIFLEX SBS / GREEN ROOF,** as shown on Figure 1
- base membrane torched-on in ICOPAL **Speed Profile® SBS** technology, as shown on Figure 1
- thermal insulation - polystyrene layered board **ICOPAL PSK**
- bitumen vapor control layer: Icopal **FOALBIT AI S40** membrane, or as shown on Figure 1
- priming layer: **Siplast Primer® Speed Primer SBS**
- concrete downward layer
- reinforced concrete construction



NOTE: (*) Pedestrian route between curbs should be leveled with longitudinal angle of about 2% in order to drain surface water. Precipitation water should be drained into linear dewatering or roof drains in accordance with technical green roof design. Industrial cobblestone can be replaced with concrete boards.

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Extensive green flat roof of angle up to 6 grades in classical system, on concrete surface. **Traffic route.**

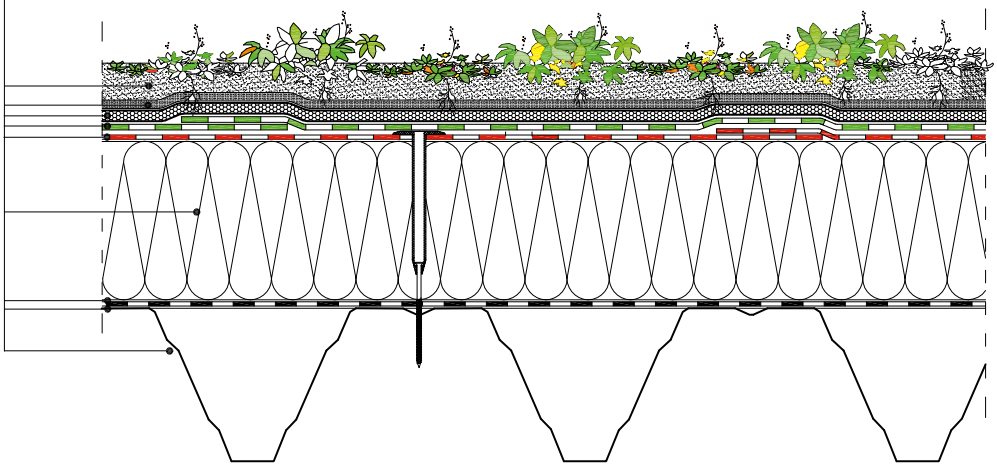
Figure 1f

1-1-1-f

ISO 14001

Extensive green flat roof in classical system, on trapezoidal sheet

- pre-cultivated vegetation mat, e.g. **ICOMAT GREEN 317,** thickness 2.5 cm
- retention and micro-drainage mat **ICOMAT 140** (7 layers)
- drainage mat **ICODREN 10 Szybki Drenaż® SBS**
- membrane with root barrier function **GRAVIFLEX 5.2 SBS / GREEN ROOF** or **GRAVIFLEX 4.2 SBS/ GREEN ROOF**
- base membrane fastened mechanically ICOPAL **GLASBIT G200 Speed Profile® SBS**
- thermal insulation - polystyrene board ICOPAL **EPS 100-038**
- bitumen vapor control layer: i.e. Icopal **FOALBIT Al S40** membrane, or other Icopal base membrane or PE foil
- priming layer: **Siplast Primer® Speed Primer SBS**
- trapezoidal sheet



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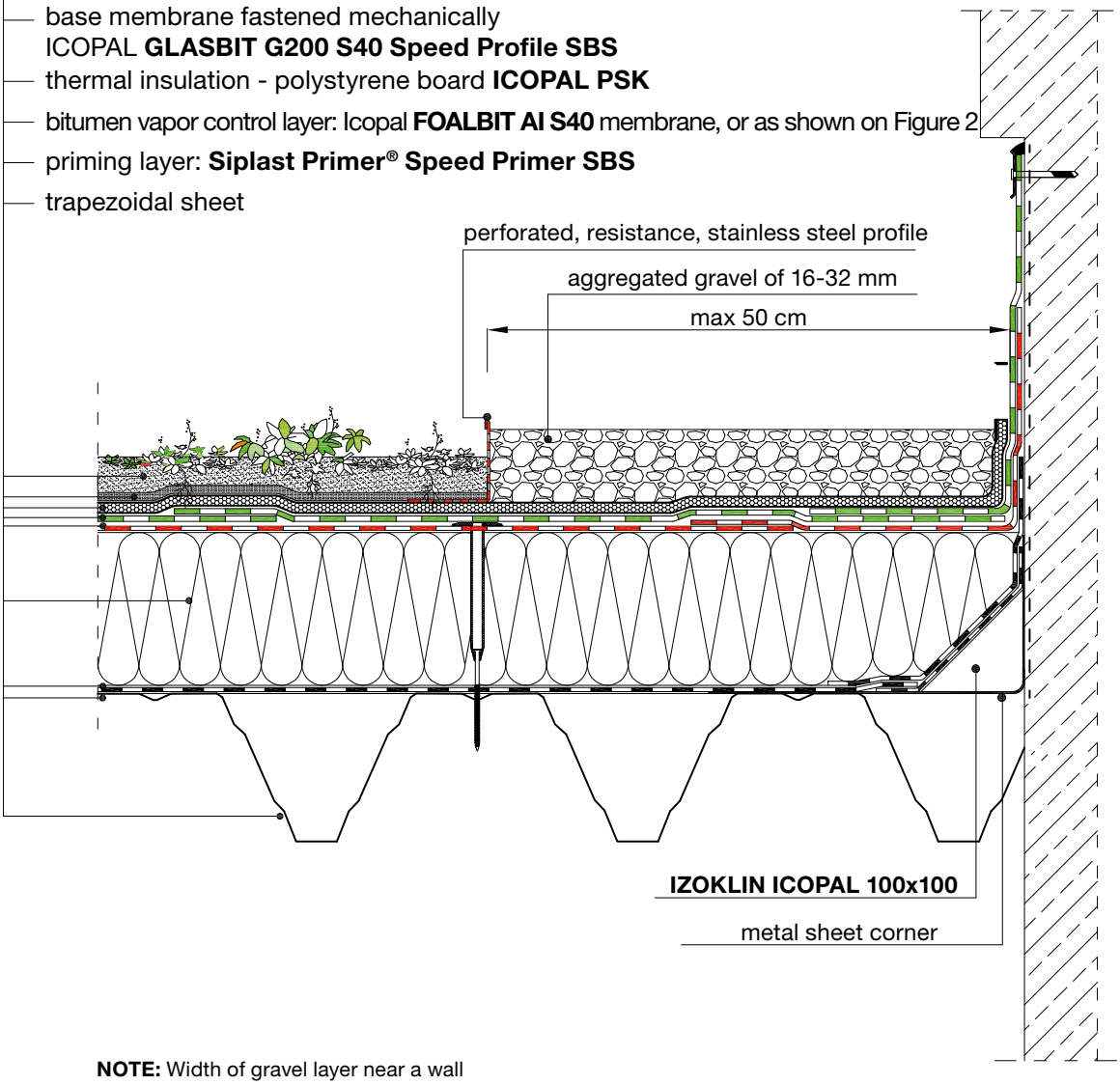
Extensive green flat roof of angle up to 6 grades in classical system, on trapezoidal sheet.

Figure 2
1-1-2

Detail of attic, chimney, walls finishing

- pre-cultivated vegetation mat, e.g. **ICOMAT GREEN 317,** thickness 2.5 cm
- retention and micro-drainage mat **ICOMAT 140** (7 layers)
- drainage mat **ICODREN 10 Szybki Drenaż® SBS**
- membrane with root barrier function **GRAVIFLEX SBS / GREEN ROOF,** as shown on Figure 2
- base membrane fastened mechanically
  ICOPAL **GLASBIT G200 S40 Speed Profile SBS**
- thermal insulation - polystyrene board **ICOPAL PSK**
- bitumen vapor control layer: Icopal **FOALBIT Al S40** membrane, or as shown on Figure 2
- priming layer: **Siplast Primer® Speed Primer SBS**
- trapezoidal sheet



NOTE: Width of gravel layer near a wall should be maximum 50 cm, its depth 10 cm minimum and granulation of aggregated gravel from 16 to 32 mm.

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Extensive green flat roof of angle up to 6 grades in classical system, on trapezoidal sheet.
Detail of attic, chimney, walls finishing.

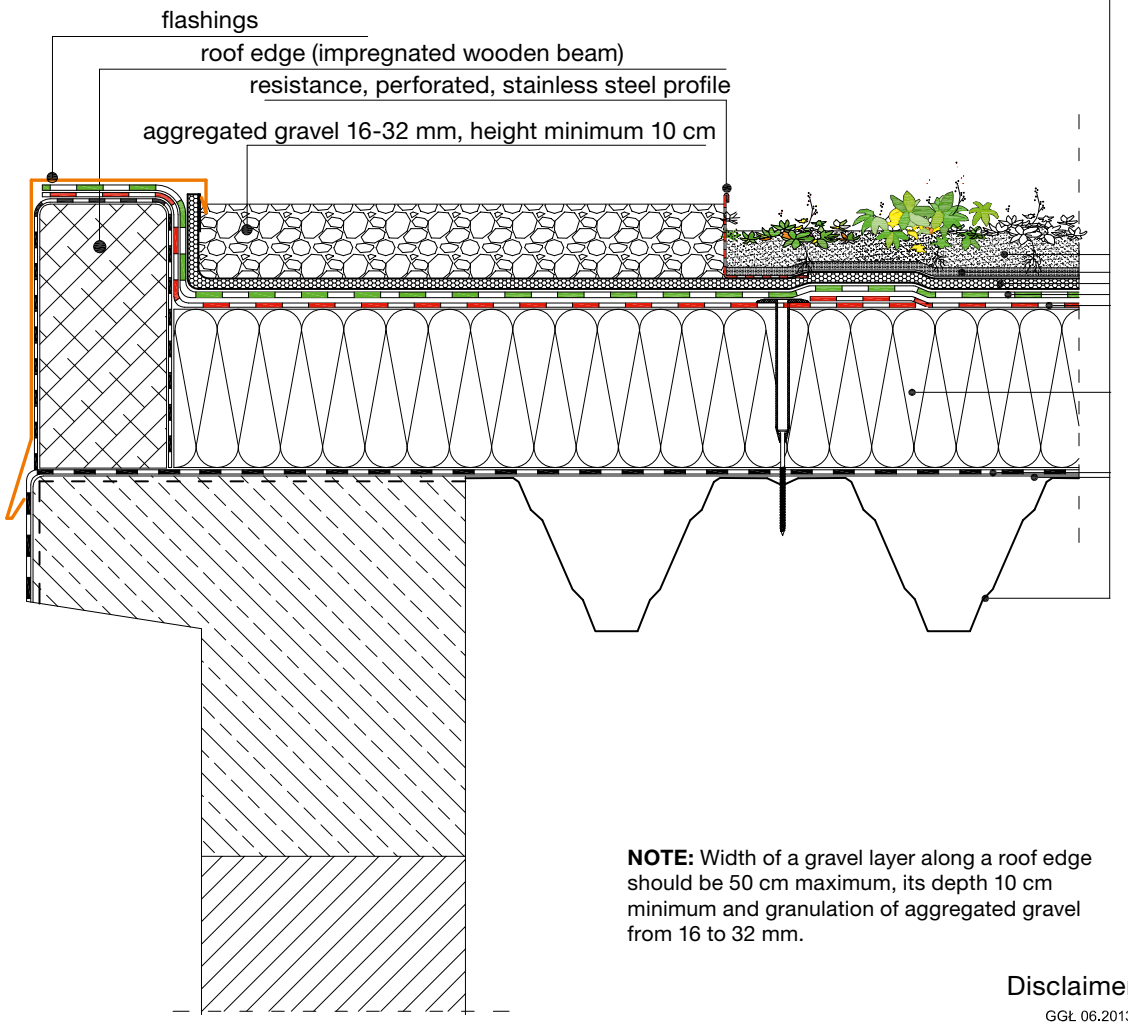
Figure 2a

1-1-2-a

ISO 14001

Detail of the roof edge finishing

pre-cultivated vegetation mat, e.g. **ICOMAT GREEN 317,** thickness 2.5 cm
retention and micro-drainage mat **ICOMAT 140** (7 layers)
drainage mat **ICODREN 10 Szybki Drenaż® SBS**
membrane with root barrier function **GRAVIFLEX SBS / GREEN ROOF,** as shown on Figure 2
base membrane fastened mechanically
ICOPAL **GLASBIT G200 S40 Speed Profile SBS**
thermal insulation - polystyrene board ICOPAL **EPS 100-038**
bitumen vapor control layer: Icopal **FOALBIT AI S40** membrane, or as shown on Figure 2
priming layer: **Siplast Primer® Speed Primer SBS**
trapezoidal sheet



NOTE: Width of a gravel layer along a roof edge should be 50 cm maximum, its depth 10 cm minimum and granulation of aggregated gravel from 16 to 32 mm.

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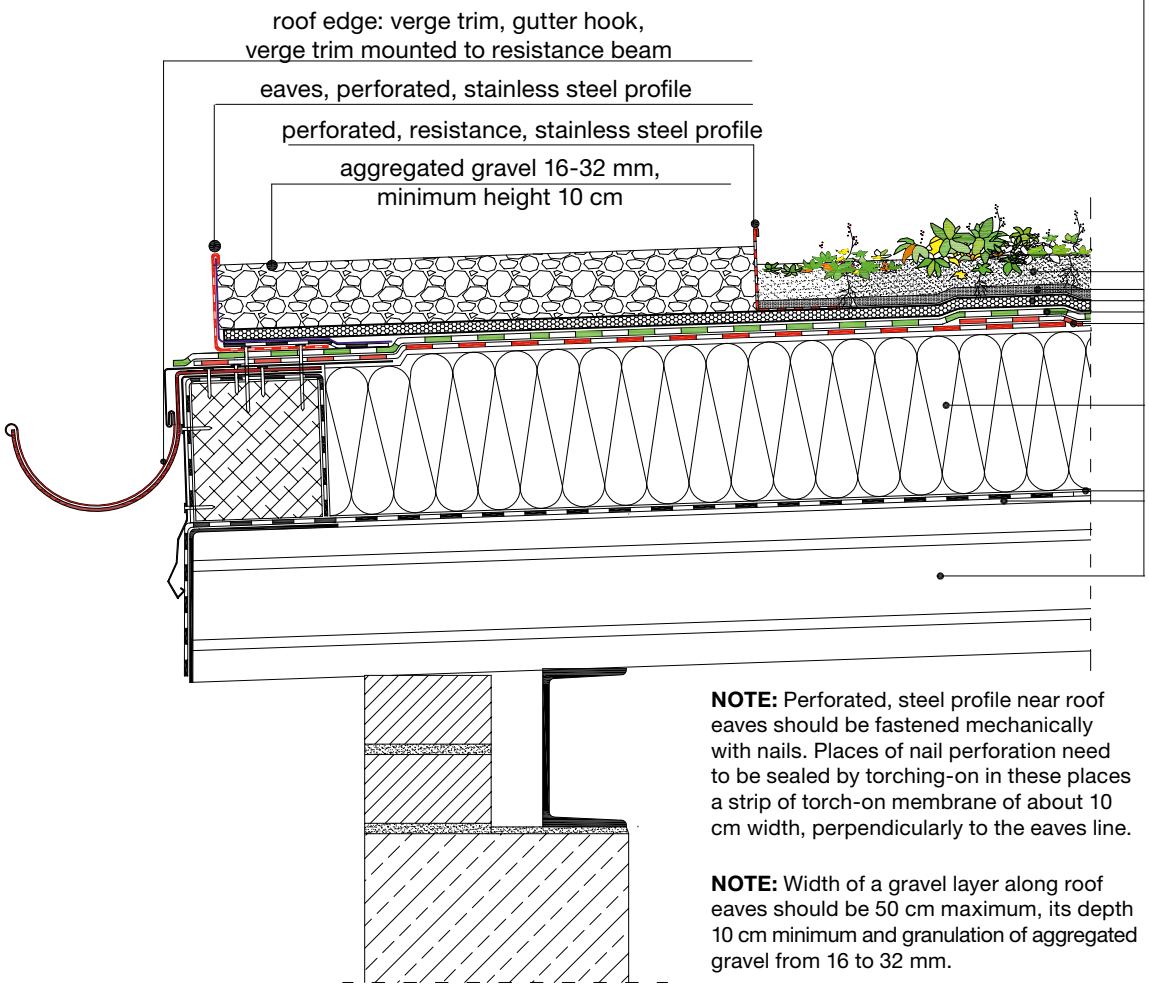
Extensive green flat roof of angle up to 6 grades in classical system, on trapezoidal sheet.
Detail of the roof edge finishing.

Figure 2b

1-1-2-b

Detail of eaves finishing

pre-cultivated vegetation mat, e.g. **ICOMAT GREEN 317,** thickness 2.5 cm
retention and micro-drainage mat **ICOMAT 140** (7 layers)
drainage mat **ICODREN 10 Szybki Drenaż® SBS**
membrane with root barrier function **GRAVIFLEX SBS / GREEN ROOF,** as shown on Figure 2
base membrane fastened mechanically ICOPAL **GLASBIT G200 S40 Speed Profile® SBS**
thermal insulation - polystyrene board ICOPAL **EPS 100-038**
bitumen vapor control layer: Icopal **FOALBIT AI S40** membrane, or as shown on Figure 2
priming layer: **Siplast Primer® Speed Primer SBS**
trapezoidal sheet



NOTE: Perforated, steel profile near roof eaves should be fastened mechanically with nails. Places of nail perforation need to be sealed by torching-on in these places a strip of torch-on membrane of about 10 cm width, perpendicularly to the eaves line.

NOTE: Width of a gravel layer along roof eaves should be 50 cm maximum, its depth 10 cm minimum and granulation of aggregated gravel from 16 to 32 mm.

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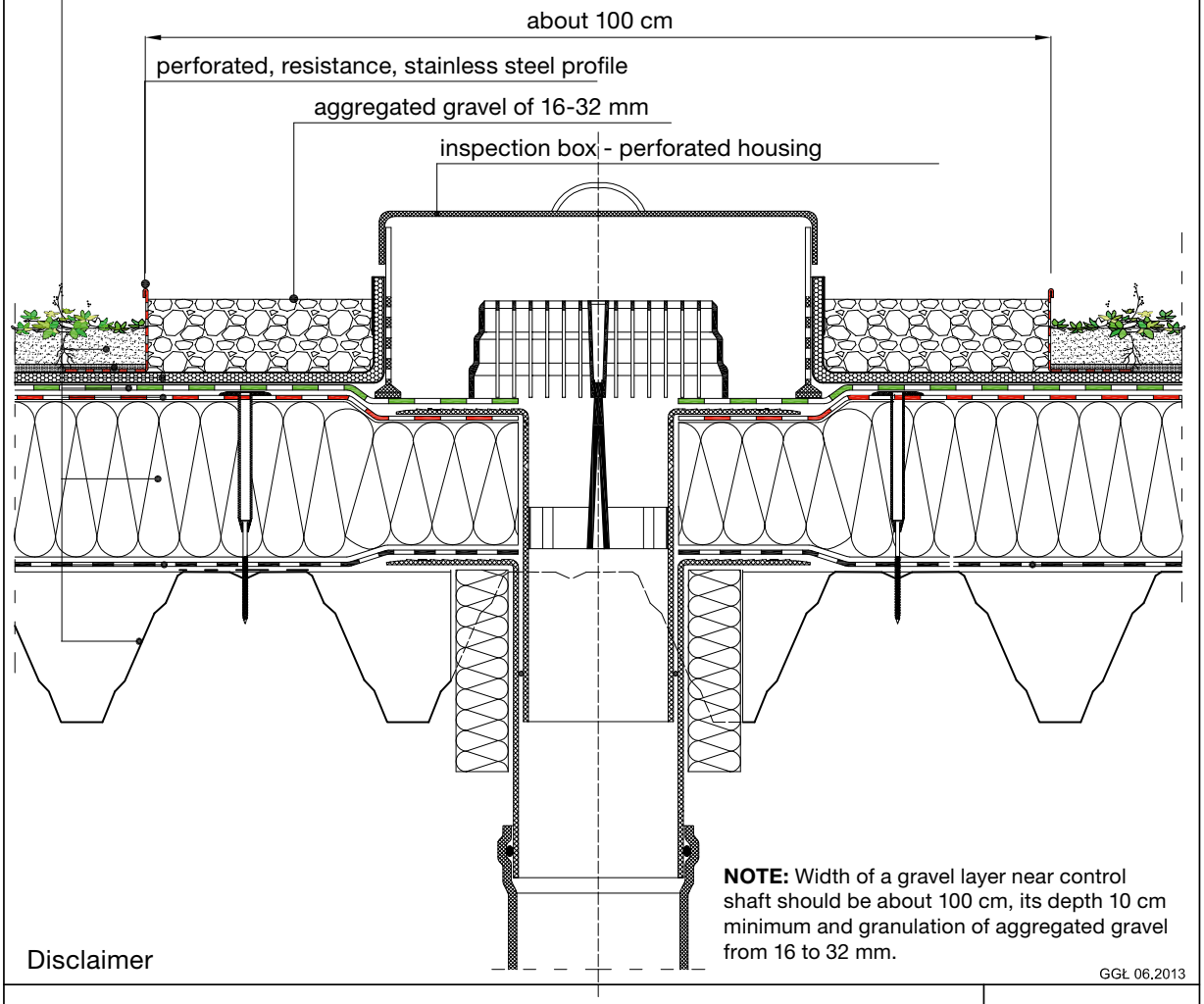
Extensive green flat roof of angle up to 6 grades in classical system, on trapezoidal sheet.
Detail of eaves finishing.

Figure 2c

1-1-2-c

Detail of the roof drain with inspection box

- pre-cultivated vegetation mat, e.g. **ICOMAT GREEN 317,** thickness 2.5 cm
- retention and micro-drainage mat **ICOMAT 140** (7 layers)
- drainage mat **ICODREN 10 Szybki Drenaż® SBS**
- membrane with root barrier function **GRAVIFLEX SBS / GREEN ROOF,** as shown on Figure 2
- base membrane fastened mechanically ICOPAL **GLASBIT G200 S40 Speed Profile® SBS**
- thermal insulation - polystyrene board ICOPAL **EPS 100-038**
- bitumen vapor control layer: Icopal **FOALBIT AI S40** membrane, or as shown on Figure 2
- priming layer: **Siplast Primer® Speed Primer SBS**
- trapezoidal sheet



NOTE: Width of a gravel layer near control shaft should be about 100 cm, its depth 10 cm minimum and granulation of aggregated gravel from 16 to 32 mm.

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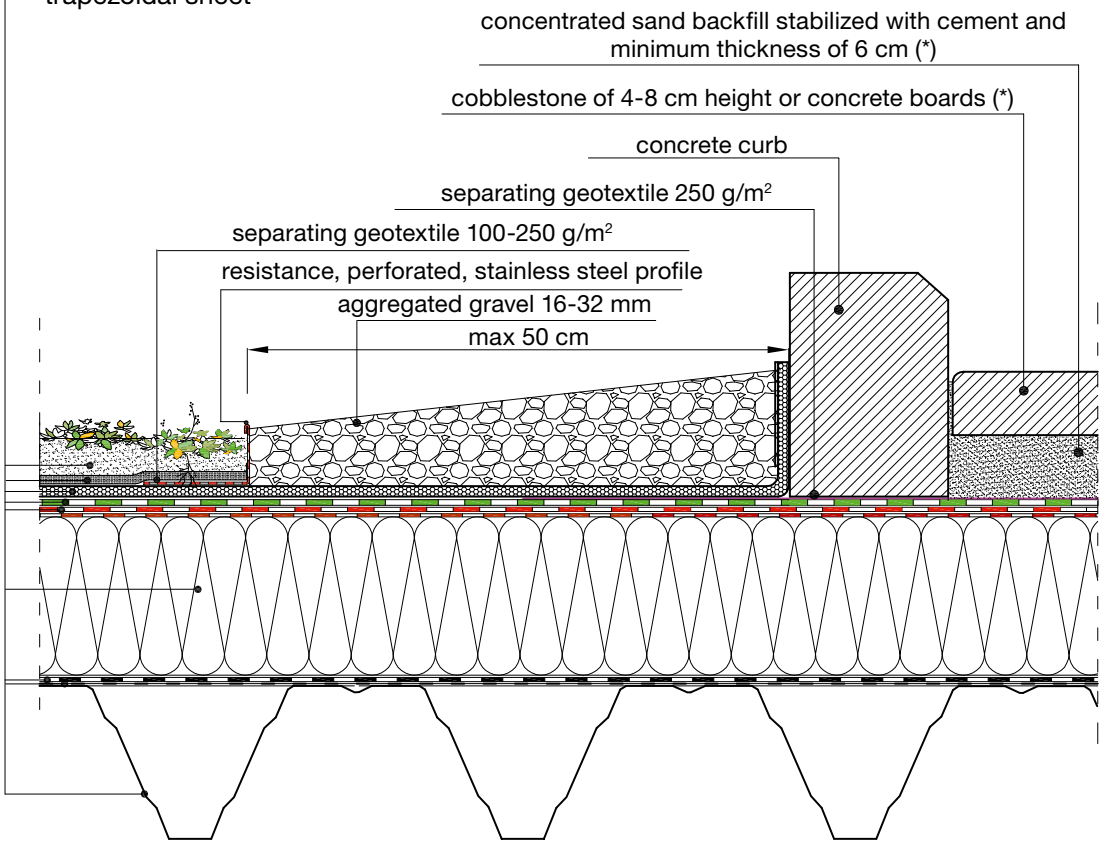
Extensive green flat roof of angle up to 6 grades in classical system, on trpezoidal sheet.
Detail of the roof drain with inspection box.

Figure 2d

1-1-2-d

Pedestrian route

- pre-cultivated vegetation mat, e.g. **ICOMAT GREEN 317,** thickness 2.5 cm
- retention and micro-drainage mat **ICOMAT 140** (7 layers)
- drainage mat **ICODREN 10 Szybki Drenaż® SBS**
- membrane with root barrier function **GRAVIFLEX SBS / GREEN ROOF**, as shown on Figure 2
- base membrane fastened mechanically ICOPAL **GLASBIT G200 S40 Speed Profile SBS**
- thermal insulation - polystyrene layered board **ICOPAL PSK**
- bitumen vapor control layer: Icopal **FOALBIT AI S40** membrane, or as shown on Figure 2
- priming layer: **Siplast Primer® Speed Primer SBS**
- trapezoidal sheet



NOTE: (*) PeThe pedestrian route between curbs can be filled with aggregated gravel of 16-32 mm laid on separating geotextile 250 g/m² lying directly on Icopal Graviflex Green Roof membrane. Thickness of gravel layer of minimum 15 cm.

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Extensive green flat roof of angle up to 6 grades in classical system, on trapezoidal sheet. **PEDESTRIAN ROUTE.**

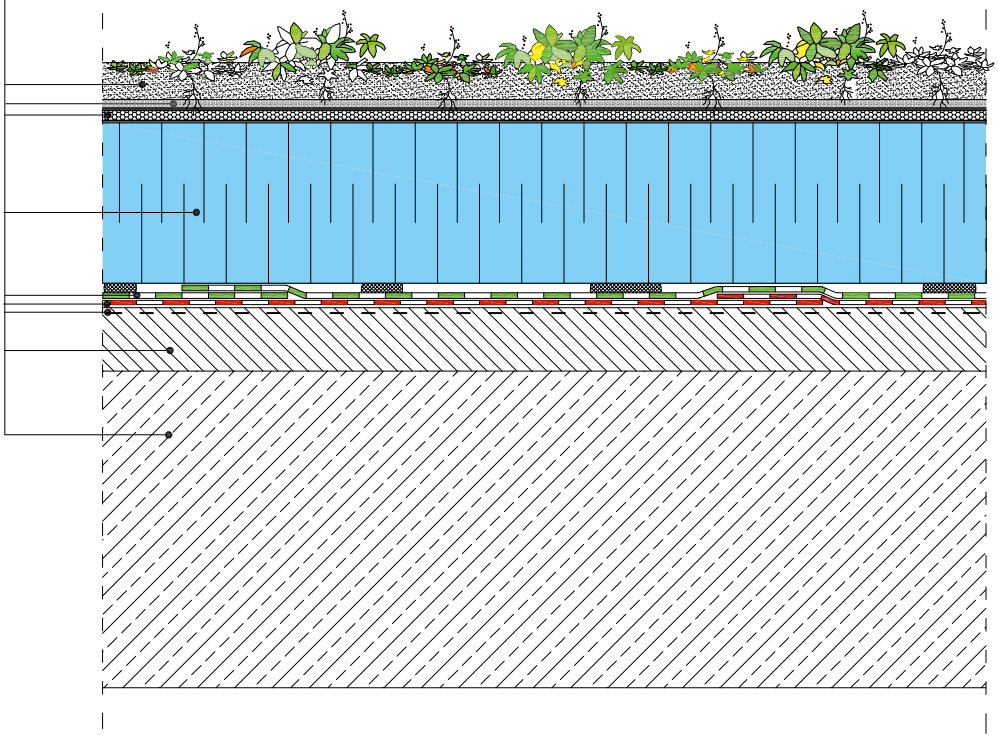
Figure 2e

1-1-2-e

ISO 14001

Extensive green flat roof in reversed system, on concrete surface

- pre-cultivated vegetation mat, e.g. **ICOMAT GREEN 317**, thickness 2.5 cm
- retention and micro-drainage mat **ICOMAT 140** (7 layers)
- drainage mat **ICODREN 10 Szybki Drenaż® SBS**
- thermal insulation - polystyrene board XPS bonded with **Siplast Klej® Szybki Styk SBS**
- membrane with root barrier function **GRAVIFLEX 5.2. SBS / GREEN ROOF** or **GRAVIFLEX 4.2 SBS / GREEN ROOF**
- base membrane torched-on in ICOPAL **Speed Profile® SBS** technology: **POLBIT BAZA 5.0 Speed Profile® SBS** or **EXTRADACH BAZA 4.0 Speed Profile® SBS** or **JUNIOR BAZA 3.0 Speed Profile® SBS**
- priming layer: **Siplast Primer® Speed Primer SBS**
- concrete downward layer
- reinforced concrete construction



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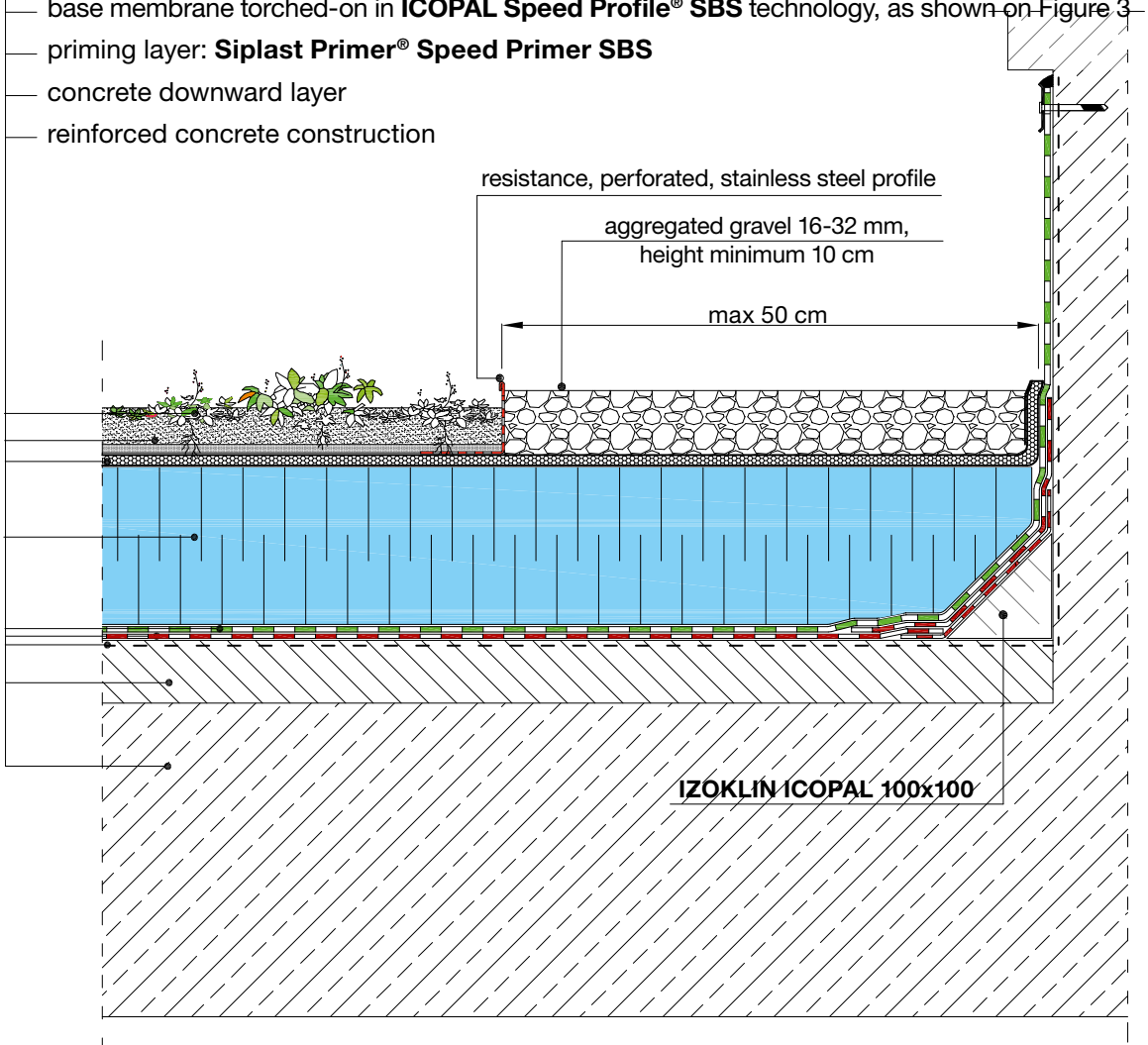
Extensive green flat roof of angle up to 6 grades in reversed system, on concrete surface.

Figure 3 1-2-1

Detail of attic, chimney, walls finishing

- pre-cultivated vegetation mat, e.g. **ICOMAT GREEN 317,** thickness 2.5 cm
- retention and micro-drainage mat **ICOMAT 140** (7 layers)
- drainage mat **ICODREN 10 Szybki Drenaż® SBS**
- thermal insulation - extruded polystyrene XPS bonded with **Siplast Klej® Szybki Styk SBS**
- membrane with root barrier function **GRAVIFLEX SBS / GREEN ROOF,** as shown on Figure 3
- base membrane torched-on in **ICOPAL Speed Profile® SBS** technology, as shown on Figure 3
- priming layer: **Siplast Primer® Speed Primer SBS**
- concrete downward layer
- reinforced concrete construction



NOTE: Width of a gravel layer adjacent to a wall should be 50 cm maximum, its depth 10 cm minimum and granulation of aggregated gravel from 16 to 32 mm.

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Extensive green flat roof of angle up to 6 grades in reversed system, on concrete surface.
Detail of attic, chimney, walls finishing.

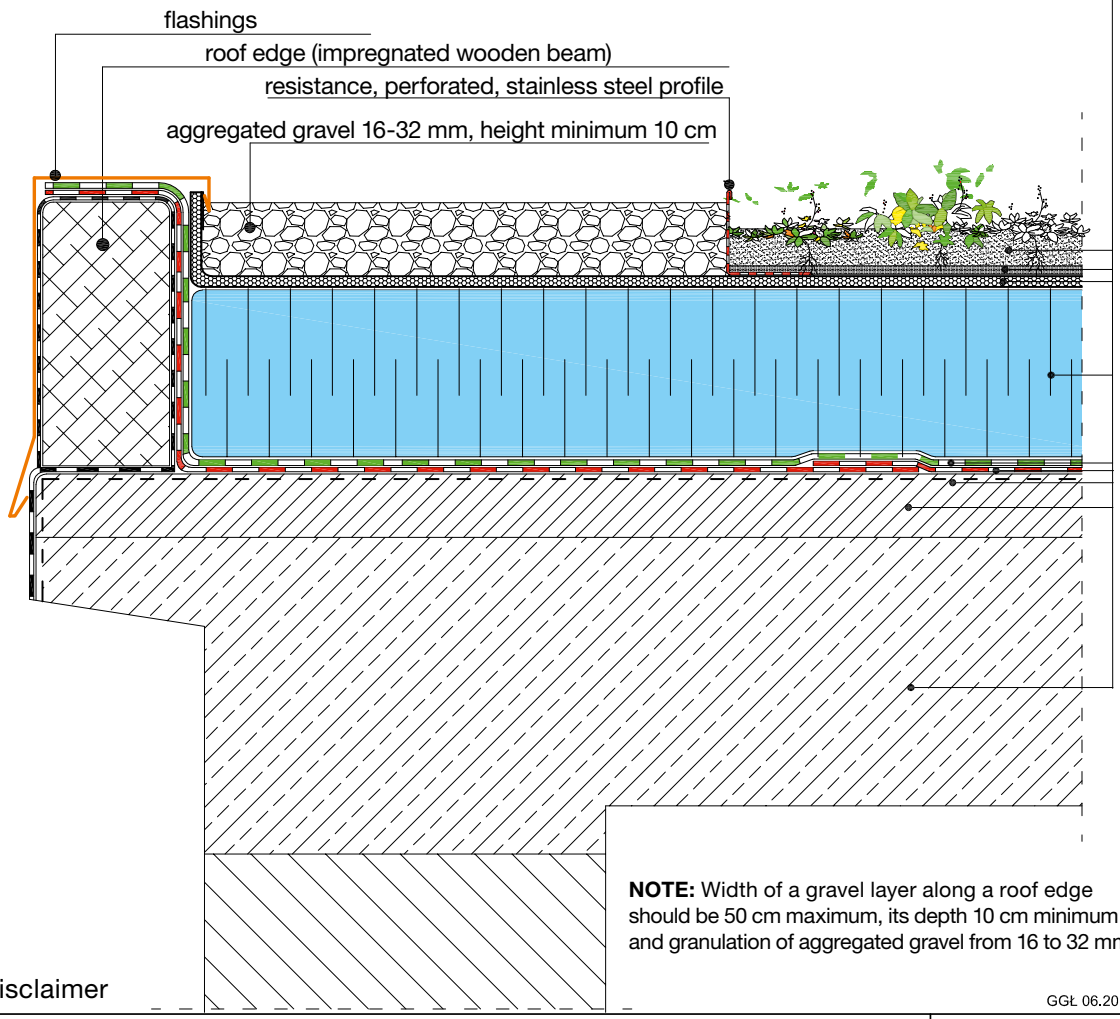
Figure 3a

1-2-1-a

ISO 14001

Detail of the roof edge finishing

pre-cultivated vegetation mat, e.g. **ICOMAT GREEN 317**, thickness 2.5 cm
retention and micro-drainage mat **ICOMAT 140** (7 layers)
drainage mat **ICODREN 10 Szybki Drenaż® SBS**
thermal insulation - polystyrene XPS bonded with **Siplast Klej® Szybki Styk SBS**
membrane with root barrier function **GRAVIFLEX SBS / GREEN ROOF,** as shown on Figure 3
base membrane torched-on in **ICOPAL Speed Profile® SBS** technology, as shown on Figure 3
priming layer: **Siplast Primer® Speed Primer SBS**
concrete downward layer
reinforced concrete construction



NOTE: Width of a gravel layer along a roof edge should be 50 cm maximum, its depth 10 cm minimum and granulation of aggregated gravel from 16 to 32 mm.

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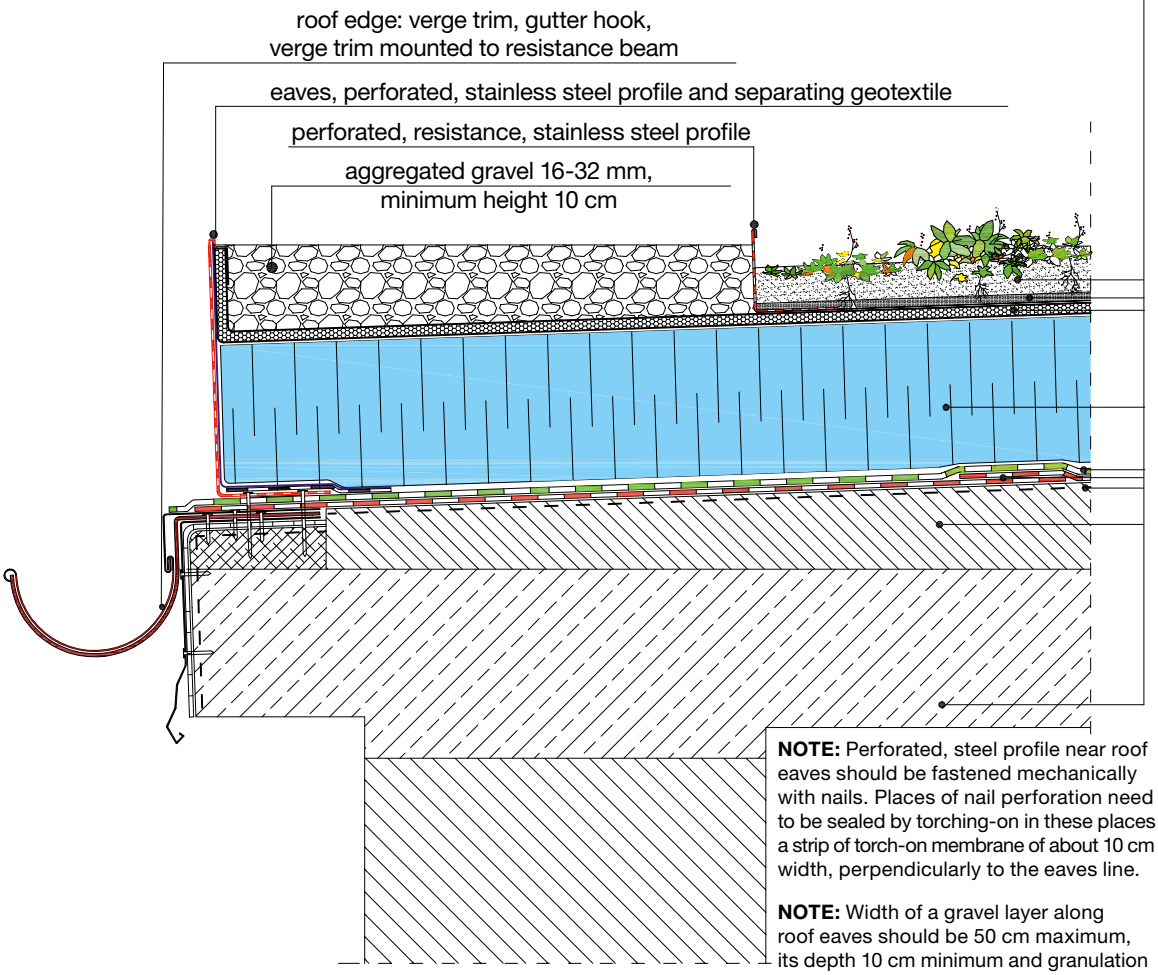
Extensive green flat roof of angle up to 6 grades in reversed system, on concrete surface.
Detail of the roof edge finishing.

Figure 3b

1-2-1-b

Detail of eaves finishing

pre-cultivated vegetation mat, e.g. **ICOMAT GREEN 317**, thickness 2.5 cm
retention and micro-drainage mat **ICOMAT 140** (7 layers)
drainage mat **ICODREN 10 Szybki Drenaż® SBS**
thermal insulation - polystyrene XPS bonded with **Siplast Klej® Szybki Styk SBS**
membrane with root barrier function **GRAVIFLEX SBS / GREEN ROOF,** as shown on Figure 3
base membrane torched-on in **ICOPAL Speed Profile® SBS** technology, as shown on Figure 3
priming layer: **Siplast Primer® Speed Primer SBS**
concrete downward layer
reinforced concrete construction



NOTE: Perforated, steel profile near roof eaves should be fastened mechanically with nails. Places of nail perforation need to be sealed by torching-on in these places a strip of torch-on membrane of about 10 cm width, perpendicularly to the eaves line.

NOTE: Width of a gravel layer along roof eaves should be 50 cm maximum, its depth 10 cm minimum and granulation of aggregated gravel from 16 to 32 mm.

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Extensive green flat roof of angle up to 6 grades in reversed system, on concrete surface.
Detail of eaves finishing.

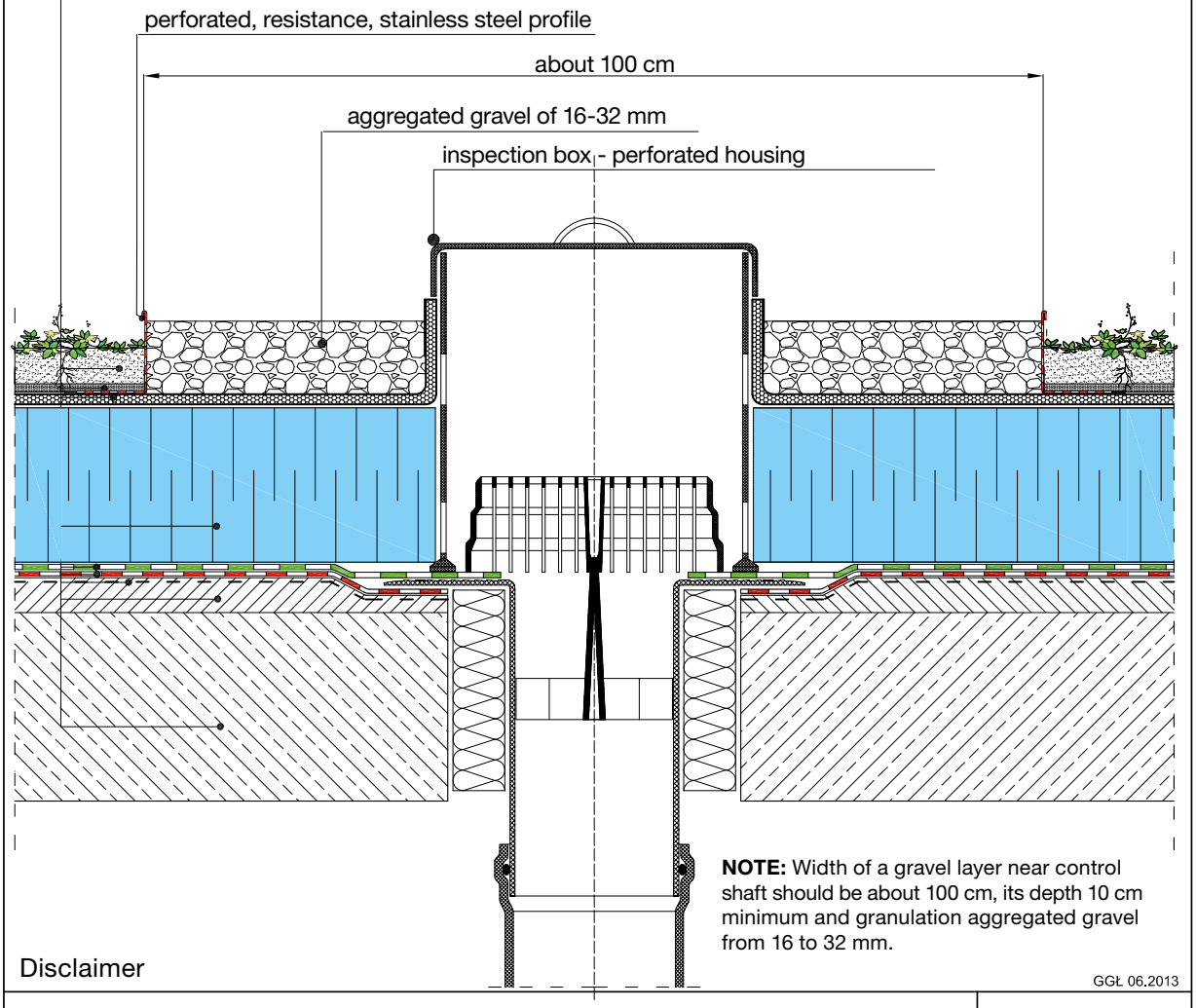
Figure 3c

1-2-1-c

ISO 14001

Detail of the roof drain with inspection box

- pre-cultivated vegetation mat, e.g. **ICOMAT GREEN 317**, thickness 2.5 cm
- retention and micro-drainage mat **ICOMAT 140** (7 layers)
- drainage mat **ICODREN 10 Szybki Drenaż® SBS**
- thermal insulation - polystyrene **XPS** bonded with **Siplast Klej® Szybki Styk SBS**
- membrane with root barrier function **GRAVIFLEX SBS / GREEN ROOF,** as shown on Figure 3
- base membrane torched-on in **ICOPAL Speed Profile® SBS** technology, as shown on Figure 3
- priming layer: **Siplast Primer® Speed Primer SBS**
- concrete downward layer
- reinforced concrete construction



NOTE: Width of a gravel layer near control shaft should be about 100 cm, its depth 10 cm minimum and granulation aggregated gravel from 16 to 32 mm.

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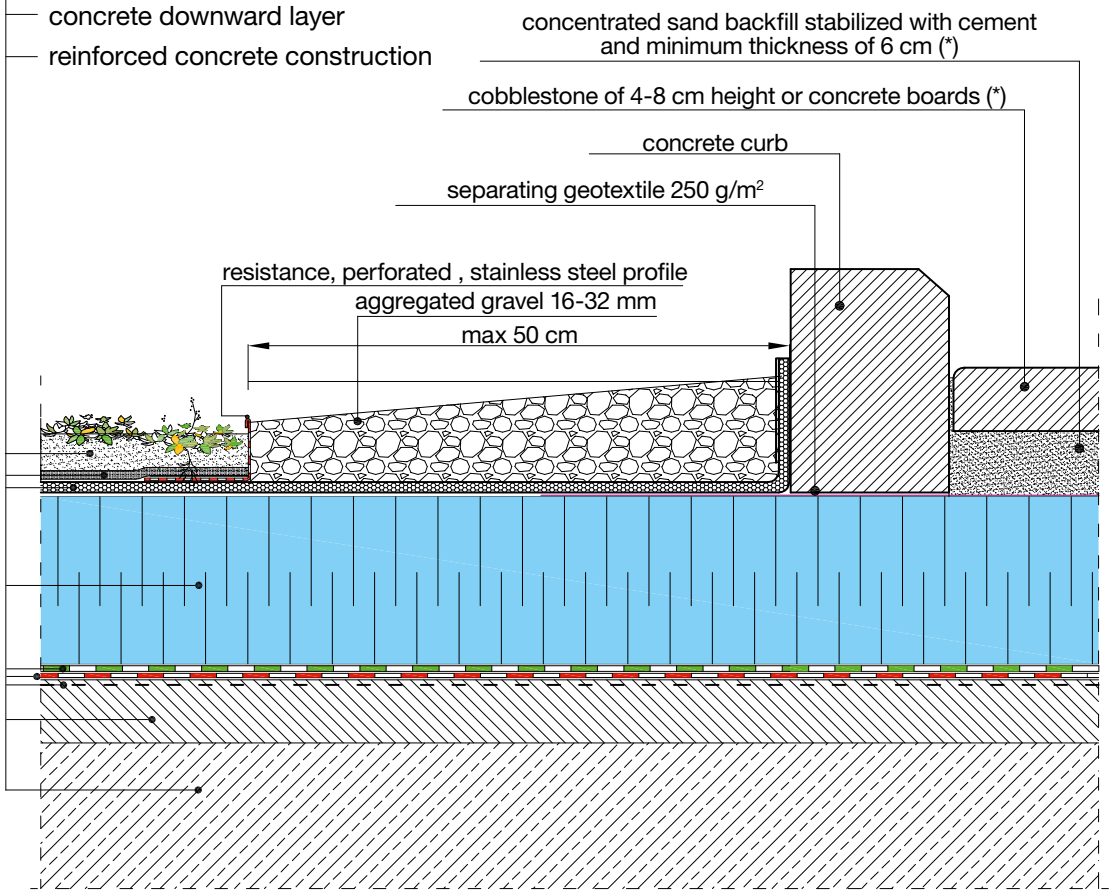
Extensive green flat roof of angle up to 6 grades in reversed system, on concrete surface.
Detail of the roof drain with inspection box.

Figure 3d

1-2-1-d

Pedestrian route

- pre-cultivated vegetation mat, e.g. **ICOMAT GREEN 317,** thickness 2.5 cm
- retention and micro-drainage mat **ICOMAT 140** (7 layers)
- drainage mat **ICODREN 10 Szybki Drenaż® SBS**
- thermal insulation - polystyrene **XPS** bonded with **Siplast Klej® Szybki Styk SBS**
- membrane with root barrier function **GRAVIFLEX SBS / GREEN ROOF**, as shown on Figure 3
- base membrane torched-on in **ICOPAL Speed Profile® SBS** technology, as shown on Figure 3
- priming layer: **Siplast Primer® Speed Primer SBS**
- concrete downward layer
- reinforced concrete construction



NOTE: (*) The pedestrian route between curbs can be filled with aggregated gravel of 16-32 mm laid on separating geotextile 250 g/m^2 lying directly on Icopal Graviflex Green Roof membrane. Thickness of gravel layer of minimum 15 cm.

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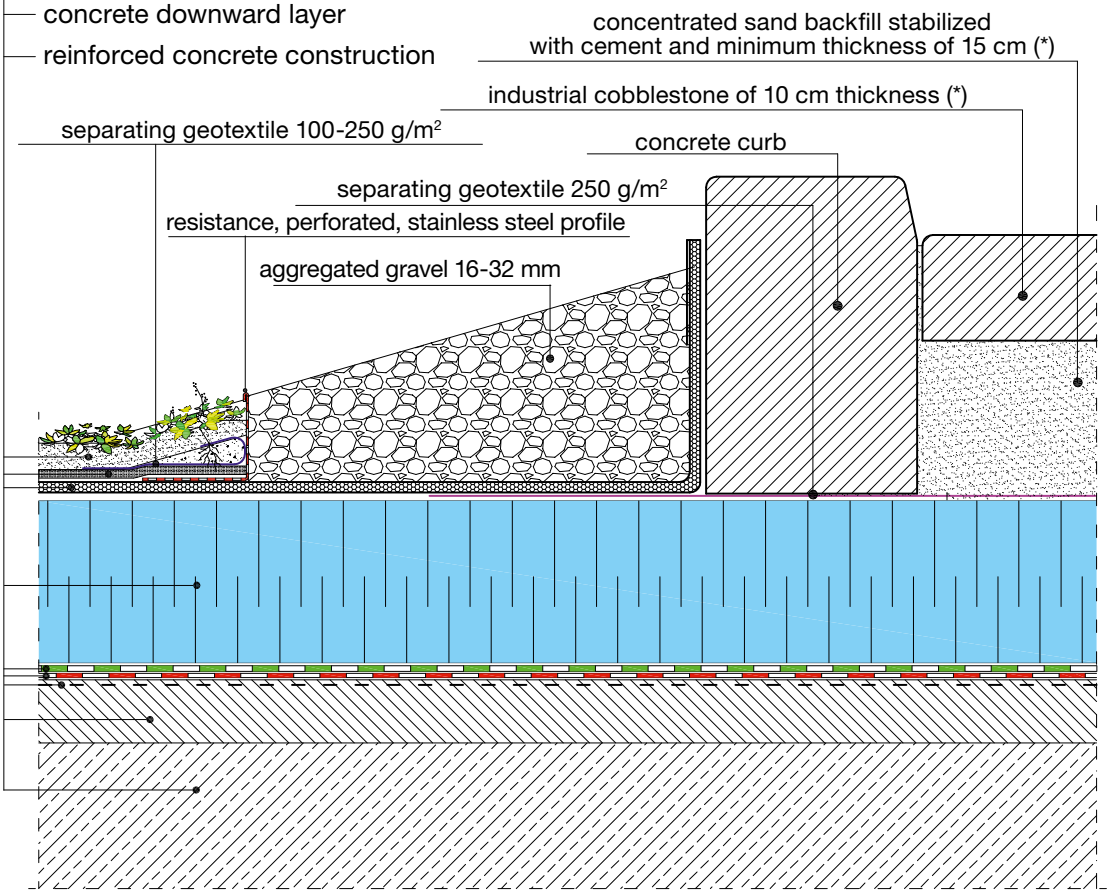
Extensive green flat roof of angle up to 6 grades in reversed system, on concrete surface. **Pedestrian route.**

Figure 3e

1-2-1-e

Traffic route

- pre-cultivated vegetation mat, e.g. **ICOMAT GREEN 317,** thickness 2.5 cm
- retention and micro-drainage mat **ICOMAT 140** (7 layers)
- drainage mat **ICODREN 10 Szybki Drenaż® SBS**
- thermal insulation - polystyrene **XPS** bonded with **Siplast Klej® Szybki Styk SBS**
- membrane with root barrier function **GRAVIFLEX SBS / GREEN ROOF,** as shown on Figure 3
- base membrane torched-on in **ICOPAL Speed Profile® SBS** technology, as shown on Figure 3
- priming layer: **Siplast Primer® Speed Primer SBS**
- concrete downward layer
- reinforced concrete construction



NOTE: (*) Pedestrian route between curbs should be leveled with longitudinal angle of about 2% in order to drain surface water. Precipitation water should be drained into linear dewaterings or roof drains in accordance with technical green roof design. Industrial cobblestone can be replaced with concrete boards.

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Extensive green flat roof of angle up to 6 grades in reversed system, on concrete surface.
Traffic route.

Figure 3f

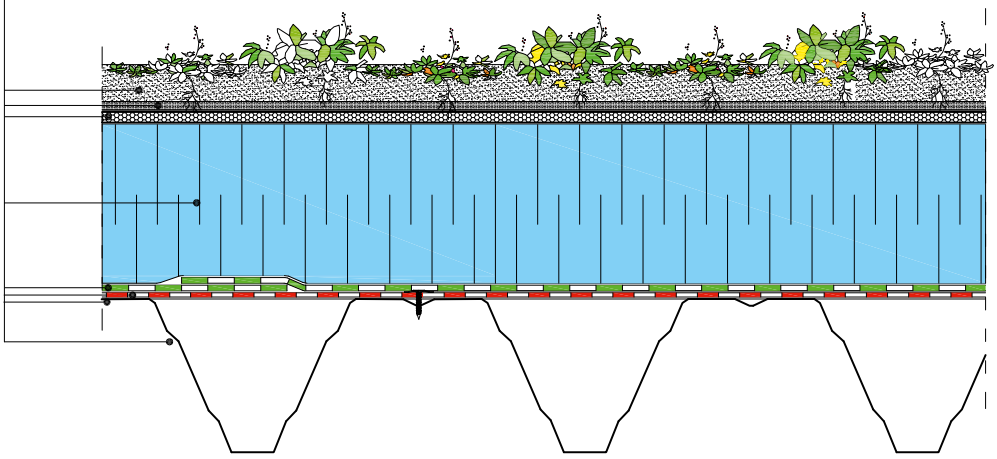
1-2-1-f

Icopal Green Roof

Immediately after installation

Extensive green flat roof in reversed system, on trapezoidal sheet

- pre-cultivated vegetation mat, e.g. **ICOMAT GREEN 317,** thickness 2.5 cm
- retention and micro-drainage mat **ICOMAT 140** (7 layers)
- drainage mat **ICODREN 10 Szybki Drenaż® SBS**
- thermal insulation - polystyrene board **XPS** bonded with **Siplast Klej® Szybki Styk SBS**
- membrane with root barrier function **GRAVIFLEX 5.2 SBS / GREEN ROOF** or **GRAVIFLEX 4.2 SBS/ GREEN ROOF**
- base membrane fastened mechanically ICOPAL **GLASBIT G200 Speed Profile® SBS**
- priming layer: **Siplast Primer® Speed Primer SBS**
- trapezoidal sheet



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Extensive green flat roof in reversed system, on trapezoidal sheet.

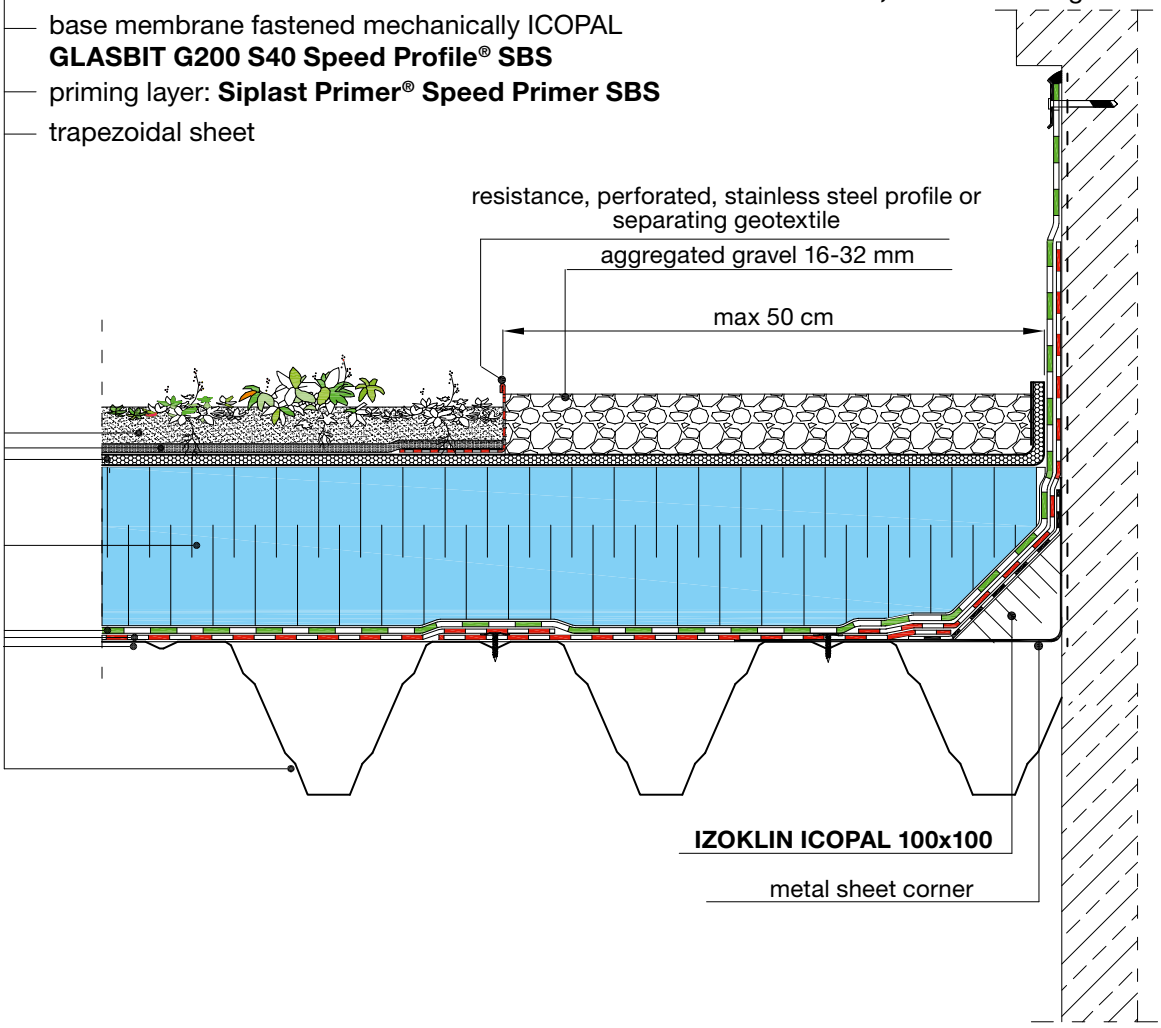
Figure 4

1-2-2

ISO 14001

Detail of attic, chimney, walls finishing

- pre-cultivated vegetation mat, e.g. **ICOMAT GREEN 317,** thickness 2.5 cm
- retention and micro-drainage mat **ICOMAT 140** (7 layers)
- drainage mat **ICODREN 10 Szybki Drenaż® SBS**
- thermal insulation - polystyrene board **XPS** bonded with **Siplast Klej® Szybki Styk SBS**
- membrane with root barrier function **GRAVIFLEX SBS / GREEN ROOF,** as shown on Figure 4
- base membrane fastened mechanically ICOPAL **GLASBIT G200 S40 Speed Profile® SBS**
- priming layer: **Siplast Primer® Speed Primer SBS**
- trapezoidal sheet



NOTE: Width of a gravel layer adjacent to a wall should be 50 cm maximum, its depth 10 cm minimum and granulation of aggregated gravel from 16 to 32 mm.

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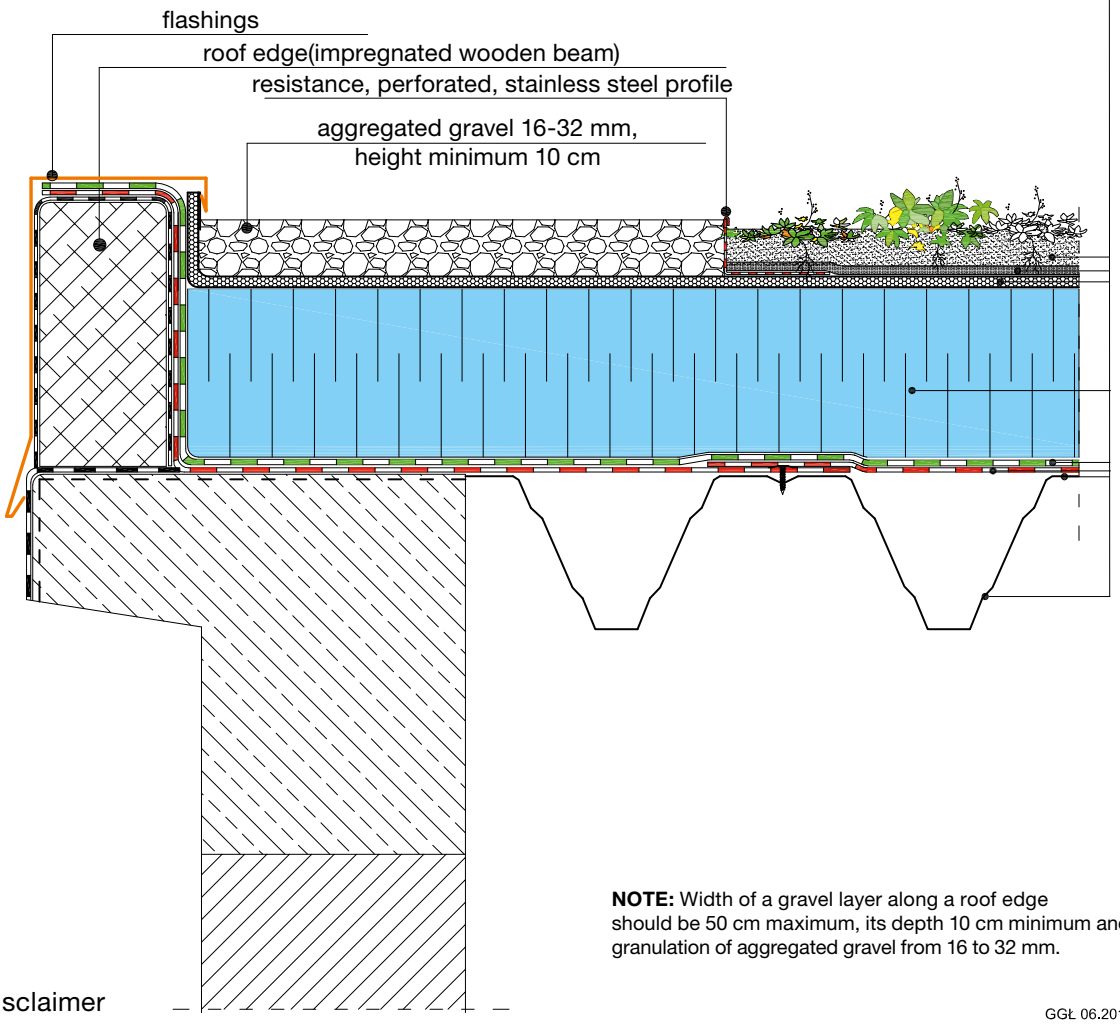
Extensive green flat roof of angle up to 6 grades in reversed system, on trapezoidal sheet.
Detail of attic, chimney, walls finishing.

Figure 4a

1-2-2-a

Detail of the roof edge finishing

pre-cultivated vegetation mat, e.g. **ICOMAT GREEN 317**, thickness 2.5 cm
retention and micro-drainage mat **ICOMAT 140** (7 layers)
drainage mat **ICODREN 10 Szybki Drenaż® SBS**
thermal insulation - polystyrene board XPS bonded with **Siplast Klej® Szybki Styk SBS**
membrane with root barrier function **GRAVIFLEX SBS / GREEN ROOF** as shown on Figure 4
base membrane fastened mechanically
ICOPAL **GLASBIT G200 S40 Speed Profile SBS**
priming layer: **Siplast Primer® Speed Primer SBS**
trapezoidal sheet



NOTE: Width of a gravel layer along a roof edge should be 50 cm maximum, its depth 10 cm minimum and granulation of aggregated gravel from 16 to 32 mm.

Disclaimer

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Extensive green flat roof of angle up to 6 grades in reversed system, on trapezoidal sheet
Detail of the roof edge finishing.

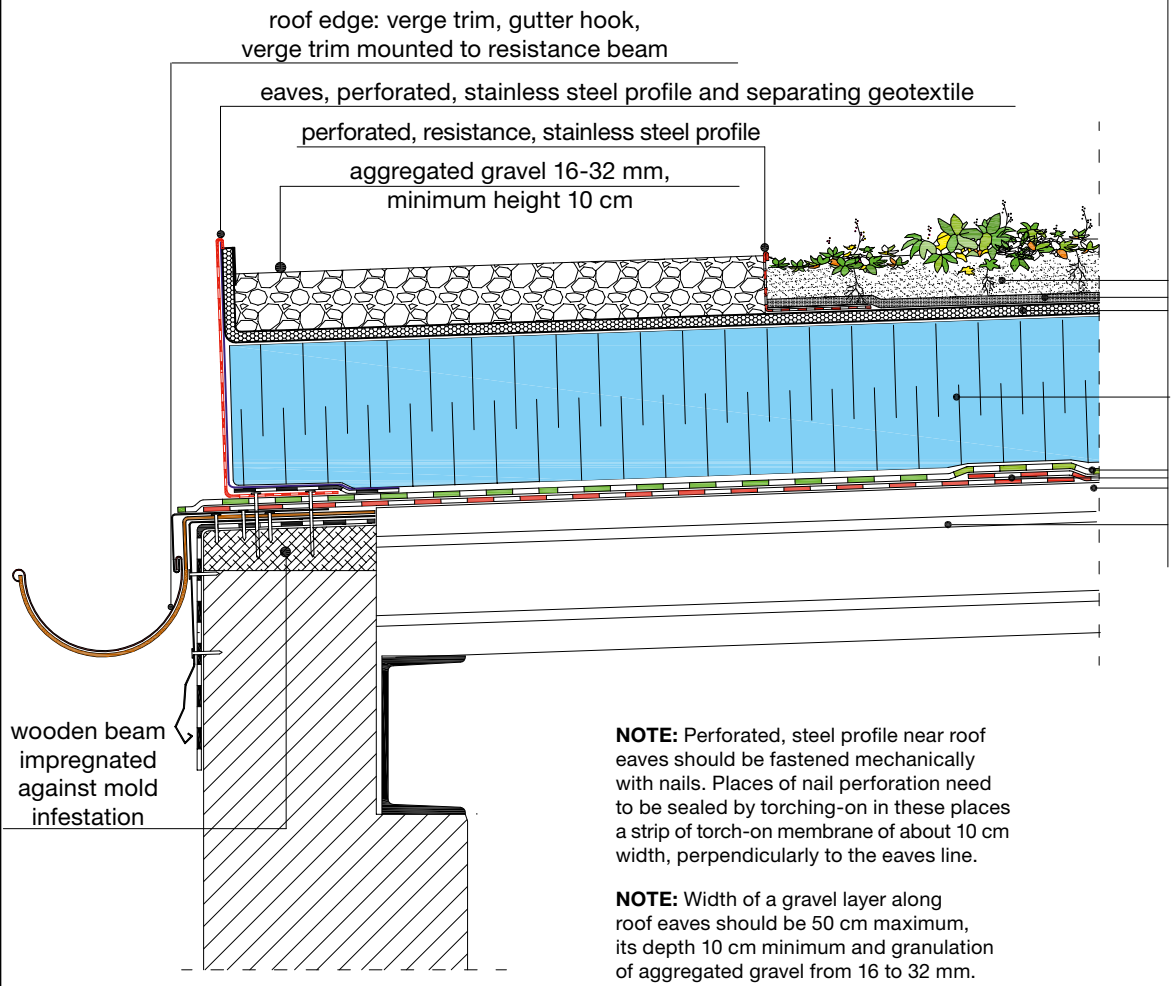
Figure 4b

1-2-2-b

ISO 14001

Detail of eaves finishing

pre-cultivated vegetation mat, e.g. **ICOMAT GREEN 317**, thickness 2.5 cm
retention and micro-drainage mat **ICOMAT 140** (7 layers)
drainage mat **ICODREN 10 Szybki Drenaż® SBS**
thermal insulation - polystyrene XPS bonded with **Siplast Klej® Szybki Styk SBS**
membrane with root barrier function **GRAVIFLEX SBS / GREEN ROOF** as shown on Figure 4
base membrane fastened mechanically ICOPAL
GLASBIT G200 S40 Speed Profile® SBS
priming layer: **Siplast Primer® Speed Primer SBS**
trapezoidal sheet



NOTE: Perforated, steel profile near roof eaves should be fastened mechanically with nails. Places of nail perforation need to be sealed by torching-on in these places a strip of torch-on membrane of about 10 cm width, perpendicularly to the eaves line.

NOTE: Width of a gravel layer along roof eaves should be 50 cm maximum, its depth 10 cm minimum and granulation of aggregated gravel from 16 to 32 mm.

Disclaimer

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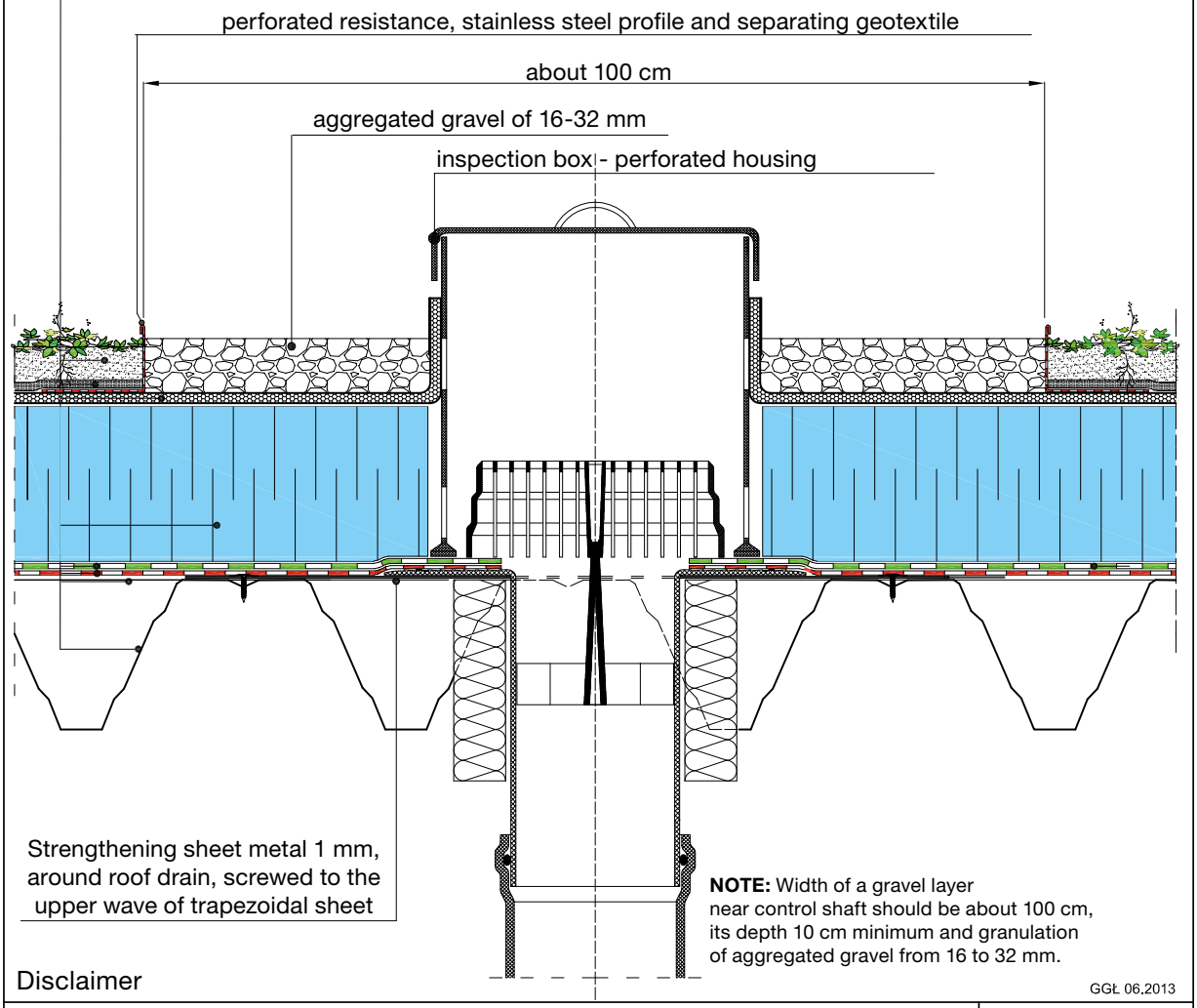
Extensive green flat roof of angle up to 6 grades in reversed system, on trapezoidal sheet.
Detail of eaves finishing.

Figure 4c

1-2-2-c

Detail of the roof drain with inspection box

- pre-cultivated vegetation mat, e.g. **ICOMAT GREEN 317,** thickness 2.5 cm
- retention and micro-drainage mat **ICOMAT 140** (7 layers)
- drainage mat **ICODREN 10 Szybki Drenaż® SBS**
- thermal insulation - extruded polystyrene **XPS** bonded with **Siplast Klej® Szybki Styk SBS**
- membrane with root barrier function **GRAVIFLEX SBS / GREEN ROOF,** as shown on Figure 4
- base membrane fastened mechanically ICOPAL **GLASBIT G200 S40 Speed Profile® SBS**
- priming layer: **Siplast Primer® Speed Primer SBS**
- trapezoidal sheet



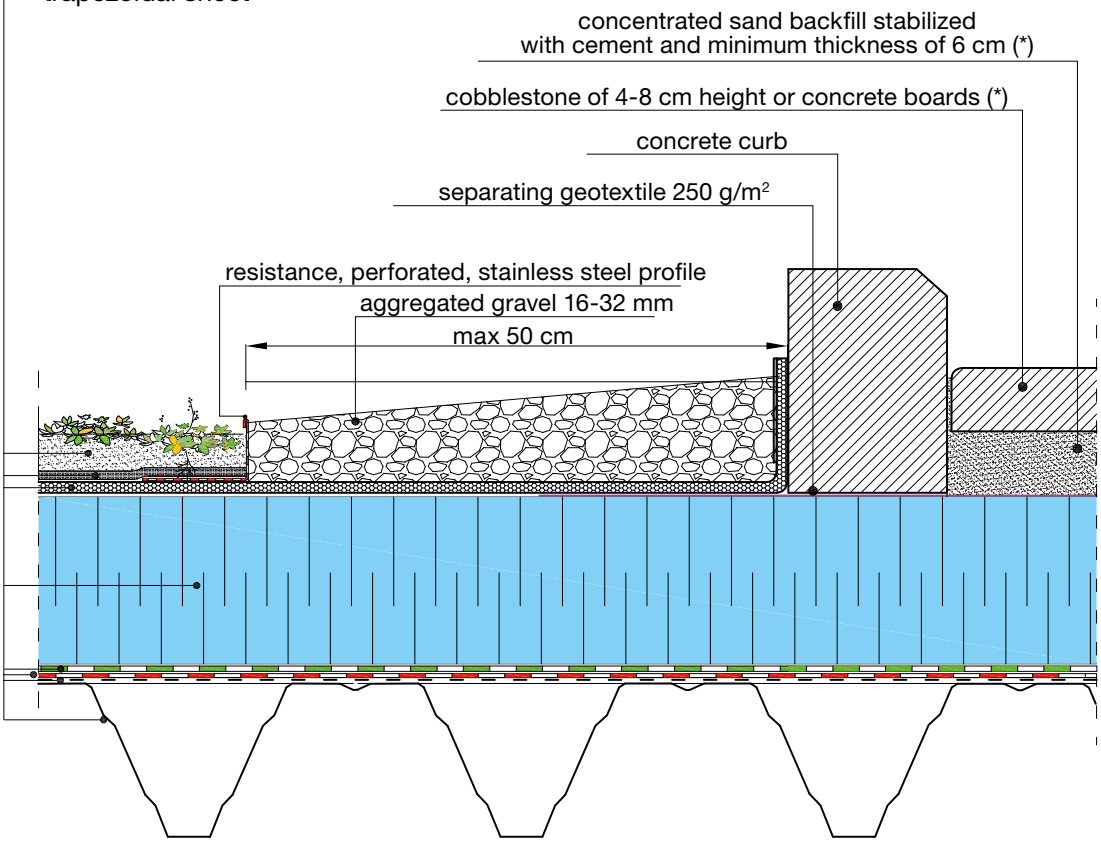
Disclaimer

Extensive green flat roof of angle up to 6 grades in reversed system, on trapezoidal sheet.
Detail of the roof drain with inspection box.

Figure 4d
1-2-2-d

Pedestrian route

- pre-cultivated vegetation mat, e.g. **ICOMAT GREEN 317,** thickness 2.5 cm
- retention and micro-drainage mat **ICOMAT 140** (7 layers)
- drainage mat **ICODREN 10 Szybki Drenaż® SBS**
- thermal insulation - polystyrene **XPS** bonded with **Siplast Klej® Szybki Styk SBS**
- membrane with root barrier function **GRAVIFLEX SBS / GREEN ROOF,** as shown on Figure 4
- base membrane fastened mechanically ICOPAL **GLASBIT G200 S40 Speed Profile® SBS**
- priming layer: **Siplast Primer® Speed Primer SBS**
- trapezoidal sheet



NOTE: (*) The pedestrian route between curbs can be filled with aggregated gravel of 16-32 mm laid on separating geotextile 250 g/m² lying directly on Icopal Graviflex Green Roof membrane. Thickness of gravel layer of minimum 15 cm.

Disclaimer

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Extensive green flat roof of angle up to 6 grades in reversed system, on trapezoidal sheet. **Pedestrian route.**

Figure 4e

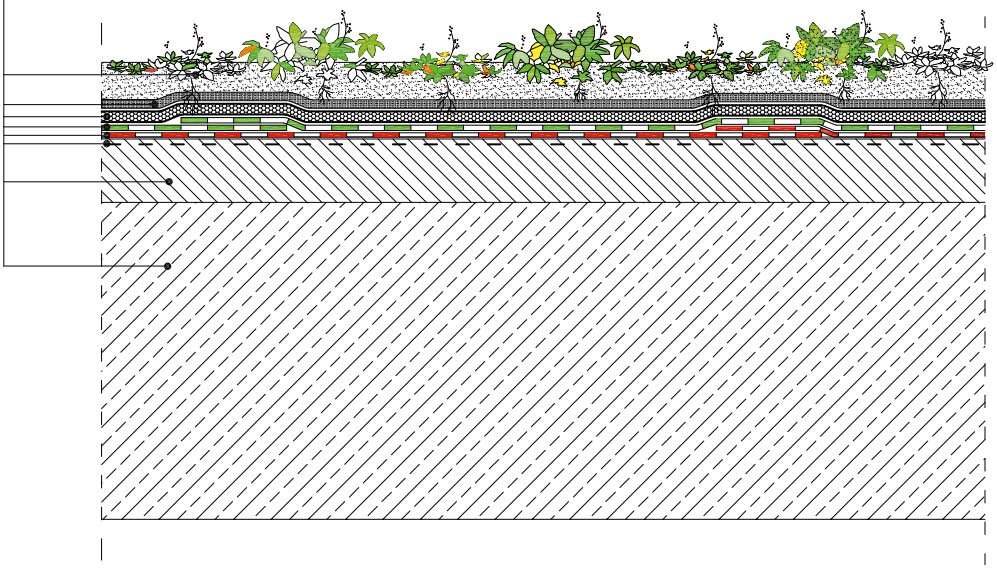
1-2-2-e

Icopal Green Roof

Immediately after installation

Extensive green flat roof without thermal insulation, on concrete surface

- pre-cultivated vegetation mat, e.g. **ICOMAT GREEN 317,** thickness 2.5 cm
- retention and micro-drainage mat **ICOMAT 140** (7 layers)
- drainage mat **ICODREN 10 Szybki Drenaż® SBS**
- membrane with root barrier function **GRAVIFLEX 5.2. SBS / GREEN ROOF** or **GRAVIFLEX 4.2 SBS / GREEN ROOF**
- base membrane torched-on in ICOPAL **Speed Profile® SBS** technology: **POLBIT BAZA 5.0 Speed Profile® SBS** or **EXTRADACH BAZA 4.0 Speed Profile® SBS** or **JUNIOR BAZA 3.0 Speed Profile® SBS**
- priming layer: **Siplast Primer® Speed Primer SBS**
- concrete downward layer
- reinforced concrete construction



Disclaimer

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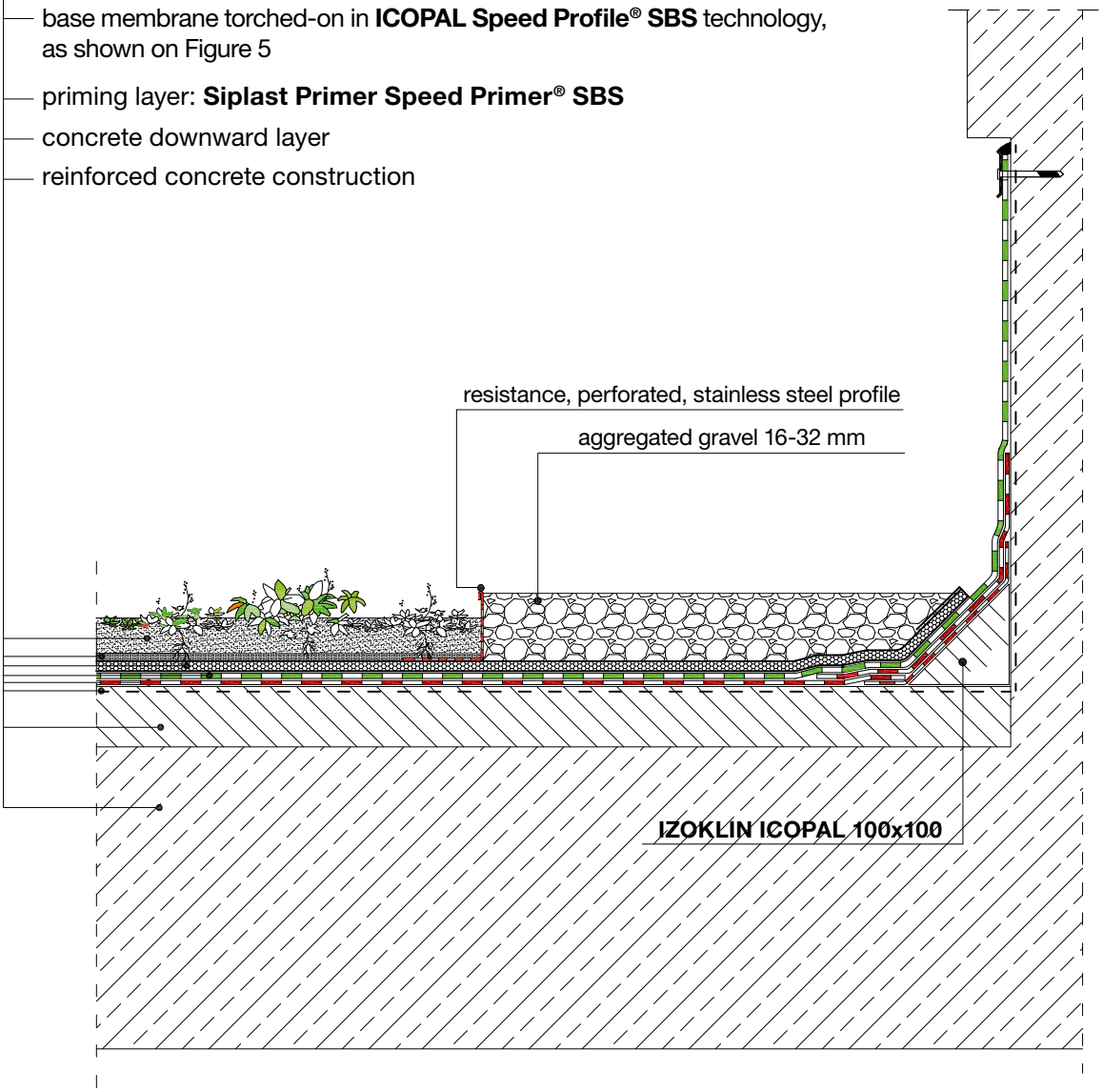
Extensive green flat roof of angle up to 6 grades without thermal insulation, on concrete surface.

Figure 5

1-3-1

Detail of attic, chimney, walls finishing

- pre-cultivated vegetation mat, e.g. **ICOMAT GREEN 317,** thickness 2.5 cm
- retention and micro-drainage mat **ICOMAT 140**
- drainage mat **ICODREN 10 Szybki Drenaż® SBS**
- membrane with root barrier function **GRAVIFLEX SBS / GREEN ROOF,** as shown on Figure 5
- base membrane torched-on in **ICOPAL Speed Profile® SBS** technology, as shown on Figure 5
- priming layer: **Siplast Primer Speed Primer® SBS**
- concrete downward layer
- reinforced concrete construction



NOTE: Width of a gravel layer adjacent to a wall should be 50 cm maximum, its depth 10 cm minimum and granulation of aggregated gravel from 16 to 32 mm.

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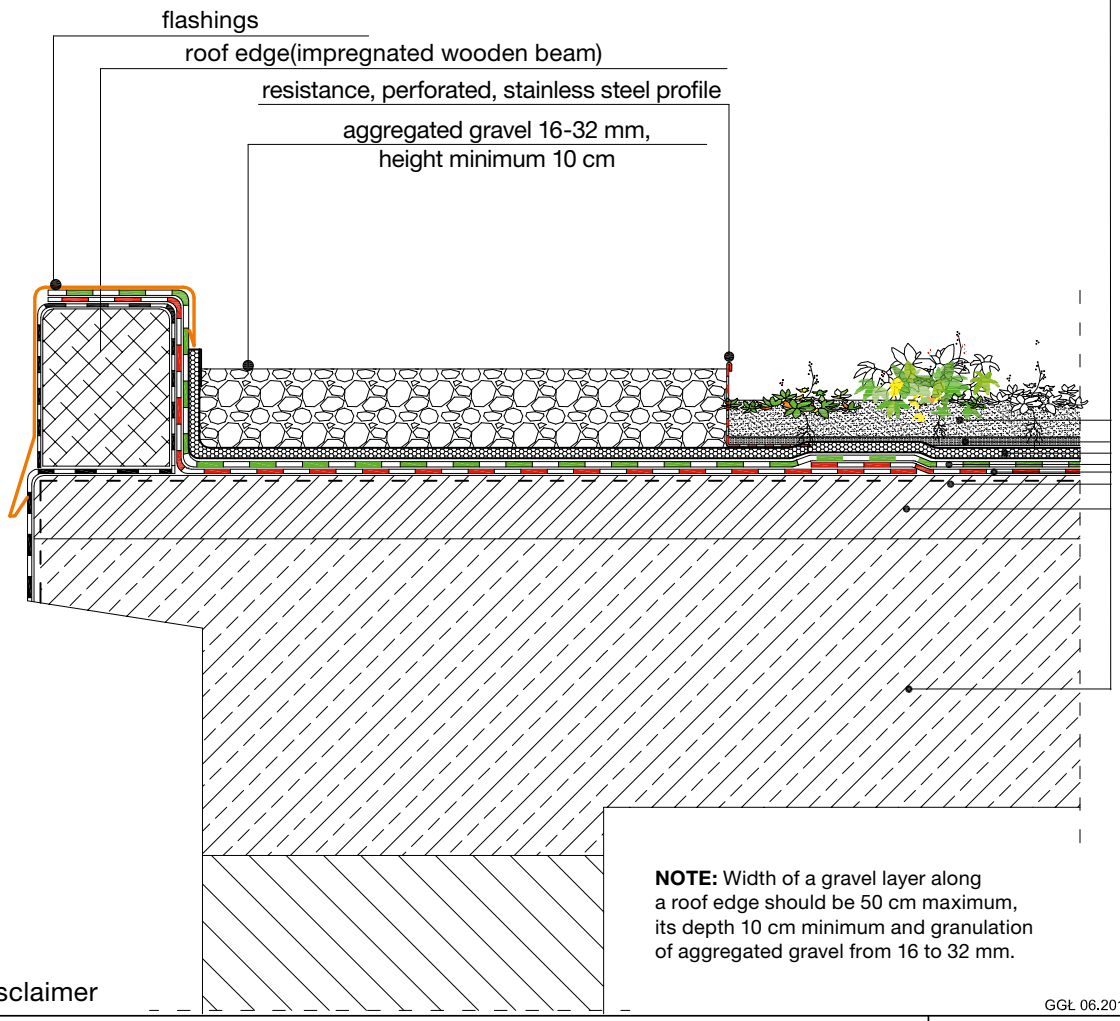
Extensive green flat roof of angle up to 6 grades without thermal insulation, on concrete surface.
Detail of attic, chimney, walls finishing.

Figure 5a

1-3-1-a

Detail of the roof edge finishing

pre-cultivated vegetation mat, e.g. **ICOMAT GREEN 317,** thickness 2.5 cm
retention and micro-drainage mat **ICOMAT 140**
drainage mat **ICODREN 10 Szybki Drenaż® SBS**
membrane with root barrier function **GRAVIFLEX SBS / GREEN ROOF,** as shown on Figure 5
base membrane torched-on in **ICOPAL Speed Profile® SBS** technology, as shown on Figure 5
priming layer: **Siplast Primer® Speed Primer SBS**
concrete downward layer
reinforced concrete construction



NOTE: Width of a gravel layer along a roof edge should be 50 cm maximum, its depth 10 cm minimum and granulation of aggregated gravel from 16 to 32 mm.

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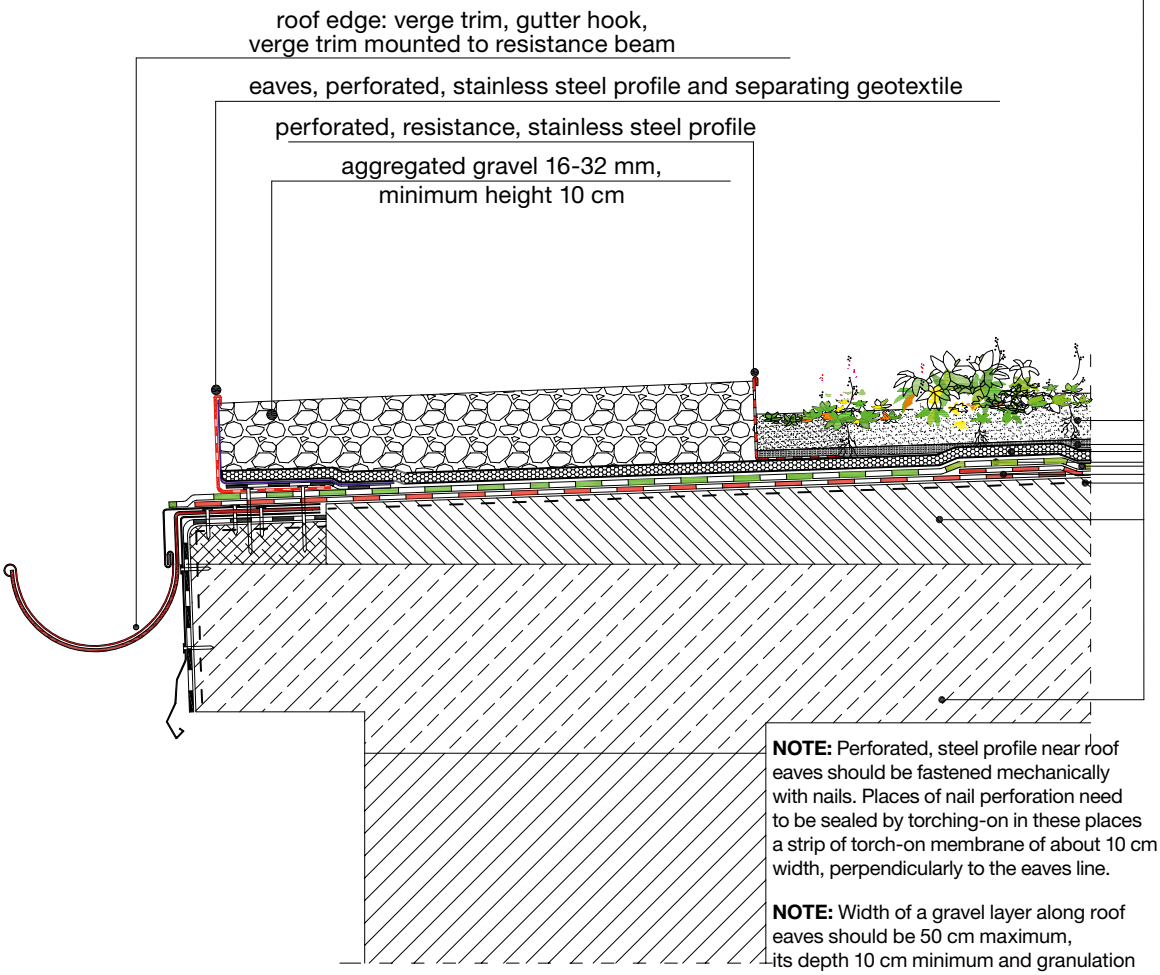
Extensive green flat roof of angle up to 6 grades without thermal insulation, on concrete surface. **Detail of the roof edge finishing.**

Figure 5b

1-3-1-b

Detail of eaves finishing

pre-cultivated vegetation mat, e.g. **ICOMAT GREEN 317,** thickness 2.5 cm
retention and micro-drainage mat **ICOMAT 140**
drainage mat **ICODREN 10 Szybki Drenaż® SBS**
membrane with root barrier function **GRAVIFLEX SBS / GREEN ROOF,** as shown on Figure 5
base membrane torched-on in **ICOPAL Speed Profile® SBS** technology, as shown on Figure 5
priming layer: **Siplast Primer® Speed Primer SBS**
concrete downward layer
reinforced concrete construction



NOTE: Perforated, steel profile near roof eaves should be fastened mechanically with nails. Places of nail perforation need to be sealed by torching-on in these places a strip of torch-on membrane of about 10 cm width, perpendicularly to the eaves line.

NOTE: Width of a gravel layer along roof eaves should be 50 cm maximum, its depth 10 cm minimum and granulation of aggregated gravel from 16 to 32 mm.

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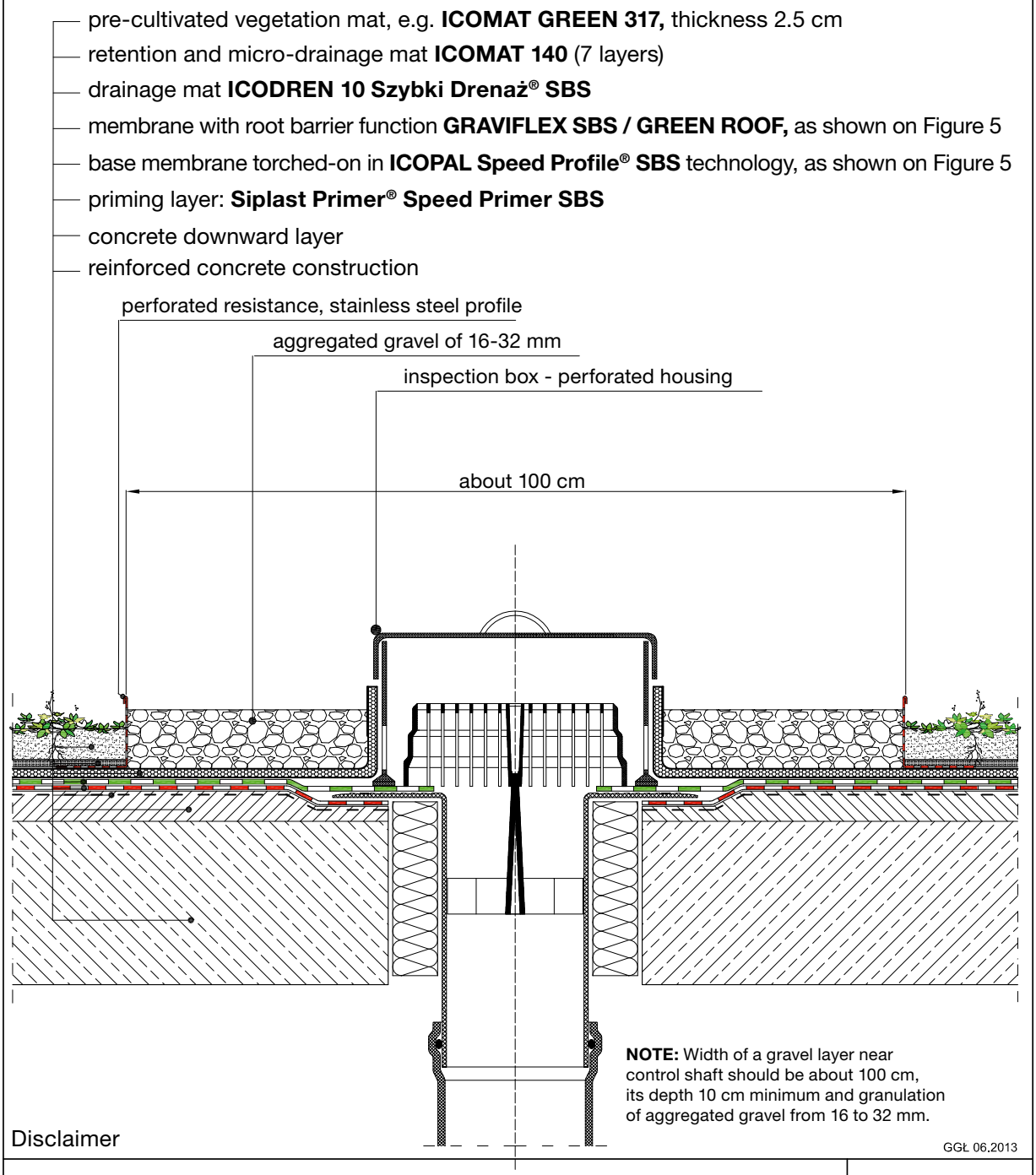
Extensive green flat roof of angle up to 6 grades without thermal insulation, on concrete surface.
Detail of eaves finishing.

Figure 5c

1-3-1-c

Detail of the roof drain with inspection box



Disclaimer

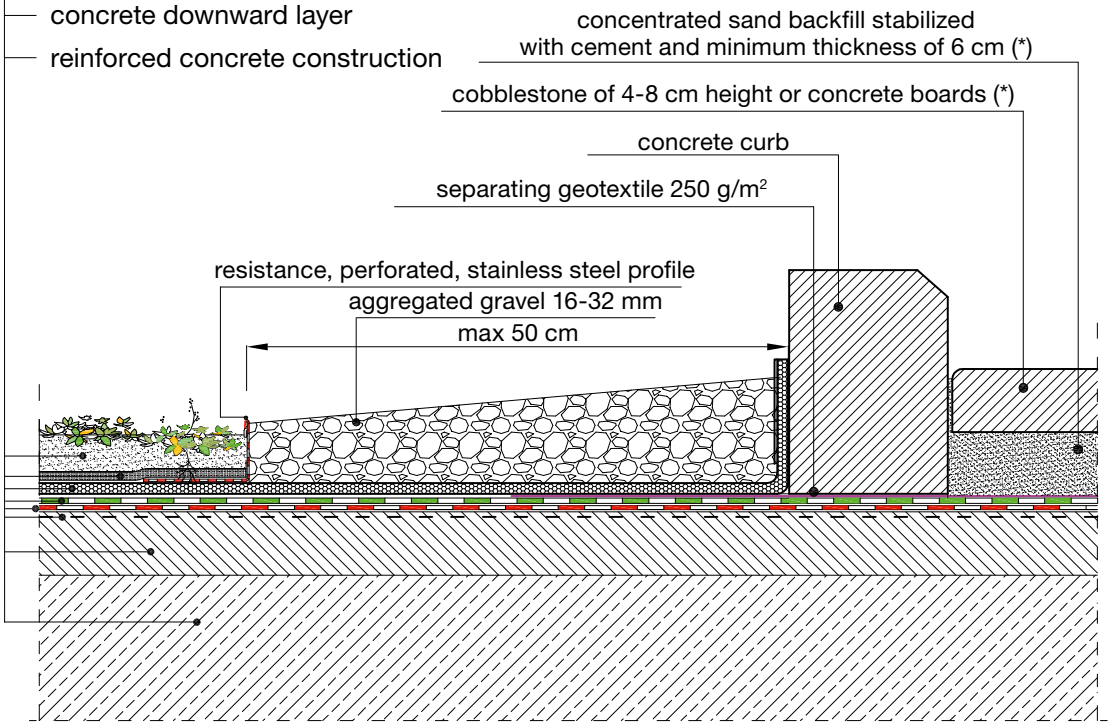
Extensive green flat roof of angle up to 6 grades without thermal insulation, on concrete surface.
Detail of the roof drain with inspection box.

Figure 5d

1-3-1-d

Pedestrian route

- pre-cultivated vegetation mat, e.g. **ICOMAT GREEN 317,** thickness 2.5 cm
- retention and micro-drainage mat **ICOMAT 140** (7 layers)
- drainage mat **ICODREN 10 Szybki Drenaż® SBS**
- membrane with root barrier function **GRAVIFLEX SBS / GREEN ROOF,** as shown on Figure 5
- base membrane torched-on in **ICOPAL Speed Profile® SBS** technology, as shown on Figure 5
- priming layer: **Siplast Primer® Speed Primer SBS**
- concrete downward layer
- reinforced concrete construction



NOTE: (*) The pedestrian route between curbs can be filled with aggregated gravel of 16-32 mm laid on separating geotextile 250 g/m² lying directly on Icopal Graviflex Green Roof membrane. Thickness of gravel layer of minimum 15 cm.

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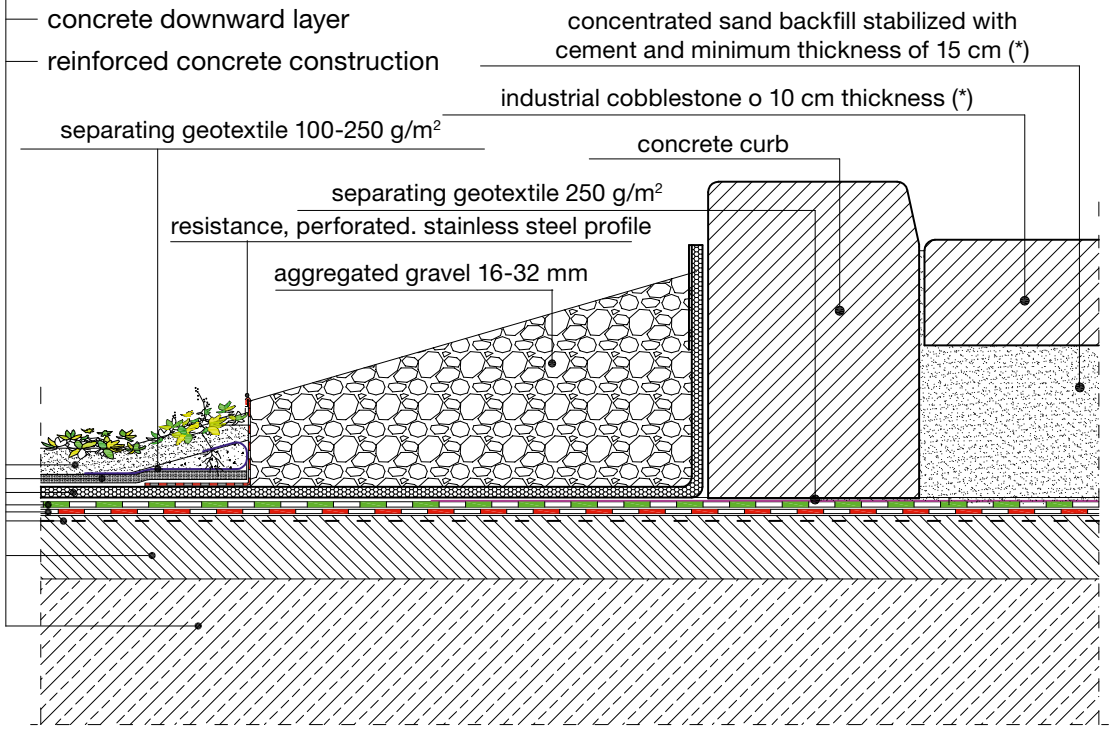
Extensive green flat roof of angle up to 6 grades without thermal insulation, on concrete surface. **Pedestrian route.**

Figure 5e

1-3-1-e

Traffic route

- pre-cultivated vegetation mat, e.g. **ICOMAT GREEN 317,** thickness 2.5 cm
- retention and micro-drainage mat **ICOMAT 140** (7 layers)
- drainage mat **ICODREN 10 Szybki Drenaż® SBS**
- membrane with root barrier function **GRAVIFLEX SBS / GREEN ROOF,** as shown on Figure 5
- base membrane torched-on in **ICOPAL Speed Profile® SBS** technology, as shown on Figure 5
- priming layer: **Siplast Primer® Speed Primer SBS**
- concrete downward layer
- reinforced concrete construction



NOTE: (*) Pedestrian route between curbs should be leveled with longitudinal angle of about 2% in order to drain surface water. Rainwater should be drained into linear dewatering or roof drains in accordance with technical green roof design. Industrial cobblestone can be replaced with concrete boards.

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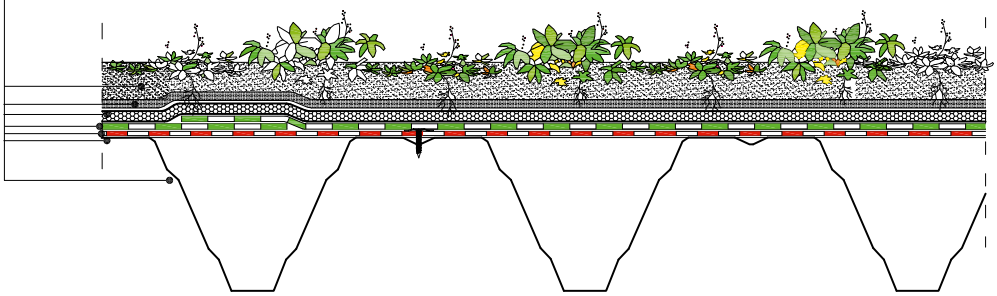
Extensive green flat roof of angle up to 6 grades without thermal insulation, on concrete surface. **Traffic route.**

Figure 5f

1-3-1-f

Extensive green flat roof without thermal insulation, on trapezoidal sheet

- pre-cultivated vegetation mat, e.g. **ICOMAT GREEN 317,** thickness 2.5 cm
- retention and micro-drainage mat **ICOMAT 140** (7 layers)
- drainage mat **ICODREN 10 Szybki Drenaż® SBS**
- membrane with root barrier function **GRAVIFLEX 5.2 SBS / GREEN ROOF** or **GRAVIFLEX 4.2 SBS/ GREEN ROOF**
- base membrane fastened mechanically ICOPAL **GLASBIT G200 S40 Speed Profile® SBS**
- priming layer: **Siplast Primer® Speed Primer SBS**
- trapezoidal sheet



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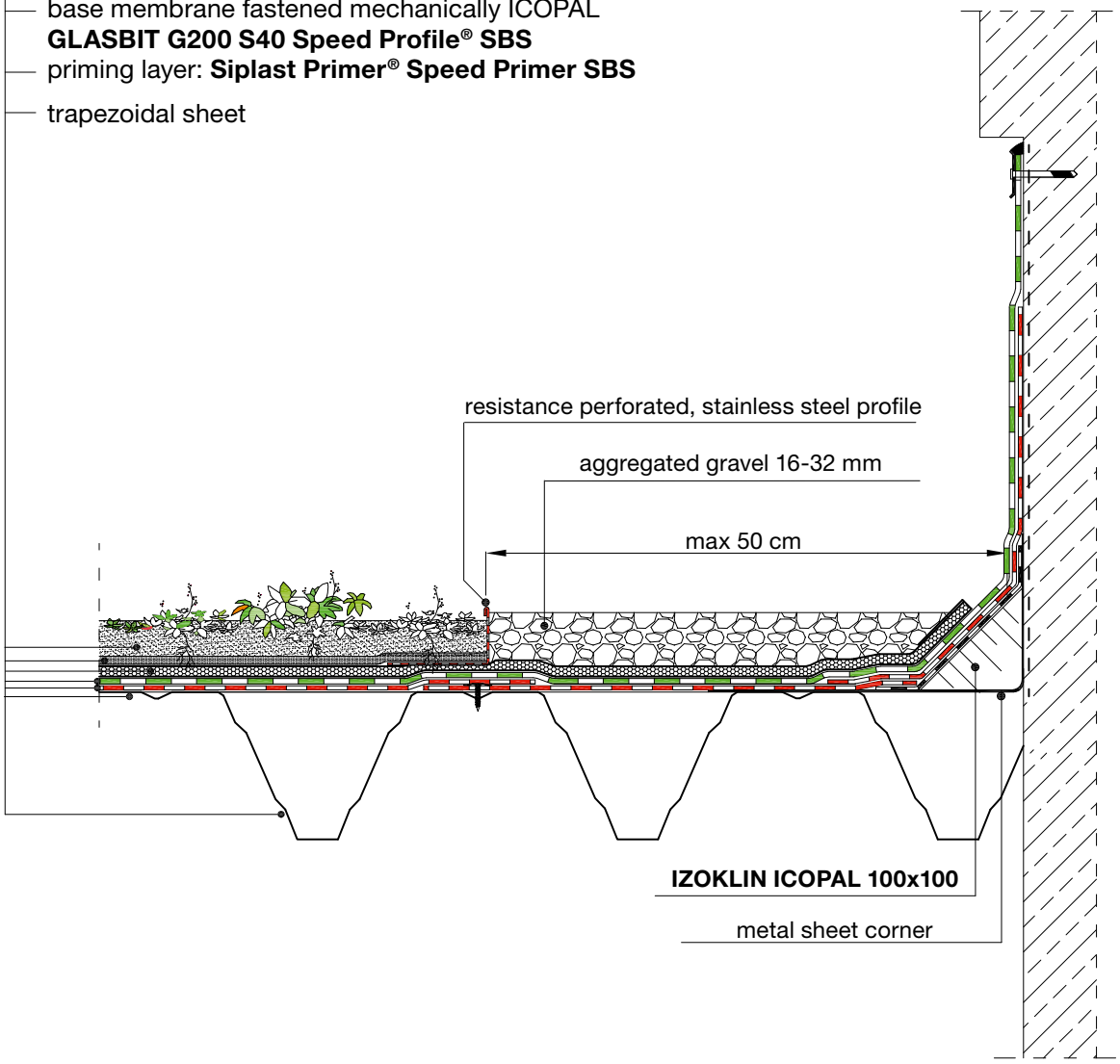
Extensive green flat roof without thermal insulation, on trapezoidal sheet.

Figure 6

1-3-2

Detail of attic, chimney, walls finishing

- pre-cultivated vegetation mat, e.g. **ICOMAT GREEN 317,** thickness 2.5 cm
- retention and micro-drainage mat **ICOMAT 140** (7 layers)
- drainage mat **ICODREN 10 Szybki Drenaż® SBS**
- membrane with root barrier function **GRAVIFLEX SBS / GREEN ROOF,** as shown on Figure 6
- base membrane fastened mechanically ICOPAL **GLASBIT G200 S40 Speed Profile® SBS**
- priming layer: **Siplast Primer® Speed Primer SBS**
- trapezoidal sheet



NOTE: Width of a gravel layer adjacent to a wall should be 50 cm maximum, its depth 10 cm minimum and granulation of aggregated gravel from 16 to 32 mm.

Disclaimer

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Extensive green flat roof of angle up to 6 grades without thermal insulation, on trapezoidal sheet.
Detail of attic, chimney, walls finishing.

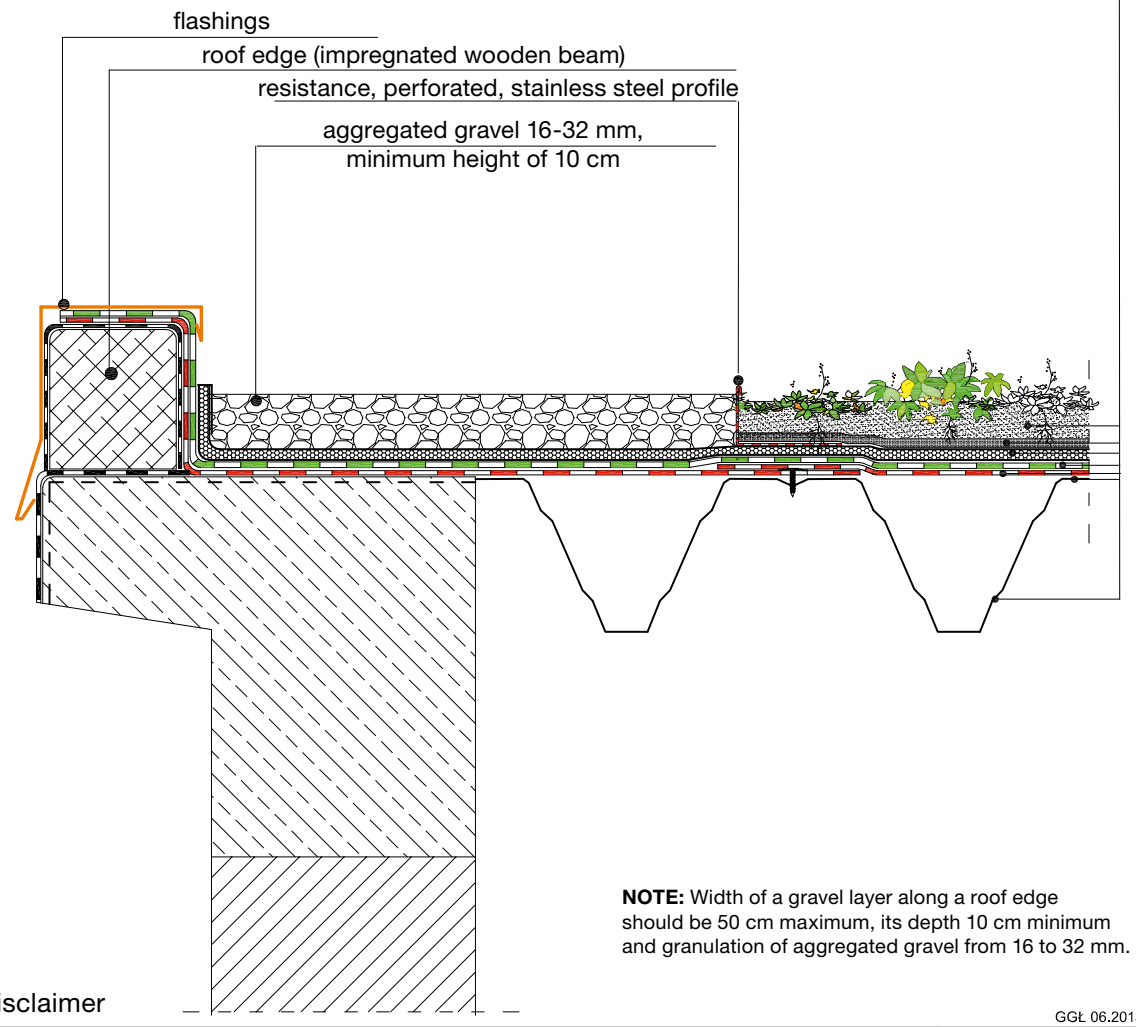
Figure 6a

1-3-2-a

ISO 14001

Detail of the roof edge finishing

pre-cultivated vegetation mat, e.g. **ICOMAT GREEN 317,** thickness 2.5 cm
retention and micro-drainage mat **ICOMAT 140** (7 layers)
drainage mat **ICODREN 10 Szybki Drenaż® SBS**
membrane with root barrier function **GRAVIFLEX SBS / GREEN ROOF,** as shown on Figure 6
base membrane fastened mechanically ICOPAL **GLASBIT G200 S40 Speed Profile® SBS**
priming layer: **Siplast Primer® Speed Primer SBS**
trapezoidal sheet



NOTE: Width of a gravel layer along a roof edge should be 50 cm maximum, its depth 10 cm minimum and granulation of aggregated gravel from 16 to 32 mm.

Disclaimer

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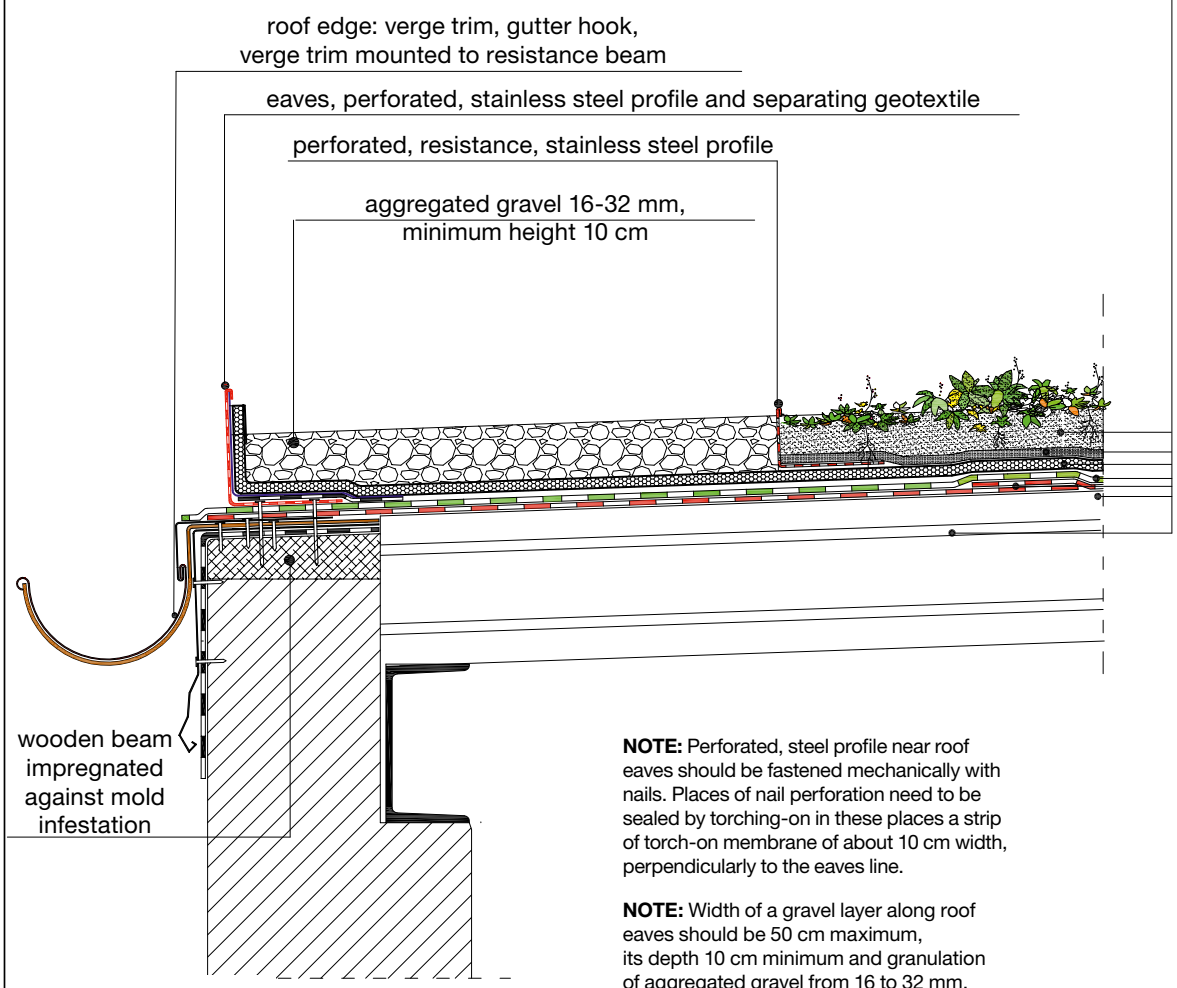
Extensive green flat roof of angle up to 6 grades without thermal insulation, on trapezoidal sheet.
Detail of the roof edge finishing.

Figure 6b

1-3-2-b

Detail of eaves finishing



NOTE: Perforated, steel profile near roof eaves should be fastened mechanically with nails. Places of nail perforation need to be sealed by torching-on in these places a strip of torch-on membrane of about 10 cm width, perpendicularly to the eaves line.

NOTE: Width of a gravel layer along roof eaves should be 50 cm maximum, its depth 10 cm minimum and granulation of aggregated gravel from 16 to 32 mm.

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Extensive green flat roof of angle up to 6 grades without thermal insulation, on trapezoidal sheet.
Detail of eaves finishing.

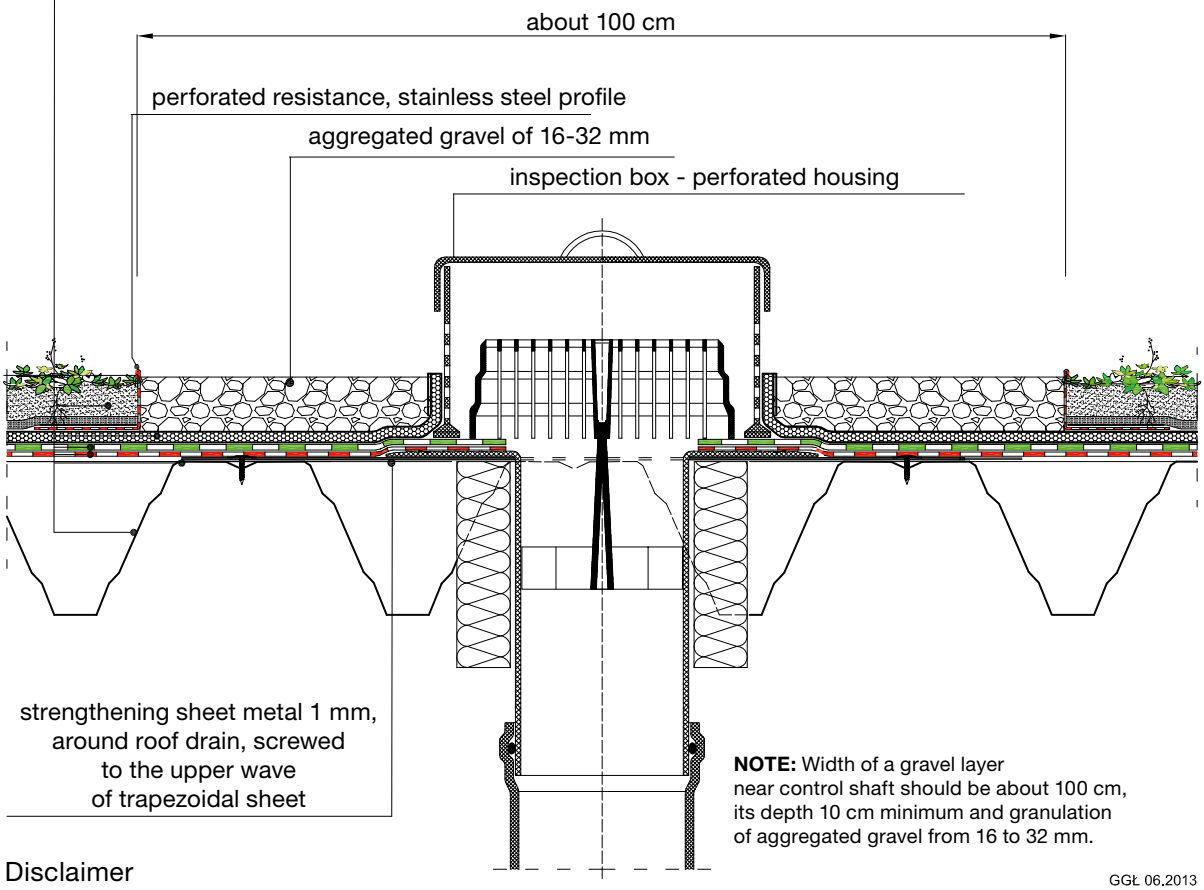
Figure 6c

1-3-2-c

ISO 14001

Detail of the roof drain with inspection box

- pre-cultivated vegetation mat, e.g. **ICOMAT GREEN 317,** thickness 2.5 cm
- retention and micro-drainage mat **ICOMAT 140** (7 layers)
- drainage mat **ICODREN 10 Szybki Drenaż® SBS**
- membrane with root barrier function **GRAVIFLEX SBS / GREEN ROOF,** as shown on Figure 6
- base membrane fastened mechanically ICOPAL **GLASBIT G200 S40 Speed Profile® SBS**
- priming layer: **Siplast Primer® Speed Primer SBS**
- trapezoidal sheet



Disclaimer

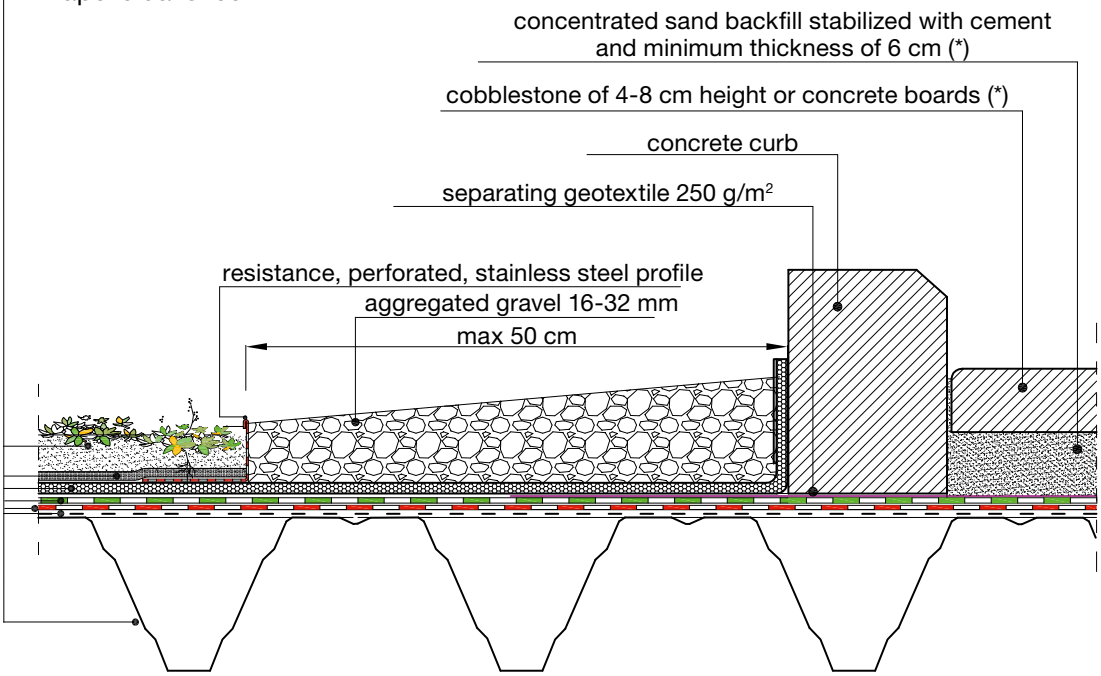
Extensive green flat roof of angle up to 6 grades without thermal insulation, on trapezoidal sheet.
Detail of the roof drain with inspection box.

Figure 6d

1-3-2-d

Pedestrian route

- pre-cultivated vegetation mat, e.g. **ICOMAT GREEN 317,** thickness 2.5 cm
- retention and micro-drainage mat **ICOMAT 140** (7 layers)
- drainage mat **ICODREN 10 Szybki Drenaż® SBS**
- membrane with root barrier function **GRAVIFLEX SBS / GREEN ROOF,** as shown on Figure 6
- base membrane fastened mechanically ICOPAL **GLASBIT G200 S40 Speed Profile® SBS**
- priming layer: **Siplast Primer® Speed Primer SBS**
- trapezoidal sheet



NOTE: (*) The pedestrian route between curbs can be filled with aggregated gravel of 16-32 mm laid on separating geotextile 250 g/m² lying directly on Icopal Graviflex Green Roof membrane. Thickness of gravel layer of minimum 15 cm.

Disclaimer

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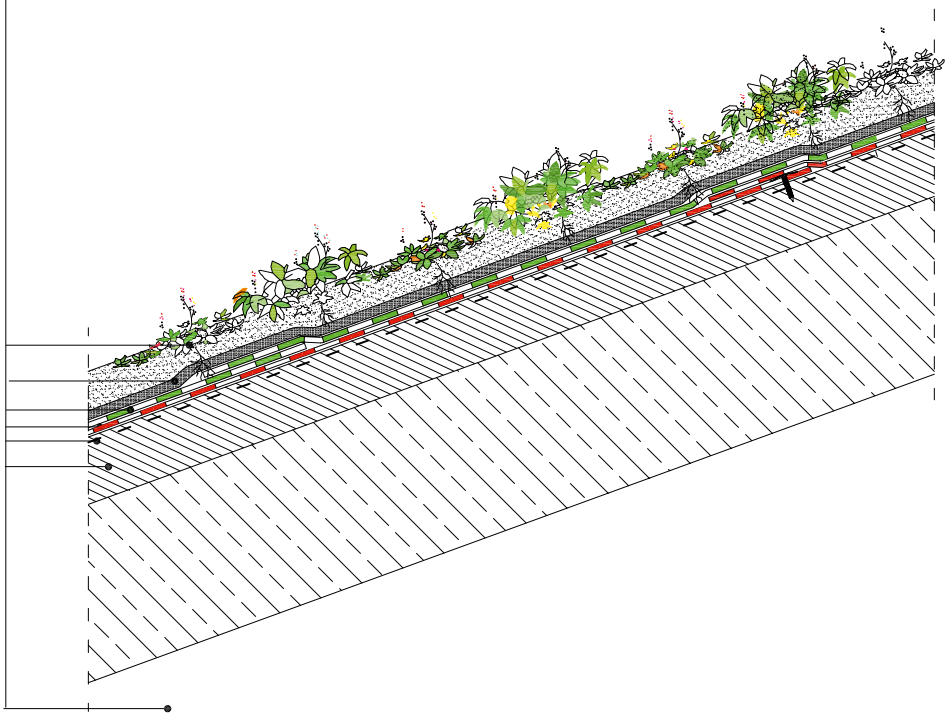
Extensive green flat roof of angle up to 6 grades without thermal insulation, on trapezoidal sheet. **Pedestrian route.**

Figure 6e

1-3-2-e

Extensive green pitched roof without thermal insulation, on concrete surface

- pre-cultivated vegetation mat, e.g. **ICOMAT GREEN 300,** thickness 3.0 cm
- retention and micro-drainage mat **ICOMAT 140** (10 layers)
- membrane with root barrier function **GRAVIFLEX 5.2 SBS / GREEN ROOF,** or **GRAVIFLEX 4.2 SBS / GREEN ROOF**
- base membrane torched-on and fastened mechanically ICOPAL **GLASBIT G200 S40 Speed Profile® SBS**
- priming layer: **Siplast Primer® Speed Primer SBS**
- concrete downward layer
- reinforced concrete construction



NOTE:
Retention-storage mat ICOMAT 140 need to be laid in strips, perpendicularly to the eaves, and mechanically fastened to the fixed element of pitched roof.

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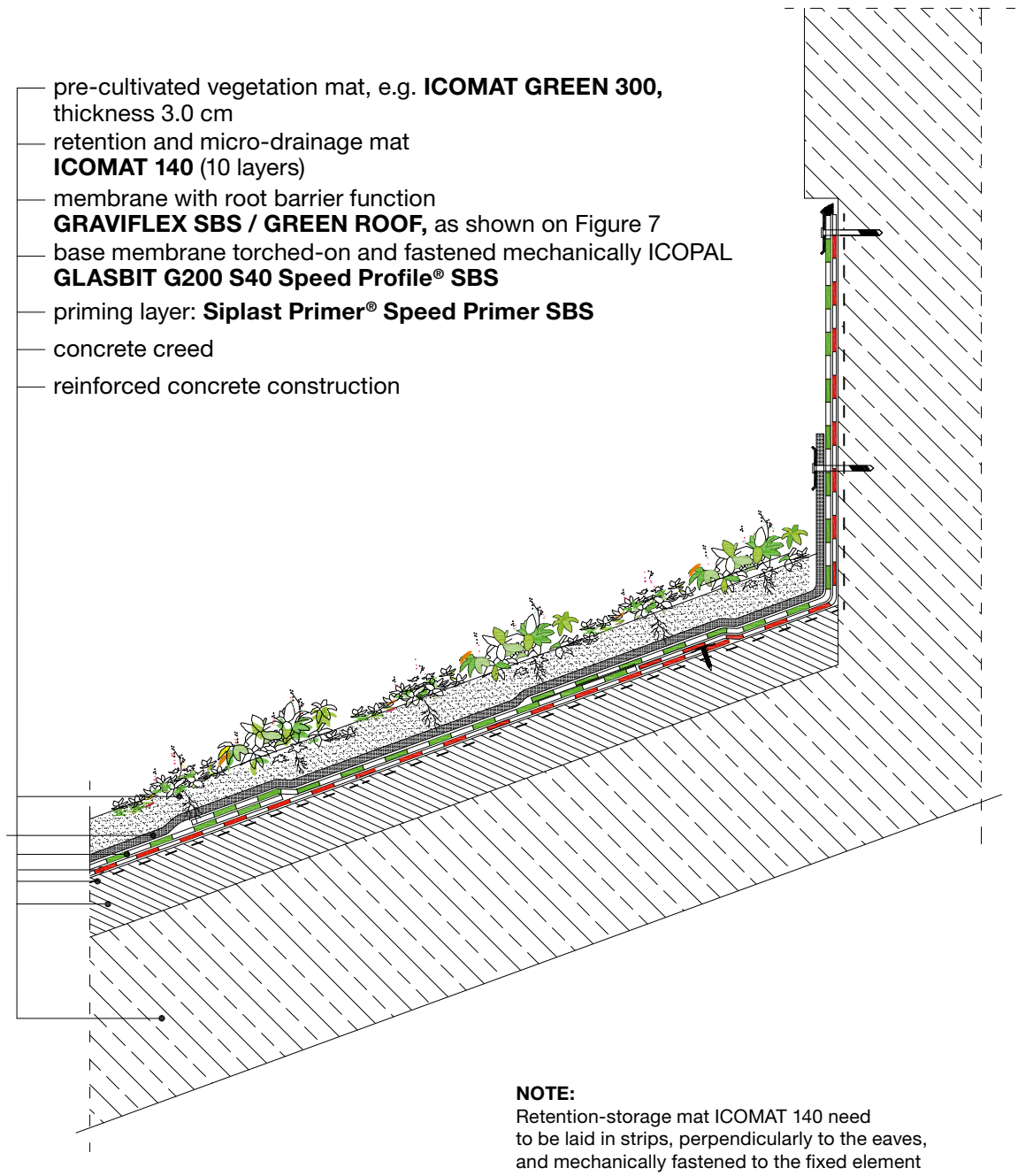
Extensive green pitched roof of angle up to 35 grades without thermal insulation, on concrete surface.

Figure 7
2-3-1

Detail of attic, chimney, walls finishing



NOTE:
Retention-storage mat ICOMAT 140 need to be laid in strips, perpendicularly to the eaves, and mechanically fastened to the fixed element of pitched roof.

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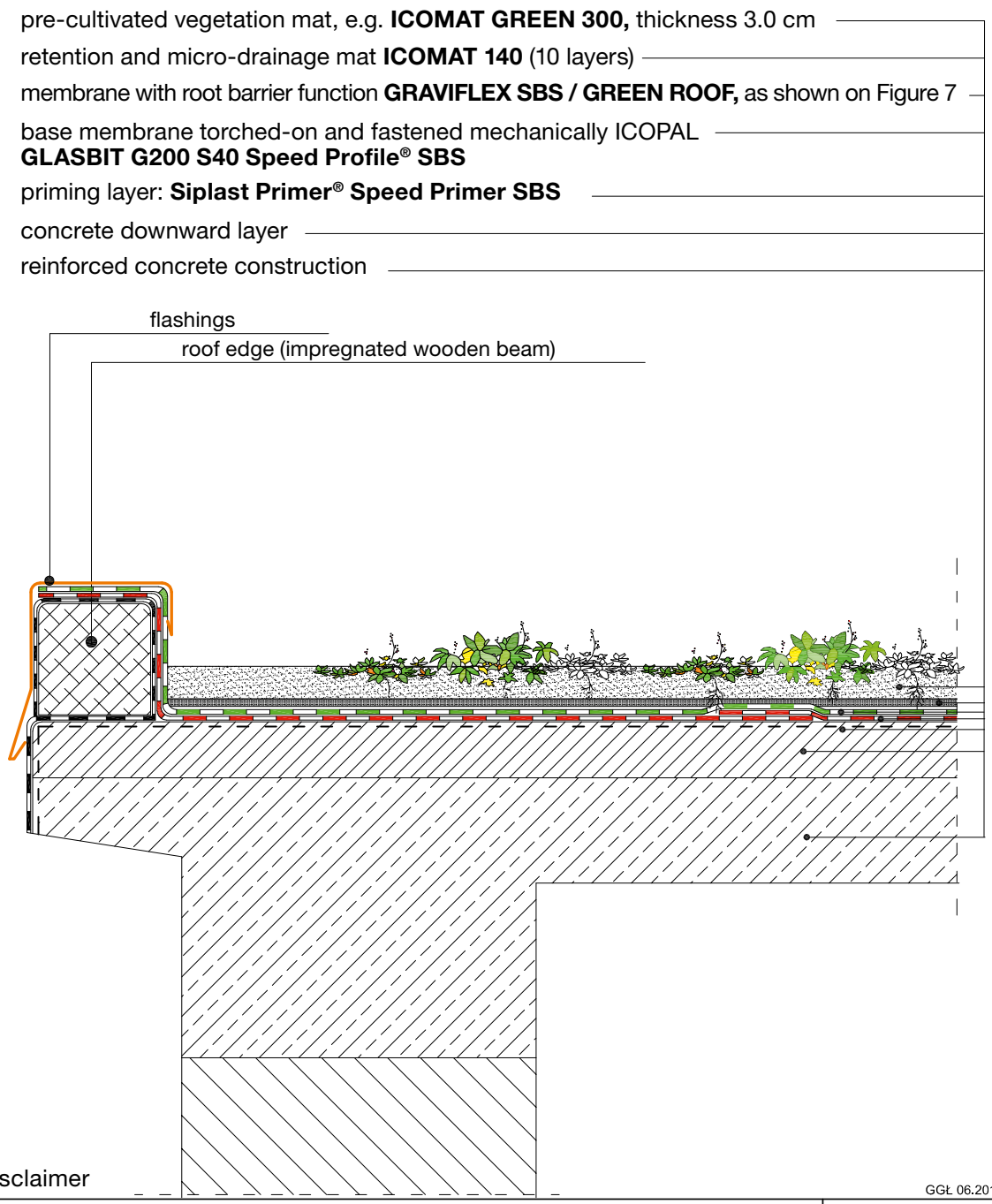
Extensive green pitched roof of angle up to 35 grades without thermal insulation, on concrete surface.
Detail of attic, chimney, walls finishing.

Figure 7a

2-3-1-a

ISO 14001

Detail of the roof edge finishing



Extensive green pitched roof of angle up to 35 grades without thermal insulation, on concrete surface.
Detail of the roof edge finishing.

Figure 7b

2-3-1-b

Detail of eaves finishing

pre-cultivated vegetation mat, e.g. **ICOMAT GREEN 300,** thickness 3.0 cm

retention and micro-drainage mat **ICOMAT 140** (10 layers)

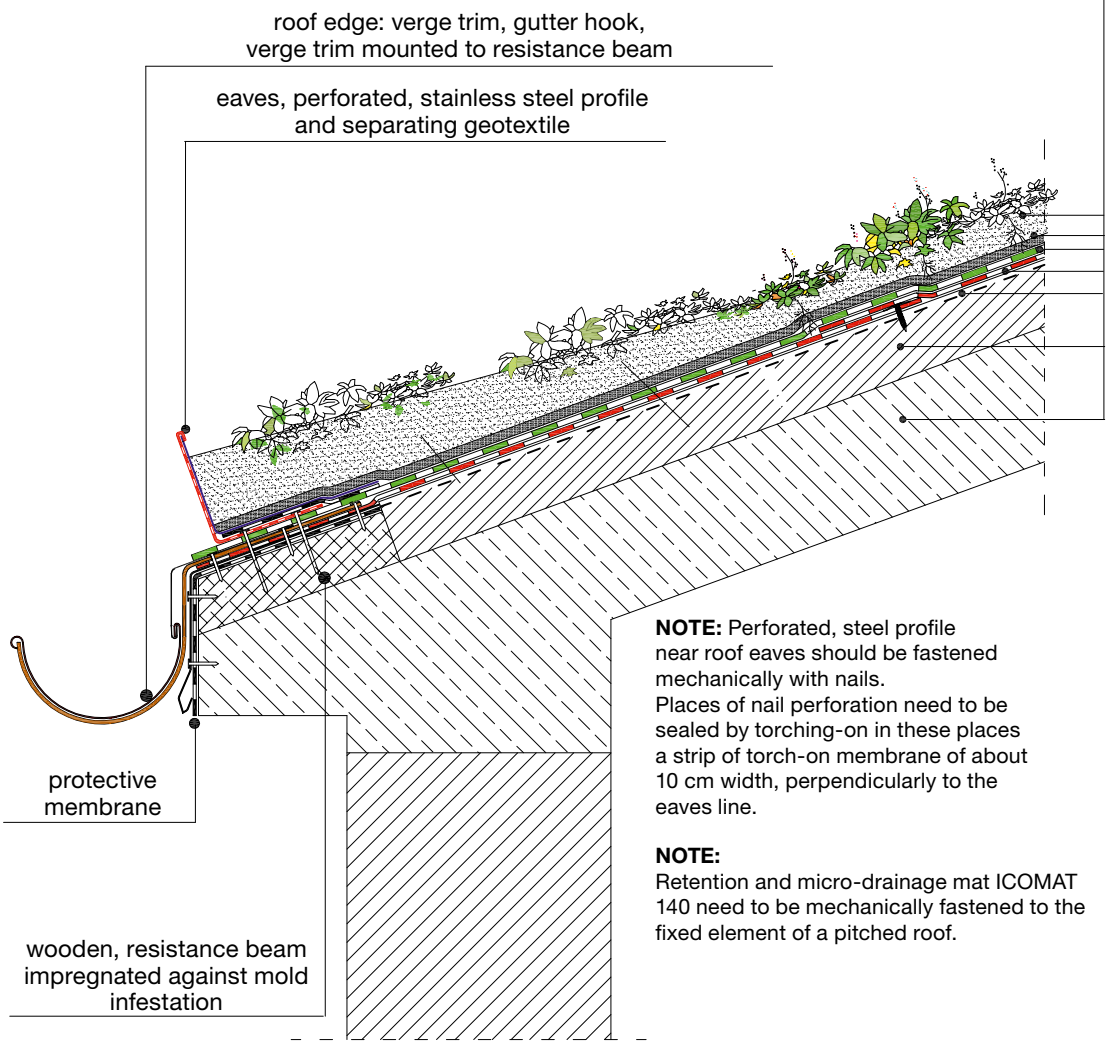
membrane with root barrier function **GRAVIFLEX SBS / GREEN ROOF,** as shown on Figure 7

base membrane torched-on and fastened mechanically ICOPAL **GLASBIT G200 S40 Speed Profile® SBS**

priming layer: **Siplast Primer® Speed Primer SBS**

concrete downward layer

reinforced concrete construction



NOTE: Perforated, steel profile near roof eaves should be fastened mechanically with nails. Places of nail perforation need to be sealed by torching-on in these places a strip of torch-on membrane of about 10 cm width, perpendicularly to the eaves line.

NOTE:
Retention and micro-drainage mat ICOMAT 140 need to be mechanically fastened to the fixed element of a pitched roof.

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Extensive green pitched roof of angle up to 35 grades without thermal insulation, on concrete surface.
Detail of eaves finishing.

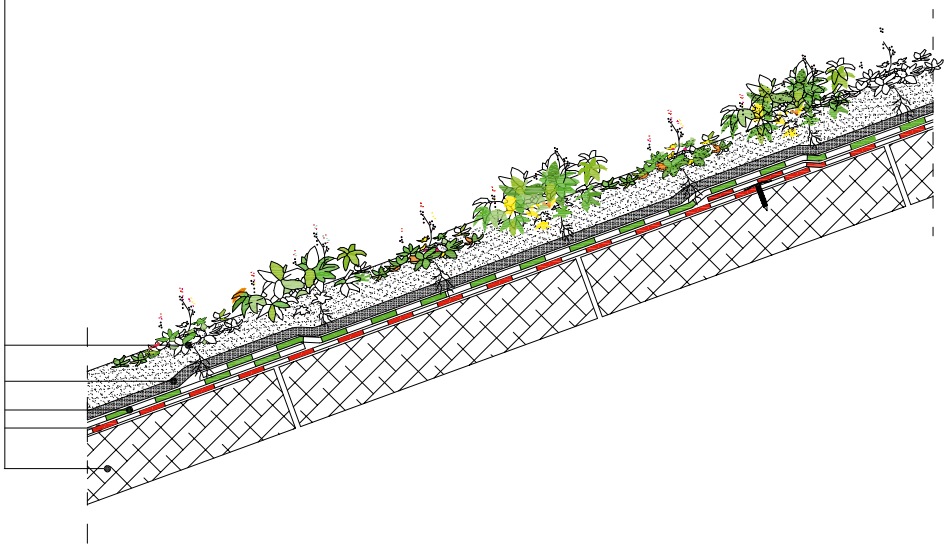
Figure 7c

2-3-1-c

ISO 14001

Extensive green pitched roof without thermal insulation, on wooden surface.

- pre-cultivated vegetation mat, e.g. **ICOMAT GREEN 300,** thickness 3.0 cm
- retention and micro-drainage mat **ICOMAT 140** (10 layers)
- membrane with root barrier function **GRAVIFLEX 5.2 SBS / GREEN ROOF,** or **GRAVIFLEX 4.2 SBS/ GREEN ROOF**
- base membrane fastened mechanically ICOPAL **GLASBIT G200 S40 Speed Profile® SBS**
- wooden surface - planks impregnated against mold infestation **ICOPAL GONTOX W6 Drewno Zewnętrzne (Exterior Wood)**



NOTE:
Retention-storage mat ICOMAT 140 need to be laid in strips, perpendicularly to the eaves, and mechanically fastened to the fixed element of a pitched roof.

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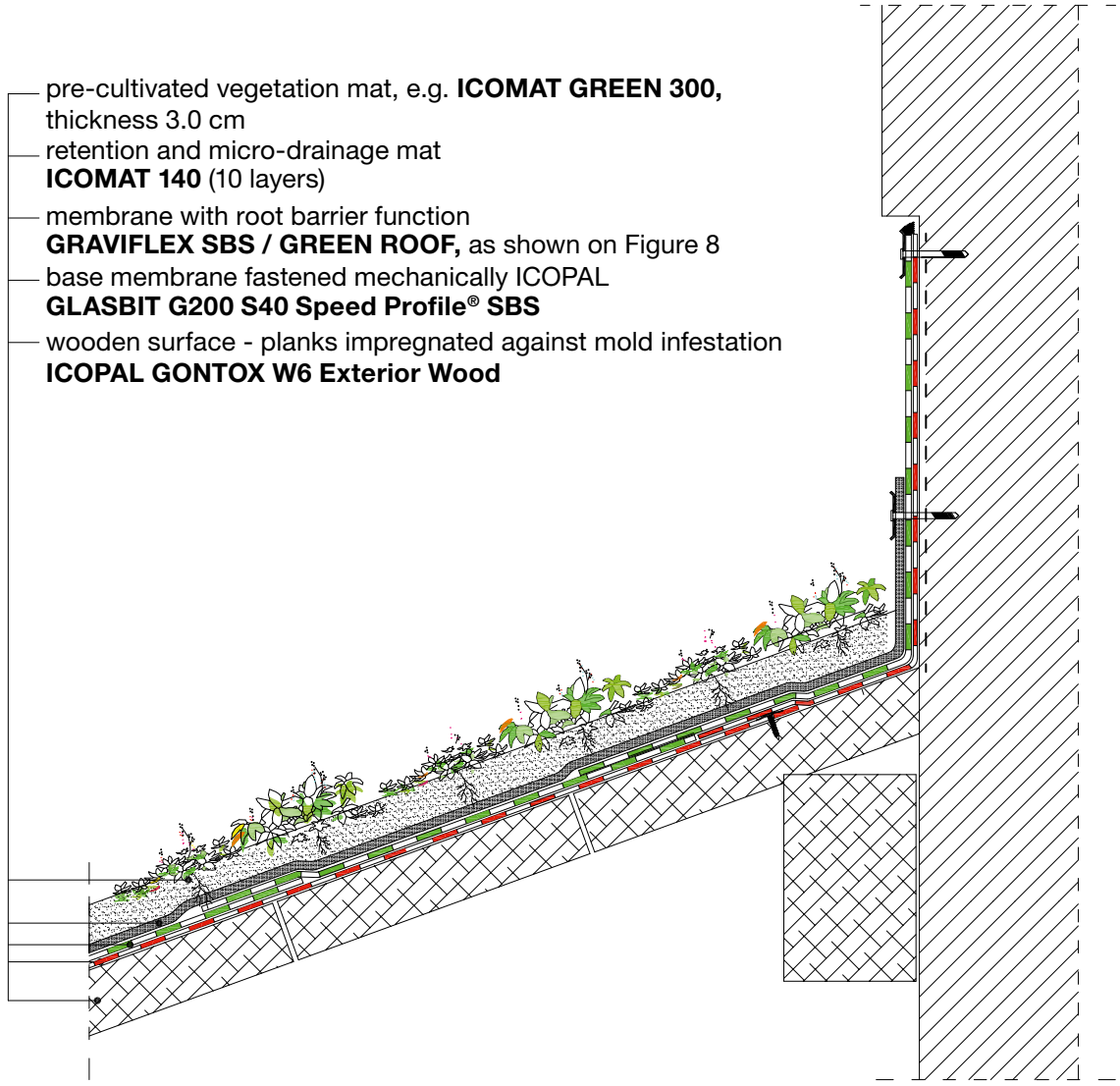
Extensive green pitched roof of angle up to 35 grades without thermal insulation, on wooden surface.

Figure 8 2-3-3

Detail of attic, chimney, walls finishing

pre-cultivated vegetation mat, e.g. **ICOMAT GREEN 300,** thickness 3.0 cm
retention and micro-drainage mat **ICOMAT 140** (10 layers)
membrane with root barrier function **GRAVIFLEX SBS / GREEN ROOF,** as shown on Figure 8
base membrane fastened mechanically ICOPAL **GLASBIT G200 S40 Speed Profile® SBS**
wooden surface - planks impregnated against mold infestation **ICOPAL GONTOX W6 Exterior Wood**



NOTE:
Retention-storage mat ICOMAT 140 need to be laid in strips, perpendicularly to the eaves, and mechanically fastened to the fixed element of a pitched roof.

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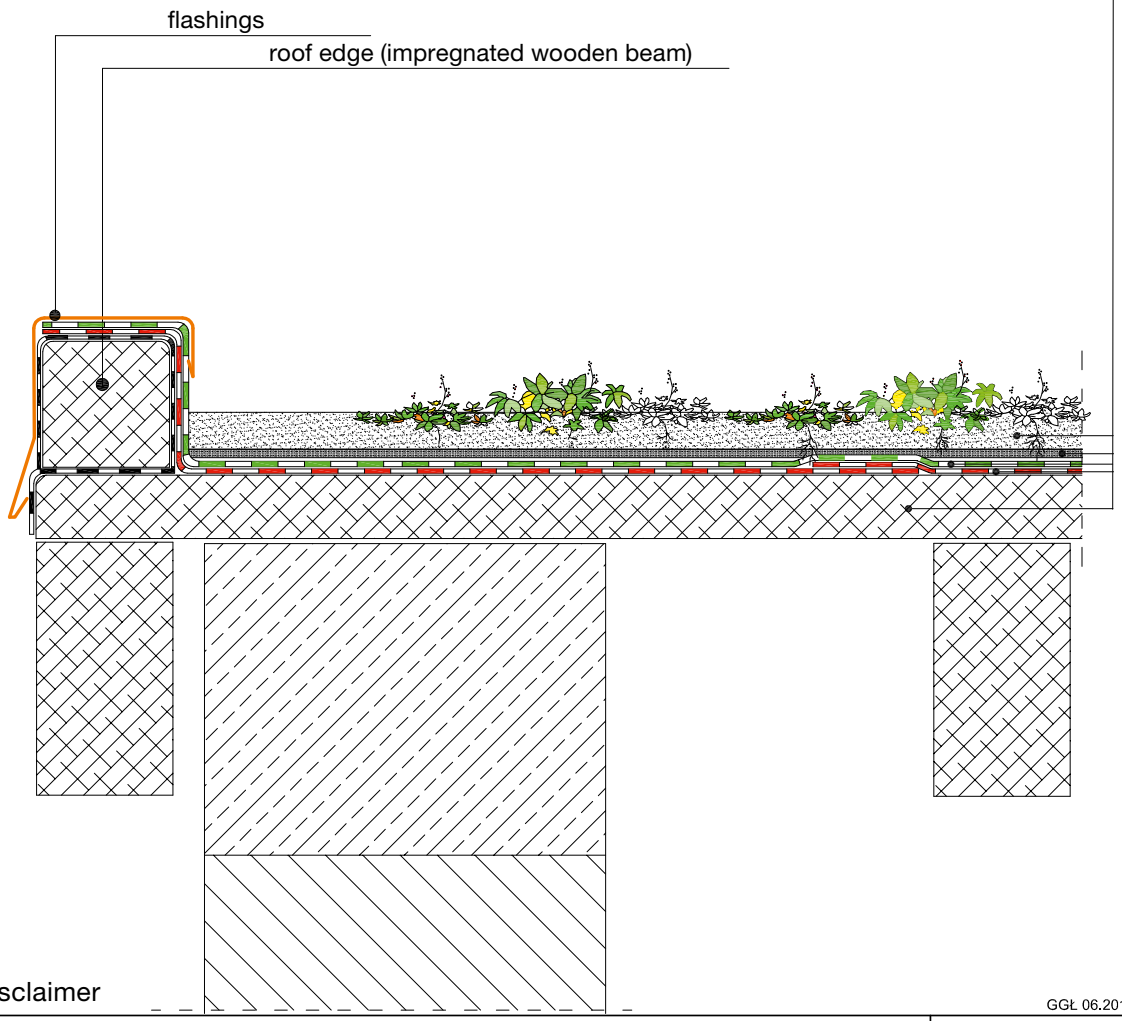
Extensive green pitched roof of angle up to 35 grades without thermal insulation, on wooden surface. Detail of attic, chimney, walls finishing

Figure 8a

2-3-3-a

Detail of the roof edge finishing

pre-cultivated vegetation mat, e.g. **ICOMAT GREEN 300,** thickness 3.0 cm
retention and micro-drainage mat **ICOMAT 140** (10 layers)
membrane with root barrier function **GRAVIFLEX SBS / GREEN ROOF**, as shown on Figure 8
base membrane fastened mechanically ICOPAL
GLASBIT G200 S40 Speed Profile® SBS
wooden surface - planks impregnated against mold infestation
ICOPAL GONTOX W6 Exterior Wood



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Extensive green pitched roof of angle up to 35 grades without thermal insulation, on wooden surface.
Detail of the roof edge finishing.

Figure 8b

2-3-3-b

Detail of eaves finishing

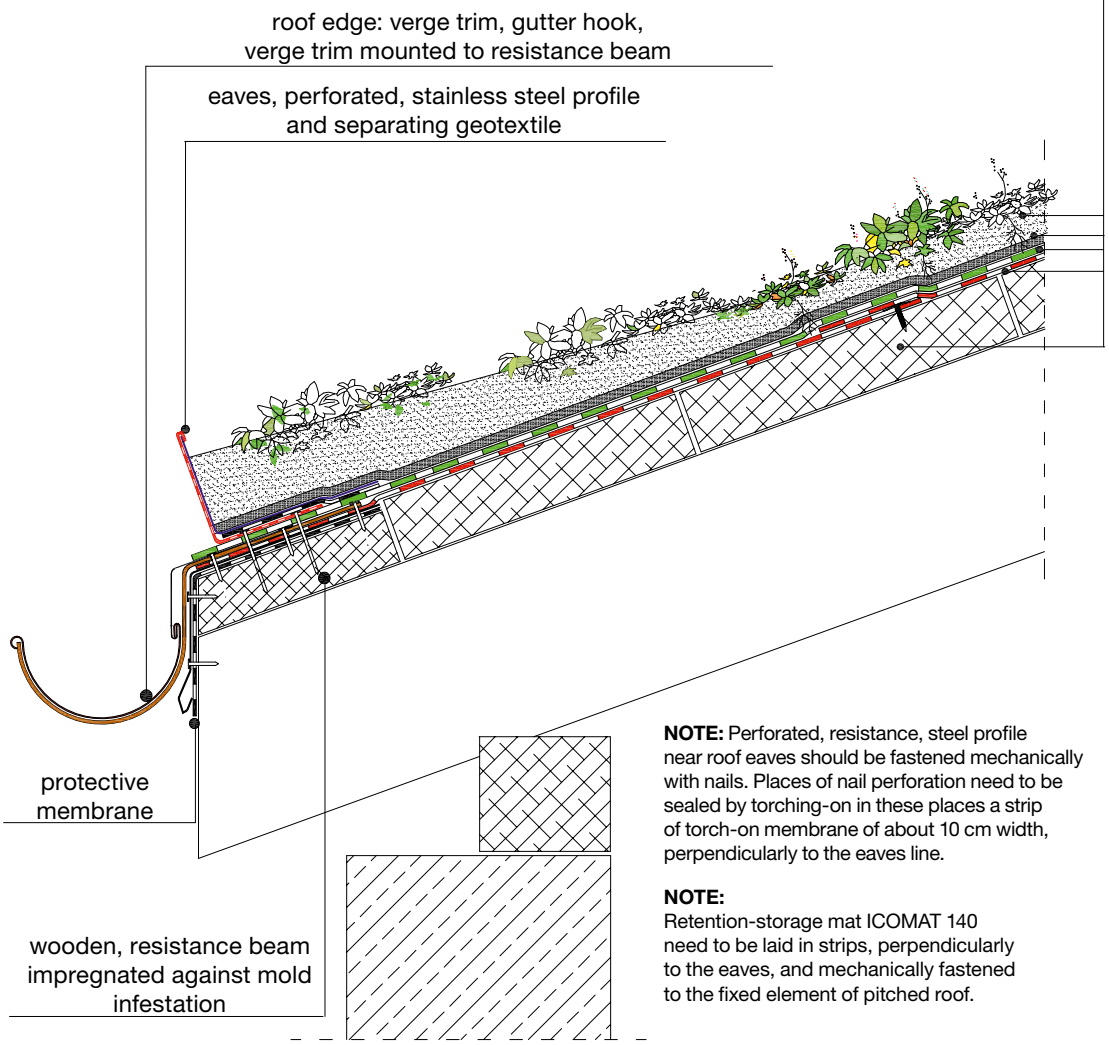
pre-cultivated vegetation mat, e.g. **ICOMAT GREEN 300,** thickness 3.0 cm

retention and micro-drainage mat **ICOMAT 140** (10 layers)

membrane with root barrier function **GRAVIFLEX SBS / GREEN ROOF**, as shown on Figure 8

base membrane fastened mechanically ICOPAL
GLASBIT G200 S40 Speed Profile® SBS

wooden surface - planks impregnated against mold infestation
ICOPAL GONTOX W6 Exterior Wood



NOTE: Perforated, resistance, steel profile near roof eaves should be fastened mechanically with nails. Places of nail perforation need to be sealed by torching-on in these places a strip of torch-on membrane of about 10 cm width, perpendicularly to the eaves line.

NOTE:
Retention-storage mat ICOMAT 140 need to be laid in strips, perpendicularly to the eaves, and mechanically fastened to the fixed element of pitched roof.

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Extensive green pitched roof of angle up to 35 grades without thermal insulation, on wooden surface.
Detail of eaves finishing.

Figure 8c

2-3-3-c

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