

▶▶ Rhepanol® hfk roofing membrane for all installation methods

Sustainability data sheet

Rhepanol® hfk is a membrane that can be used for a wide range of applications.

- Mechanically fastened (seam fastening, mechanically fastened in the Gripfix system or in the combination of seam and Gripfix system)
- Glued strip-wise or fully bonded
- With ballast (gravel, extensive and intensive greening, terrace coverings, inverted roofs, etc.)
- Building waterproofing (e.g. collecting tanks), firefighting water tank (e.g. for snow cannons, ponds, kitchens)

Rhepanol® hfk is made from the raw material polyisobutylene (PIB) and has an integrated 1.0 mm-thick synthetic fleece and a fleece-free edge. The roofing membranes are joined in the seam area by hot air welding. The fleece additionally protects against loads from the substrate.

Tests and approvals

For example for:

- Proof of an environmental product declaration in the form of a product-specific EPD according to ISO 14025 und EN 15804 (www.ibu-epd.com), listed in the DGNB Navigator (www.dgnb-navigator.de) with the declaration number: EPD-FDT-20240155-lba1-DE
- Fire behaviour: building material class B2 according to DIN 4102 or Class E according to EN 13501-1
- Test methods for external fire exposure to roofs CEN/TS 1187 and classification according to EN 13501-5: Broof (t1) (for different roof structures, general building supervisory authority test certificate (AbP) or classification reports can be requested separately)
- Root- and rhizome-resistant according to FLL method, without use of herbicides
- European Technical Assessment (ETA 13/0655) for the mechanically fastened roof sealing system "Rhepanol® hfk" according to EAD 030351-00-0402
- DUBOkeur certificate, Nibe Research BV (test of environmental and health aspects)
- Belgian approval (ATG) for Rhepanol® hfk
- Solar Reflectance Index (SRI) according to ASTM E 1980:
 - Rhepanol® hfk white (based on RAL 9016) > 98 (new condition)
 - Rhepanol® hfk grey (based on RAL 7000) > 14 (new condition)

Rhepanol® hfk leaching test according to CEN/TS 16637-2

The leaching test was carried out by the DVGW Water Technology Centre in Karlsruhe. The test shows that the Rhepanol® hfk roofing membrane does not contain the substances of concern in the list, which therefore cannot be washed out (for results, see negative list).

Substance group	Substance	AT*	Unit	Result
Anions	Ammonium	0.01	mg/L	< AT
	Chloride	1	mg/L	< AT
	Nitrate	0.5	mg/L	< AT
	Sulphate	1	mg/L	< AT
	Nitrite	0.01	mg/L	< AT
Heavy metals	Arsenic	0.001	mg/L	< AT
	Lead	0.001	mg/L	< AT
	Cadmium	0.0001	mg/L	< AT
	Copper	0.01	mg/L	< AT
	Nickel	0.001	mg/L	< AT
	Mercury	0,00005	mg/L	< AT
	Antimony	0.01	mg/L	< AT
	Tin	0.01	mg/L	< AT
	Zinc	0.2	mg/L	< AT
Cross-linking agent	2-Mercaptobenzothiazole	0.1	µg/L	< AT
Halogenated hydrocarbons	Trichloromethane (chloroform)	0.1	µg/L	< AT
	Bromodichloromethane	0.1	µg/L	< AT
	Dibromochloromethane	0.1	µg/L	< AT
	Tribromomethane (bromoform)	0.1	µg/L	< AT
	1,2-Dichloroethane	0.1	µg/L	< AT
	Trichloroethene	0.1	µg/L	< AT
	Tetrachloroethene	0.1	µg/L	< AT
Carcinogen	Benzol	0.1	µg/L	< AT
PAH (polycyclic hydrocarbons)	Benzo(a)pyrene	0.0005	µg/L	< AT
	Benzo(b)fluoranthene	0.001	µg/L	< AT
	Benzo(ghi)perylene	0.0005	µg/L	< AT
	Benzo(k)fluoranthene	0.001	µg/L	< AT
	Indeno(1,2,3-cd)pyrene	0.0005	µg/L	< AT
Biocides	IPBC	0.01	µg/L	< AT
	Carbendazim	0.01	µg/L	< AT
	Diuron	0.01	µg/L	< AT
	Irgarol	0.01	µg/L	< AT
	Isoproturon	0.01	µg/L	< AT
	MCPA	0.01	µg/L	< AT
	MCPP (Mecoprop)	0.01	µg/L	< AT
	Terbutryn	0.01	µg/L	< AT
	4,5-Dichlor-2-n-octyl-3-isothiazolinone	0.01	µg/L	< AT
	2-Octyl-3-isothiazolinone	0.01	µg/L	< AT
Endocrine disruptors	4-Octylphenol	0.01	µg/L	< AT
	Bisphenol A	0.01	µg/L	< AT
	Bisphenol F	0.01	µg/L	< AT
Antioxidants	2,6-Di-tert-butyl-4-methylphenol	0.1	µg/L	< AT
Flame retardants	Tris-(butoxyethyl)-phosphate	0.05	µg/L	< AT
	Tris-(2-chloropropyl)-phosphate	0.025	µg/L	< AT

* Assessment threshold (smallest measurable minimum concentration of a substance).

Product characteristics

- Due to high quality and above-average service life, the roofing membrane offers long-lasting of life and assets for future generations
- Free from chlorine, halogens, bitumen and PVC, and resistant to rotting
- No plasticisers
- No lead-based stabilisers, cadmium or organotin substances in concentrations exceeding 0.01% by weight
- This product is a product within the meaning of the Regulation (EC) no. 1907/2006 (REACH). Based on our current level of knowledge, Rhepanol® hfk contains no substances in concentrations exceeding 0.01% by weight that were published in Annex XIV of the REACH regulation or on the candidate list of the European Agency for Chemical Substances (ECHA)
- Postconsumer recycled content: 0 %
- Preconsumer recycled content: approx. 10% on average (only in the bottom layer)
- Extremely weather-resistant, even without additional surface protection
- Resistant to atmospheric influences, e.g. UV radiation as well as industrial and heating exhaust gases
- Outstanding resistance to natural aging
- Extremely high UV resistance (≥ 10,000 hours) in accordance with EN 1297
- Suitable as the basis for the source of life (e.g. terraces, playgrounds, green roofs, rooftop gardens, urban farming, biodiversity) and energy generation (e.g. photovoltaic systems, solar heating)
- Easy to dismantle construction product, separable into mono-fractions in the mechanically fastened application area or under ballast
- After it has fulfilled its purpose, the product can be recycled as a plastic or thermally recycled
- Suitable for rainwater retention (retention roof)
- Also suitable for flat surfaces (slope ≤ 2 %)
- System-specific repairs are possible over the complete lifetime
- Resistance to roots and rhizomes enables use in areas of both extensive and intensive greening
- Low weight per unit area of just 1.92 kg/m²
- Low operating costs due to long life service life
- Drinking water certification for Rhepanol® hfk
- Good resistant to red algae
- Weight loss after action of microorganisms according to ISO 846 methods A and C ≤ 10 % (ATG Belgium)
- Utilization of roof water is possible (e.g. watering of rooftop garden, roof greening, façade greening):
As the product contains no root toxins, the soil, surface water and groundwater is not contaminated by them
- Listed on the portals www.ibu-epd.com and www.dgnb-navigator.de (registration code 5NUPUE) as well as www.baubook.at
- Solar Reflectance Index (SRI) according to ASTM E 1980 in the colour Rhepanol® hfk white (based on RAL 9016) > 98 (new condition)



www.blauer-engel.de/uz224

Highlight:

The Rhepanol hfk roofing membrane has reached another milestone: it is now one of the first roofing membranes in Europe to proudly bear the Blue Angel ecolabel. This prestigious environmental certification stands for environmentally friendly and resource-efficient products, underscoring the outstanding quality and sustainable profile of our Rhepanol hfk roofing membrane.

Building certifications (DGNB, BNB, QNG):

DGNB (Version 2018)

(Deutsche Gesellschaft für Nachhaltiges Bauen e. V.
[German Sustainable Construction Association])

Relevant requirements according to DGNB criterion
ENV1.2 "Risks for the local environment" for new
buildings:

1. Criteria matrix row number 36: Synthetic foils on
roof and foundation (DGNB, Version 2018, see
Annex 1 Criteria matrix)

- Free from lead and organotin compounds
(manufacturer's declaration: content < 0.1 %)

Quality level 1: fulfilled
Quality level 2: fulfilled
Quality level 3: fulfilled
Quality level 4: fulfilled

2. Criteria matrix row number 44:
Synthetic products (DGNB, Version 2018, see
Annex 1 Criteria matrix)

- No SVHC substances (manufacturer's
declaration: content < 0.1 %)*

Quality level 1: –
Quality level 2: –
Quality level 3: fulfilled
Quality level 4: fulfilled

Special properties

Rhepanol® hfk synthetic membranes can be used as
the basis for green roofs and photovoltaic
systems/solar heating – usable roof areas (roof
terraces, rooftop gardens, urban farming, playgrounds
on the roof, etc.) are considered within the framework
of the DGNB criterion SOC1.6.

BNB (Version 2015)

(Bewertungssystem Nachhaltiges Bauen für Büro-
und Verwaltungsgebäude [Sustainable building
assessment system for office and administration
buildings])

Relevant requirements according to BNB criterion
1.1.6 "Risks for the local environment":

The assessment system only contains
requirements for roofing membranes made of PVC
and polymer bitumen. Products made of PIB are
not considered. Nevertheless, Rhepanol® hfk
meets the following requirement:

1. BNB_BN 1.1.6 Annex 1 (Overview table of all
quality requirements) row number 29:
Synthetic (PVC) building products

- No cadmium, lead or tin stabilisers (cadmium
content < 0.01 % according to REACH Annex
XVII no. 23 pursuant to footnote c)
- For soft PVC, the rule is: reprotoxic phthalate
plasticisers < 0.1 % (see Annex 2, E)

Quality level 1: fulfilled
Quality level 2: fulfilled
Quality level 3: fulfilled
Quality level 4: fulfilled
Quality level 5: fulfilled

2. BNB_BN 1.1.6 Annex 1, row number 44:
Bitumen products for sealing

- No use of root penetration inhibiting
ingredients such as Mecoprop

Quality level 1: fulfilled
Quality level 2: fulfilled
Quality level 3: fulfilled
Quality level 4: fulfilled
Quality level 5: fulfilled

Rhepanol® hfk contains no root penetration inhibiting
ingredients such as Mecoprop.

* SVHC = Substance of Very High Concern.

Qualitätssiegel Nachhaltiges Gebäude (QNG)

Within the framework of the Bundesförderung für effiziente Gebäude (BEG) [Federal Funding for Efficient Buildings] the state has subsidized sustainability aspects through a dedicated “NH Class” since 1 July 2021.

The proof required for the granting of the subsidy is provided by the award of the building-related QNG.

Relevant requirements according to the QNG criteria catalogue, Annex 313 dated 14 September 2023
“Avoidance of harmful substances in building materials”:

The QNG criteria catalogue sets out requirements solely for PVC roofing membranes. Products made from PIB are not covered. Rhepanol® hfk nevertheless meets the requirements:

1. Requirement: no intentionally added cadmium compounds > 0.01% (w/w)
and no tin or lead stabilisers > 0.1% (w/w);
Classification: fulfilled
2. Requirement for soft PVC applies:
no phthalate plasticisers that are toxic during production < 0.1 %
Classification: fulfilled
3. Requirement for biocides in root protection:
no addition of root-inhibiting active substances such as, for example, mecoprop
Classification: fulfilled

Special properties:

Rhepanol® hfk is resistant to roots and rhizomes without the use of root-inhibiting agents such as mecoprop or similar herbicides.



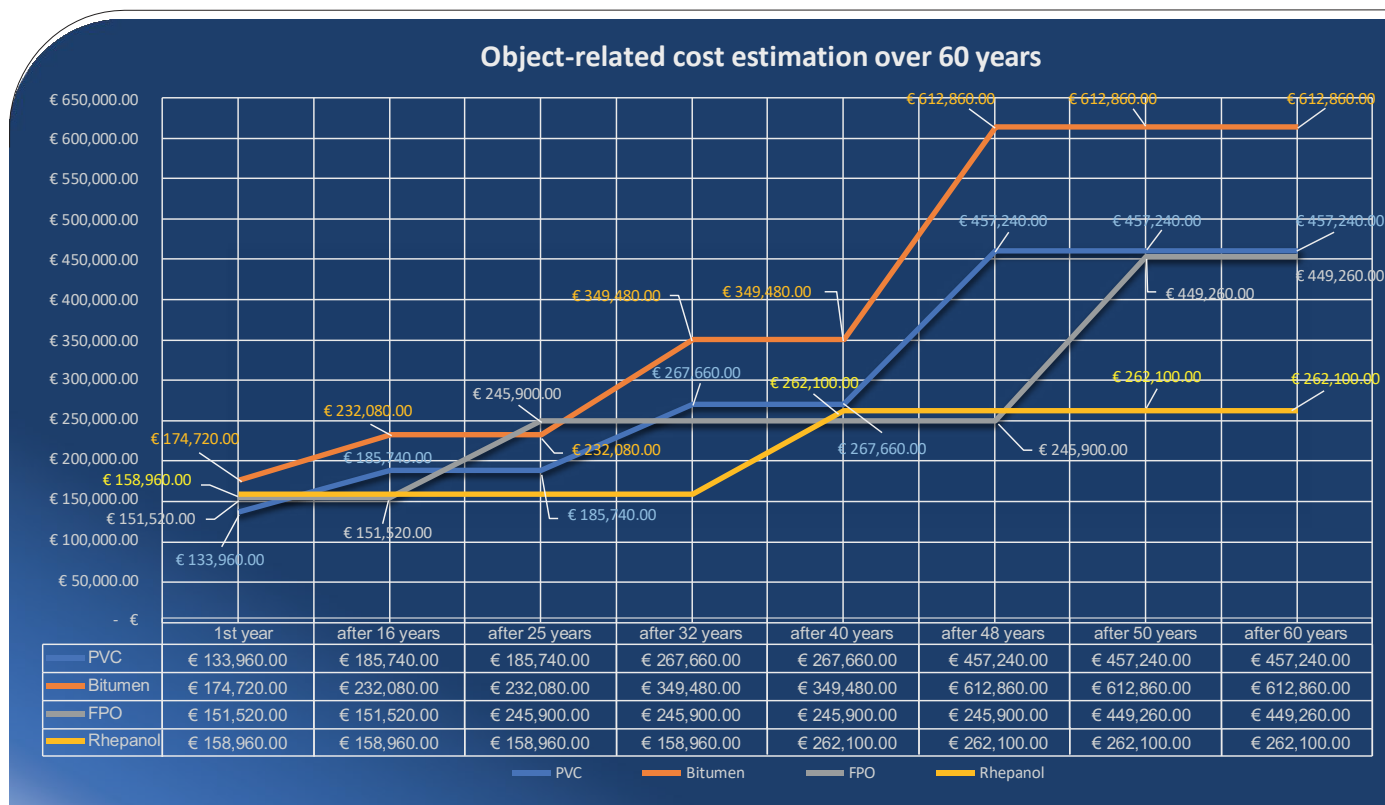
Durability of Rhepanol® roofing membranes

Our oldest existing project featuring our PIB roofing membranes is located in Eggenstein-Leopoldshafen and was installed in 1956. The PIB roofing membrane installed at the time is still performing its sealing function with flying colors today (more than 65 years later). As far as we are aware, the PIB synthetic membrane is the oldest synthetic roofing membrane reference in Europe.



Despite its long reference service life, a realistic average service life of approx. 40 years is assumed for the Rhepanol roofing membrane in the following cost comparison.

In the following graphic, for example, 4 sealing solutions (PVC, Bitumen, FPO and Rhepanol®) are considered over a time period of 60 years.



For information on the basis for calculation, see the next page.

Calculation basis

	PVC roofing membranes	Bitumen roofing membranes	FPO roofing membranes	Rhepanol® roofing membranes
First installation area 2,000 m² (Without connections)	- Concrete - Clean the substrate - Precoat with bitumen - Bitumen-DS V 60 S4 – AL - EPS 0,35, U-value 0.20, dm without slope - Raw glass fleece 120 g/m² - PVC 1.5 mm, mech. fastened	- Concrete - Clean the substrate - Precoat with bitumen - Bitumen-DS V 60 S4 – AL - EPS 0,35, U-value 0.20, dm without slope 1st layer KSK 2nd layer top layer	- Concrete - Clean the substrate - Precoat with bitumen - Bitumen-DS V 60 S4 – AL - EPS 0,35, U-value 0.20, dm without slope - Raw glass fleece 120 g/m² - FPO 1.5 mm, mech. fastened	- Concrete - Clean the substrate - Precoat with bitumen - Bitumen-DS V 60 S4 – AL - EPS 0,35, U-value 0.20, dm without slope - Raw glass fleece 120 g/m² - Rhepanol® hfk 1.5 mm, mech. fastened
	Costs per m² (material + installation)			
	€ 66.98/m²	€ 87.36/m²	€ 75.76/m²	€ 79.48/m²
	Cost estimation for first installation			
	€ 133,960.00	€ 174,720.00	€ 151,520.00	€ 158,960.00
1st renovation measure	after 16 years - No additional thermal insulation according to GEG (Building Energy Act) exception, therefore only a new fleece + 1 layer - Raw glass fleece + 1 layer - PVC 1.5 mm, mech. fastened - Upstands are not considered	after 16 years - No additional thermal insulation according to GEG (Building Energy Act) exception, therefore only a new sealing layer - Cleaning + pre-coat + top layer PYE - Upstands are not considered	after 25 years - Additional thermal insulation - EPS 035 loose, 60 mm, dm without slope - Raw glass fleece + 1 layer - FPO, 1.5 mm, mech. fastened - Upstands are not considered	Unnecessary
	Costs per m² (material + installation)			
	€ 25.89/m²	€ 28.68/m²	€ 47.19/m²	€ 0.00/m²
	Cost estimation for 1st renovation measure			
	€ 51,780.00	€ 57,360.00	€ 94,380.00	€ 0.00
2nd renovation measure	after 32 years - Additional thermal insulation - EPS 035 loose, 60 mm dm without slope - Raw glass fleece + 1 layer - PVC 1.5 mm, mech. fastened - Upstands are not considered	after 32 years - Clean the substrate - Additional thermal insulation - EPS 035, glued, 60 mm dm without slope, glued 1st layer KSK 2nd layer top layer - Upstands are not considered	Unnecessary	Unnecessary
	Costs per m² (material + installation)			
	€ 40.96/m²	€ 58.70/m²	€ 0.00/m²	€ 0.00/m²
	Cost estimation for 2st renovation measure			
	€ 81,920.00	€ 117,400.00	€ 0.00	€ 0.00
3rd renovation measure	after 48 years - Removal of 3 layers of roofing membrane - Removal of 2 layers of insulation 180 mm + 60 mm - Old vapour barrier is retained - Cleaning + preparation - Precoat with bitumen - Bitumen-DS V60 S4 + AL - New thermal insulation - EPS 035, U-value 0.20, dm without slope - Raw glass fleece 120 g/m² - PVC 1.5 mm, mech. fastened - Upstands are not considered	after 48 years - Removal of 5 layers of roofing membrane - Removal of 2 layers of insulation 180 mm + 60 mm - Old vapour barrier is retained - Cleaning + preparation - Precoat with bitumen - Bitumen-DS V60 S4 + AL - New thermal insulation - EPS 035, U-value 0.20 mm, dm without slope, glued 1st layer KSK 2nd layer top layer - Upstands are not considered	after 50 years - Removal of 2 layers of roofing membrane - Removal of 2 layers of insulation 180 mm + 60 mm - Old vapour barrier is retained - Cleaning + preparation - Precoat with bitumen - Bitumen-DS V60 S4 + AL - New thermal insulation - EPS 035, U-value 0.20, dm without slope - Raw glass fleece 120 g/m² - FPO 1.5 mm, mech. fastened - Upstands are not considered	after 40 years - Additional thermal insulation - EPS 035 loose, 60 mm, dm, without slope - Insulation, raw glass fleece + 1 layer - Rhepanol® hfk 1.5 mm, mech. fastened - Upstands are not considered
	Costs per m² (material + installation)			
	€ 94.79/m²	€ 131.69/m²	€ 101.68/m²	€ 51.57/m²
	Cost estimation for 3st renovation measure			
	€ 189,580.00	€ 263,380.00	€ 203,360.00	€ 103,140.00
Total costs after 60 years				
	€ 457,240.00	€ 612,860.00	€ 449,260.00	€ 262,100.00

Notes: The calculation shown is a practical example based on the illustrated reference and was drawn up to the best of our knowledge. Legal claims cannot be derived from it. The calculation considers the material and installation costs that would probably be incurred for the covering of a 2000 m² sample roof area over a period of 60 years. The product prices taken are based on the price level as of April 2022. The renovation measures 1 to 3 are also based on the price level as of April 2022. Price increases were not considered. The complete removal in the third renovation phase in variants 1 to 3 was preferred over a new layer by the roofing companies surveyed. Reason: after 48 years, shrinkage, old fastenings, bubbles, moisture, etc. could have damaged the lower layers. The prices taken were calculated by mid-size roofing companies. Junctions, scaffolding, site equipment etc. were not considered. The expenses/costs for these would have an additional disadvantage, especially in the case of variants 1 to 3.

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Summary

There are many factors that determine how long a roof will last before it needs renovation, e.g. roof construction, quality of materials and workmanship, location of the building, weather conditions, etc. One and the same product may have entirely different life expectancies in different installation situations. Therefore, we have selected times for the estimated renovation measures that correspond to our many years of experience. Even if the individual renovation measures were moved forward or back by a few years, or if the time frame were shortened to, say, 35 years, the option using Rhepanol® roofing membranes would still stand out as a particularly advantageous solution that conserves resources thanks to its extreme durability.

Further benefits

- Rhepanol hfk was one of the first synthetic roofing membranes to be awarded the prestigious “Blue Angel” eco-label
- Reducing resource consumption preserves our environment
- Lower lifecycle costs (e.g. maintenance costs, renovation costs, removal costs, disposal costs)
- Waste avoidance
- Simple removal possible without any problems when separated by type
- As a rule, lower construction and operating costs over periods under consideration of > 35 years

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