Environmental Product Declaration Type III (EPD) ITB number 611/2024

Salamander HDPE Geomembranes manufactured by Atus Group

ITB cooperates with other operators EPD programmes via ECO-PLATFORM, (http://www. eco-platform. org/) In order to coordinate efforts in support of industrial sectors while reducing verification efforts in different countries.

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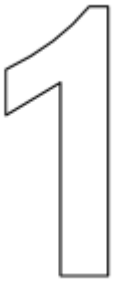
Basic Information



The declaration is a Type III Environmental Product Declaration (EPD) based on EN 15804 and verified in accordance with ISO 14025 by an independent auditor.

It contains information on the environmental impact of the declared building materials. Their aspects have been verified by an independent entity in accordance with ISO 14025. Basically, a comparison or evaluation of EPD data is only possible if all the comparable data have been created in accordance with EN 15804 (see clause 5.3 of the standard).

LCA analysis: A1 - A3, A4, C1 - C4 and D according to EN 15804 (from cradle to grave with options)
Year of development of the EPD: 2023
Declared product lifetime: 50 years
Product standard: PN-EN 13361:2006, PN-EN 13362:2005, PN-EN 13491:2006, PN-EN 13492:2006, PN-EN 13493:2005, PN-EN 15382:2013
PCR: ITB-PCR A (based on EN 15804)
Declared unit: 1 m^2 of product
Reason for implementation: B2B
Representativeness: Polish products, 2022

Manufacturer

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ATUS Group creates innovative solutions and technologies in the building materials industry. ATUS Group is the largest recycler of HDPE packaging in Poland, proving that products made from recycled raw material are just as strong as products made from virgin raw material.

ATUS Group is the largest recycler of HDPE packaging in Poland, producing ready-made solutions for the building industry. The company was founded in 2003 and has been growing ever since, improving the methods used so far, introducing innovative solutions and gaining the trust of more customers. ATUS Group adapts production methods to the needs of the consumer, customers and the environment. The company is committed to genuine transformation and the use of technologies that create social awareness and reduce waste and pollution. Made from recycled materials, ATUS Group products meet the requirements for specialised products in the building industry. A product made from recycled raw material is just as durable and trustworthy as one made from virgin raw material.

Product description and application

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The EPD Environmental Declaration prepared within the scope of this document covers Salamander HDPE geomembranes manufactured by ATUS Group Sp z o.o. Sp. k..

Salamander HDPE geomembranes

Salamander HDPE sealing geomembrane made from high density polyethylene (HDPE) is designed for use in the construction of:

- water reservoirs and dams,
- canals,
- tunnels,
- underground structures,
- liquid waste disposal sites,
- intermediate or secondary containment stations,
- intermediate storage facilities and solid waste disposal sites,
- sealing of transport infrastructures.

Geomembranes manufactured by ATUS Group show high resistance to chemicals, acids, salt and alkaline solutions. They are also resistant to UV radiation, corrosion, oxidation and decay. Resistance to a variety of mechanical and environmental factors guarantees the long-term durability of the geomembrane.

Thanks to the production of the geomembrane by CAST-type extrusion technology (pouring the melted plastic through the head onto the calenders), welding and seaming of the product is much easier. The wide roll size ensures quick installation and coverage of the sealed area.

In order to reduce the environmental impact, Salamander HDPE geomembranes are mostly made from recycled material and the entire production process follows circular economy principles.

Overview of properties of Salamander HDPE geomembranes:

HDPE geomembranes			0.75	1.00	1.50	2.00	2.50
Properties	Test method	Unit	Value				
Thickness	PN-EN 1849-2	mm	0.75 ±10%	1.00 ±10%	1.50 ±10%	2.00 ±10%	2.50 ±10%
Surface mass (average)	PN-EN 1849-2	g/cm^2	705 ±10%	940 ±10%	1410 ±10%	1880 ±10%	2350 ±10%
Longitudinal tensile strength	PN-EN ISO 527-1:3	N/mm^2 MPa	25 (-3)				
Tensile strength	PN-EN ISO 527-1:3	N/mm^2 MPa	25 (-3)				
CBR puncture resistance	PN-EN ISO 12236	kN	2.00 (-0.40)	2.40 (-0.40)	3.40 (-0.60)	4.90 (-0.60)	5.65 (-0.65)
Water permeability	PN-EN 14150	m^2 /(m^2 x d)	≤ 10^{-6}				
Gas permeability	ASTM D 1434	m^2 /(m^2 x d)	2.516 · 10^{-4}				
Resistance to oxidation	PN-EN 14575	-	Compliant				
Resistance to climate conditions	PN-EN 12224	-	Compliant				
Root penetration resistance	prCEN/TS 14416	-	Resistant				
Density	ASTM D 1505	g/cm^2	≥ 0.94				
MFR - melt flow rate (190°C, 5kg)	PN-EN ISO 1133	g/10 min	2 - 3				
Stress corrosion resistance	ASTM D 5397	h	≥ 336				
Soot content	PN-EN ISO 11358-1	%	2 - 3				

Life Cycle Assessment (LCA) - general principles

Declared unit

The declared unit is the production of 1 m^2 of HDPE geomembrane described in the section “Product description and application”.

Allocation

Allocation in this study was created in accordance with ITB PCR A guidelines. Production takes place at the Sadkowa Góra plant, for which input data have been inventoried. The results obtained are representative average for all Salamander HDPE geomembranes produced in different thicknesses at the Sadkowa Góra plant. The allocation of impacts is based on m^2 of product. All revenues from the extraction of raw materials used in production are allocated to module A1. Production of products is based on approximately 90% recycled materials and about 10% raw materials. Module A2 is the transport of raw materials to the production plant in Sadkowa Góra. The electrical energy, gas, fuel and waste consumption for the entire production process has been inventoried and included in module A3.

System Boundaries

The life cycle analysis of the declared products includes the modules A1 - A3, A4, C1-C4+D (“from cradle to grave with options”) according to EN 15804 and ITB PCR A.

System Limits

100% of the input materials and 100% of the electricity, gas and fuel consumption were inventoried at the Sadkowa Góra plant. The assessment takes into account all relevant parameters from the collected production data, i. e. all materials used for production, electricity, gas and fuels used during production and direct production waste. Packaging materials were inventoried: finished products are wound onto sleeves and wrapped in foil.

Modules A1 and A2 Extraction and transport of raw materials

Raw materials for production such as HDPE (High Density Polyethylene) from sorted and cleaned bottles, LDPE (Low Density Polyethylene) or additional components such as dye or antioxidants are transported from Poland and neighbouring countries (Slovakia, Hungary, Czech Republic). Module A1 presents the impact of production and extraction of raw materials further used in the production of geomembranes. Data on the transport of raw materials shall be recorded by the plant. Means of transport include trucks. European fuel averages have been used for the calculation of module A2.

Module A3 Production

The production process of geomembranes is illustrated in the diagrams on page 8. The production line starts with the collection of the material and its liquefaction, then goes through forming, passing the film through the warehouse, winding the roll, cutting and packaging the product. Direct waste from production is the scraps of the finished product resulting from trimming the edges of the sheet. Electricity is consumed in the production process. Internal transport includes forklifts powered by LPG gas.

Modules A4 Transport

Finished products are transported to customers in Poland and abroad The average transport distances are calculated in proportion to the quantity of transported products. Finished products are transported by trucks or ships. The rolls can be wrapped in foil and held in place with safety straps during

transport. Forklift trucks are used for loading. The largest order recipients are located in Poland and Europe. The fuel used is diesel. The average kilometres for the largest customers over the last 12 months are summarised below:

Transport of window and door systems		
Country	**Distance [km]**	**Type of transport**
Poland	234	lorry
Greece	1950	lorry
Romania	1078	lorry
Sweden	1108	ship
Slovakia	500	lorry
Lithuania	590	lorry
Germany	700	lorry
France	1730	lorry
Estonia	1240	lorry
Morocco	5000	ship
Algeria	5000	ship

Module C1 Deconstruction and Demolition

The deconstruction of geomembranes is assumed to be done in parallel with the demolition of the structure, and during such a process the impacts from the deconstruction of the geomembrane are negligibly small. No information is available for the HDPE sealing geomembrane regarding the impact of deconstruction in the construction sector or any other sector. Therefore, no contribution in terms of impact of this module is reported and the module is equal to 0.

Module C2 Transport

It is assumed that the end-of-life product will be transported by truck to the nearest waste treatment plant (truck, diesel) within 100 km.

Module C3 Waste treatment

No reuse, recovery or recycling of the geomembrane is intended therefore this module is equal to 0.

Module C4 Disposal

After the end of use 100% of the product would end up in landfill.

Module D Benefits and Loads Outside the System Boundaries

Module D presents the burdens and benefits of recycling. Benefits are assessed at the functional equivalence point, i.e. where substitution of primary raw material takes place. As geomembranes and their parts are not recyclable this modulus is equal to 0.

Period of data collection

The input data for the calculation of declared products shall cover the period from January to December 2022. The Life Cycle Assessment has been prepared for Poland as a reference area.

Data Quality

The data for the calculation of modules A1-A4 are derived from verified LCI inventory data from the plant. According to Annex E of PN-EN 15804 + A2 data quality assessment was carried out. For technical representativeness, processes with "very good" quality represent 99% of the values for climate change indicators. For geographical and temporal representativeness, the process rating was “very good”.

Assumptions and estimates

The impacts of representative products were aggregated using a weighted average. The results obtained for representative products can be related proportionally to all products within the scope of Salamander HDPE geomembranes.

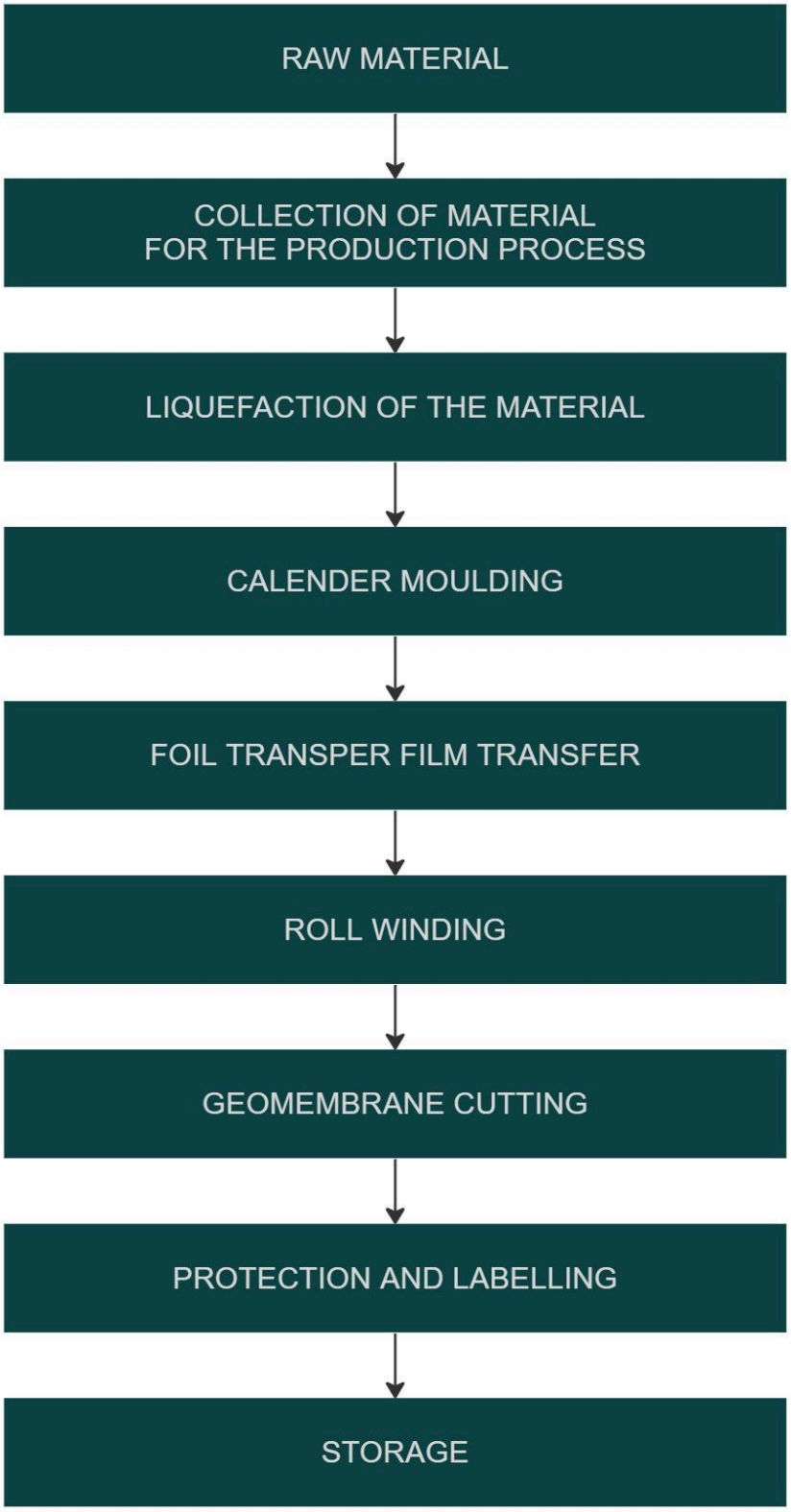
Calculation rules

LCA was made in accordance with PN-EN 15804+A2 standard and ITB PCR A (v1.6, 2023) document.

Databases

The calculation data comes from the Ecoinvent v. 3.6, Ecoinvent v. 3.8 and from the databases available in the Bionova OneClickLCA software. Characteristic factors are CML ver. 4.2 based on EN 15804+A2.

Production schedule for Salamander HDPE geomembranes manufactured by ATUS Group is presented below:



Life Cycle Assessment (LCA) - results

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Declared unit

The declared unit is 1 m^2 of Salamander HDPE geomembranes manufactured by ATUS Group Sp. z o.o. Sp. k..

The following indicates which LCA assessment modules were included in the assessment:

Information on system boundaries (MA = module assessed, MNA = module not assessed)																
Product stage			Construction stage		Use stage							End of life				Benefits and loads beyond the system boundaries
Raw material supply	Transport	Manufacturing	Transport to construction site	Construction and installation process	Use	Maintenance	Repair	Replacement	Refurbishmentt	Operational energy use	Operational water use	Deconstruction / demolition	Transport	Waste processing	Disposal	Potential for reuse, recovery or recycling
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
MA	MA	MA	MA	MNA	MNA	MNA	MNA	MNA	MNA	MNA	MNA	MA	MA	MA	MA	MA

Results for HDPE geomembranes

Environmental impacts

Indicator	Unit	A1	A2	A3	A1-A3	A4	C1	C2	C3	C4	D
Potential for creating a greenhouse effect - total	kg CO2 eq.	1.40E+00	4.18E-02	9.35E-01	2.38E+00	2.90E-01	0.00E+00	1.45E-02	0.00E+00	1.19E+00	0.00E+00
Potential for creating a greenhouse effect - resulting from the consumption of fossil fuels	kg CO2 eq.	1.24E+00	4.18E-02	9.36E-01	2.22E+00	2.90E-01	0.00E+00	1.45E-02	0.00E+00	1.19E+00	0.00E+00
Potential for creating a greenhouse effect - biogenic	kg CO2 eq.	1.63E-01	3.02E-05	-9.05E-04	1.62E-01	7.51E-05	0.00E+00	1.05E-05	0.00E+00	9.21E-06	0.00E+00
Potential for creating a greenhouse effect - land use and changes in land use	kg CO2 eq.	1.65E-03	1.25E-05	1.99E-04	1.86E-03	1.38E-04	0.00E+00	4.36E-06	0.00E+00	1.34E-04	0.00E+00
Ozone-depleting potential of the stratosphere	kg CFC 11 eq.	1.21E-07	1.21E-08	1.90E-08	1.52E-07	6.36E-08	0.00E+00	3.41E-09	0.00E+00	2.29E-09	0.00E+00
Acidification potential of soil and water	mol H+ eq.	6.76E-03	1.94E-04	8.93E-03	1.59E-02	4.95E-03	0.00E+00	6.08E-05	0.00E+00	4.21E-04	0.00E+00
Freshwater eutrophication potential	kg Pe	5.24E-05	3.36E-07	1.31E-04	1.84E-04	1.88E-06	0.00E+00	1.18E-07	0.00E+00	1.81E-07	0.00E+00
Eutrophication potential of marine waters	kg N eq.	1.44E-03	5.41E-05	1.03E-03	2.52E-03	1.25E-03	0.00E+00	1.83E-05	0.00E+00	2.03E-04	0.00E+00
Potential for terrestrial eutrophication	kg N eq.	1.41E-02	5.97E-04	1.14E-02	2.61E-02	1.39E-02	0.00E+00	2.03E-04	0.00E+00	2.08E-03	0.00E+00
Tropospheric ozone creation potential	kg NMVOC eq.	4.37E-03	1.95E-04	3.22E-03	7.79E-03	3.74E-03	0.00E+00	6.51E-05	0.00E+00	1.14E-03	0.00E+00
Abiotic depletion potential of non-fossil resources	kg Sb eq.	1.22E-05	6.81E-07	1.09E-06	1.39E-05	3.68E-06	0.00E+00	2.47E-07	0.00E+00	3.76E-08	0.00E+00
Abiotic depletion potential of fossil fuels	MJ	1.95E+01	7.82E-01	1.15E+01	3.17E+01	4.14E+00	0.00E+00	2.25E-01	0.00E+00	1.84E-01	0.00E+00
Water consumption	m^3	3.38E-01	2.56E-03	1.27E-01	4.69E-01	1.27E-02	0.00E+00	8.38E-04	0.00E+00	1.97E-02	0.00E+00

Environmental aspects of resource use

Indicator	Unit	A1	A2	A3	A1-A3	A4	C1	C2	C3	C4	D
Renewable. primary energy as an energy carrier	MJ	1.16E+00	8.18E-03	1.41E+00	2.58E+00	4.23E-02	0.00E+00	2.84E-03	0.00E+00	4.12E-03	0.00E+00
Renewable primary energy for material use	MJ	0.00E+00	0.00E+00	5.66E-02	5.66E-02	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Completely renewable primary energy	MJ	1.16E+00	8.18E-03	1.47E+00	2.64E+00	4.23E-02	0.00E+00	2.84E-03	0.00E+00	4.12E-03	0.00E+00
Non-renewable primary energy as a source of energy	MJ	1.56E+01	6.46E-01	1.09E+01	2.71E+01	4.14E+00	0.00E+00	2.25E-01	0.00E+00	1.84E-01	0.00E+00
Non-renewable primary energy for material use	MJ	4.79E+01	1.37E-01	4.67E+00	5.27E+01	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Completely non-renewable primary energy	MJ	6.35E+01	7.82E-01	1.55E+01	7.98E+01	4.14E+00	0.00E+00	2.25E-01	0.00E+00	1.84E-01	0.00E+00
Use of secondary raw materials	kg	1.55E+00	7.16E-06	1.03E-01	1.65E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.27E-04	0.00E+00
Renewable secondary fuels	MJ	3.87E-05	1.36E-07	1.98E-03	2.02E-03	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.73E-07	0.00E+00
Non-renewable secondary fuels	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Use of fresh water resources	m^3	6.86E-03	1.34E-04	3.23E-03	1.02E-02	6.71E-04	0.00E+00	4.69E-05	0.00E+00	5.87E-05	0.00E+00

Other environmental information describing waste categories

Indicator	Unit	A1	A2	A3	A1-A3	A4	C1	C2	C3	C4	D
Hazardous waste destined for landfill	kg	8.55E-02	6.42E-04	4.09E-02	1.27E-01	4.35E-03	0.00E+00	2.19E-04	0.00E+00	3.50E-03	0.00E+00
Recycled non-hazardous waste	kg	1.90E+00	6.70E-02	5.89E+00	7.86E+00	2.89E-01	0.00E+00	2.42E-02	0.00E+00	1.58E-01	0.00E+00
Radioactive waste disposed of	kg	5.08E-05	5.43E-06	6.00E-06	6.22E-05	2.87E-05	0.00E+00	1.55E-06	0.00E+00	1.04E-06	0.00E+00
Components to be reused	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Recyclable materials	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for energy recovery	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Exported electricity	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Verification

The verification process of this EPD is in accordance with ISO 14025 and ISO 21930. After verification, this EPD is valid for a period of 5 years. There is no need for recalculation after 5 years if the input data has not changed significantly.

EN 15804 serves as the basis for ITB PCR-A
Independent verification according to ISO 14025 (subsection 8.1.3.)
[ ] internal [X] external

External verification of EPD: Michał Piasecki, Professor ITB, m.piasecki@itb.pl
Input verification, LCI audit, LCA: Agnieszka Pikus, JW+A, a.pikus@jw-a.pl
LCA verification: Michał Piasecki, Professor ITB, m.piasecki@itb.pl

Note 1: The declaration owner has the sole ownership, liability, and responsibility for the information provided and contained in EPD. Declarations of construction products may not be comparable if they do not comply with EN 15804+A2. For further information about comparability, see EN 15804+A2 and ISO 14025.

Note 2: ITB is a public Research Organization and Notified Body (EC Reg. no 1488) to the European Commission and to other Member States of the European Union designated for the tasks concerning the assessment of building products' performance. ITB acts as the independent, third-party verification organization (ISO 17025/17065/17029). ITB-EPD program is recognized and registered member of The European Platform - Association of EPD program operators and ITB-EPD declarations are registered and stored in the international ECO-PORTAL.

Normative references

- ITB PCR A General Product Category Rules for Construction Products
- ISO 14025:2006 Environmental labels and declarations – Type III environmental declarations – Principles and procedures
- ISO 21930:2017 Sustainability in buildings and civil engineering works – Core rules for environmental product declarations of construction products and services
- ISO 14044:2006 Environmental management – Life cycle assessment – Requirements and guidelines
- EN 15804 +A2 Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products
- PN-EN 13361:2006 Geosynthetic barriers - Characteristics required for use in the construction of reservoirs and dams
- PN-EN 13362:2005 Geosynthetic barriers. Characteristics required for use in the construction of canals
- PN-EN 13491:2006 Geosynthetic barriers - Characteristics required for use as a fluid barrier in the construction of tunnels and underground structures
- PN-EN 13492:2006 Geosynthetic barriers - Characteristics required for use in the construction of liquid waste disposal sites, transfer stations or secondary containment
- PN-EN 13493:2005 Geosynthetic barriers - Characteristics required for use in the construction of solid waste storage and disposal sites
- PN-EN 15382:2013 Geosynthetic barriers - Characteristics required for use in transportation infrastructure

Signature Not Verified
Dokument podpisany przez Michał Piasecki ITB
Data: 2024.03.08 14:27:06 CET

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CERTIFICATE № 611/2024
of TYPE III ENVIRONMENTAL DECLARATION

Products:

Salamander HDPE Geomembranes
manufactured by Atus Group

Manufacturer:

ATUS Group Sp. z o.o. Sp. K.

Sadkowa Góra 12, 39-305 Borowa, Poland

confirms the correctness of the data included in the development of
Type III Environmental Declaration and accordance with the requirements of the standard

EN 15804+A2

Sustainability of construction works.
Environmental product declarations.
Core rules for the product category of construction products.

This certificate, issued on 7th March 2024 is valid for 5 years
or until amendment of mentioned Environmental Declaration

Head of the Thermal Physic, Acoustics
and Environment Department
Agnieszka Winkler-Skalna, PhD

INSTYTUT TECHNIKI BUDOWLANEJ

Deputy Director
for Research and Innovation
Krzysztof Kuczyński, PhD

Warsaw, March 2024