



Issuance date: 19.09.2024

Validity date: 19.09.2029

# Multilayer pipes for Tweetop PERT systems



**EPD Program Operator:**  
Building Research Institute (ITB)  
Address: Filtrowa 1  
00-611 Warsaw, Poland  
Website: [www.itb.pl](http://www.itb.pl)  
Contact: [energia@itb.pl](mailto:energia@itb.pl)

**Owner of the EPD:**  
Tweetop Sp. z o.o.  
Address: Ludowa 24 c  
71-700 Szczecin, Poland  
Website: [www.tweetop.pl](http://www.tweetop.pl)  
Contact: [biuro@tweetop.pl](mailto:biuro@tweetop.pl)

ITB is the verified member of The European Platform for EPD program operators and LCA practitioner [www.eco-platform.org](http://www.eco-platform.org)

## Basic information

This declaration is the Type III Environmental Product Declaration (EPD) based on EN 15804+A2 and verified according to ISO 14025 by an external auditor. It contains the information on the impacts of the declared construction materials on the environment and their aspects verified by the independent body according to ISO 14025. Basically, comparison or evaluation of EPD data is possible only if all the compared data were created according to EN 15804+A2.

**Life cycle analysis (LCA):** A1-A3, C1-C4 and D modules in accordance with EN 15804 (Cradle-to-Gate with options)

**The year of preparing the EPD:** 2024

**Product standards:** EN ISO 21003-1, 2, 3, 5, 7 ; EN ISO 22391-1, 2, 3, 5, 7

**Service Life:** 50 years

**PCR:** ITB-PCR A

**Functional unit:** 1 kg of multilayer pipes

**Reasons for performing LCA:** B2B

**Representativeness:** Poland, European

### MANUFACTURER

Tweetop Sp. z o.o. is a company with Polish capital and board. It operates on both Polish and European market, constantly increasing product offer and area of operation since 2001. The main product of the company is the Tweetop system, based on multilayer pipes and press fittings. Tweetop offers pipes and fittings in dimension range of 14 – 75 mm with all necessary tools and accessories dedicated to different application, from household to industrial ones. Apart from complete pipe system, Tweetop offers selection of heat pumps (air-water type): EcoHeat Pro and EcoHeat Complex.

Manufacture of multilayer PERT-AL-PERT pipes is carried out in Poland since 2007 with the use of cutting edge machinery and fully equipped laboratory. Production process is constantly under the supervision of experienced technical personnel. Tweetop Sp. z o.o. is one of the four companies in Poland that is manufacturing multilayer pipes with PERT-AL-PERT aluminium core.



*Fig. 1. Tweetop Sp. z o.o. manufacturing plant located in Szczecin, Poland.*

### PRODUCTS DESCRIPTION AND APPLICATION

Based on pipes made in special technology, along with a broad range of fitting elements and accessories which make every type of connection possible, Tweetop PERT is a complete installation solution.

Tweetop PERT system based on multilayer pipes joined by pressed connections is currently one of the most advanced and innovative solutions available on the market. This is determined by two factors - the construction of the pipes and the connection technology. Tweetop PERT pipes have a

## Type III Environmental Product Declaration No. 673/2024

multilayer structure - their core is made from an ultrasonically welded aluminium pipe. After adding two layers of the raised temperature polyethylene (PERT) material to the inside and outside of the aluminium pipe, we obtain a multilayer pipe capable of simultaneous work under the influence of pressure and temperature rated at 10 bar and 95°C. This unique combination of plastic material and the conventional aluminium insert allows Tweetop PERT pipes to keep the advantages of both, traditional and plastic pipes while eliminating their disadvantages.

Tweetop PERT system is ideal for both new investments and renovations of old installations in residential, public and historical buildings.

- **durability** - elastic material structure is very resistant to constant impacts of pressure and temperature, system components can operate for minimum 50 years
- **energy-saving** - due to low pressure losses and low thermal conductivity
- **hygienic** - PERT plastics are non-toxic, neutral in relation to water and can be recycled
- **versality** - Tweetop PERT system is recommended for use in following types of installation:
  - cold/hot utility water
  - central heating (radiator connections)
  - surface heating
  - compressed air
  - ice water
  - technological and industrial
- **flexibility with no shape remembrance** - multilayer pipes are more flexible than any other known pipes and can be bended without any supports. Bending radius is on the level of 4-5 x Dn
- **thermal stability** (0.025 mm/mK) - very low thermal expansion coefficient (0.025 mm/mK), is comparable with values characteristic for steel or copper pipes
- **resistance for oxygen diffusion** - both pipes and fittings are totally resistant for oxygen diffusion
- **total impermeability of connections**
- **possibility of making connection with any other pipe** by using threaded couplings
- **high chemical resistance**
- **low weight**

Tweetop PERT system pipes are manufactured of plastic raw material known as raised temperature polyethylene. The structure of this material is similar to balls of wool which are merged mutually with side threads, resulting in a structure that is very tangled but very strong and difficult to break. When it comes to pipes, this translates into high resistance to temperature and pressure, which is so important in plumbing and heating systems.

The foundation of Tweetop PERT system is based on multilayer pipes consisting of:

- ultrasonic-welded aluminium base pipe, with overlap
- inner and outer PERT layers
- adhesive integrating individual pipe layers

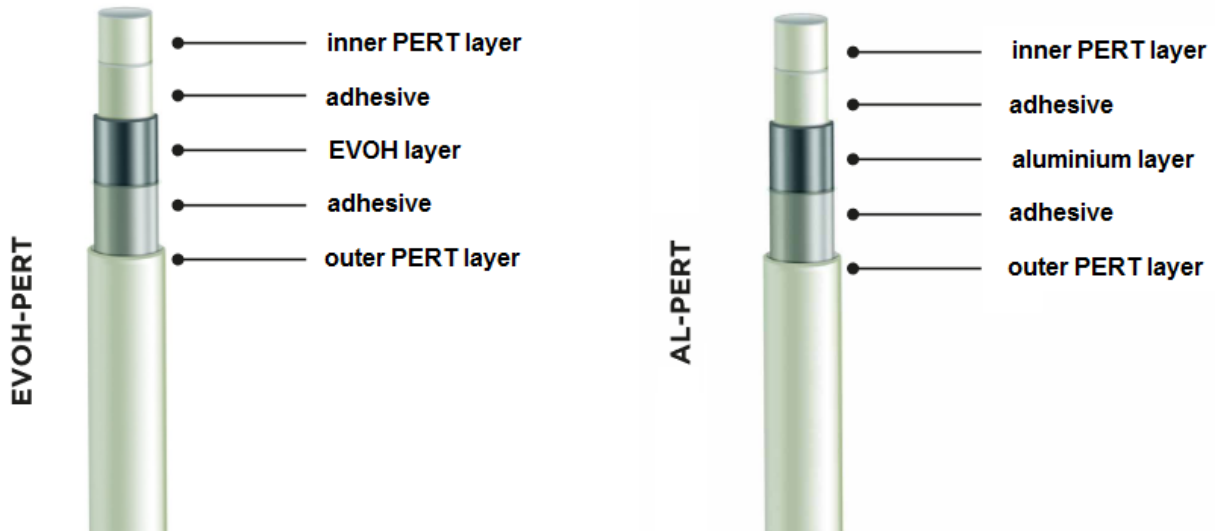


Fig. 2. Cross-section of Tweetop PERT multilayer pipe (left: EVOH-PERT ; right: AL-PERT)

Pressed connections are performed using a manual or electric pressing tools, equipped with U profile clamping jaws. Connections should be preceded by chamfering of pipe's inner surface using Tweetop bevelling tool.

More information can be found on the Tweetop Sp. z o.o. website : <https://www.tweetop.pl/>

## LIFE CYCLE ASSESSMENT (LCA) – general rules applied

### Allocation

The allocation rules used for this EPD are based on general ITB PCR A, v. 1.6. Production of multilayer pipes is a line process conducted in the manufacturing plant located in Szczecin (Poland). All impacts from raw materials extraction and processing are allocated in A1 module of EPD. Impacts from the TWEETOP production were inventoried on the annual production volume expressed in kg. Water and energy consumption, associated emissions and generated wastes are allocated to module A3. Energy supply was inventoried for whole multilayer PERT pipes production process. Packaging materials were taken into consideration.

### System limits

The life cycle analysis (LCA) of the declared products covers: product stage – modules A1-A3, end of life – modules C1-C4 and benefits and loads beyond the system boundary – module D (cradle-to-gate with options) in accordance with EN 15804 + A2 and ITB PCR A, v. 1.6. Energy and water consumption, emissions as well as information on generated wastes were inventoried and were included in the calculations. It can be assumed that the total sum of omitted processes does not exceed 5% of all impact categories. In accordance with EN 15804 + A2, machines and facilities (capital goods) required for the production as well as transportation of employees were not included in LCA.

# Type III Environmental Product Declaration No. 673/2024

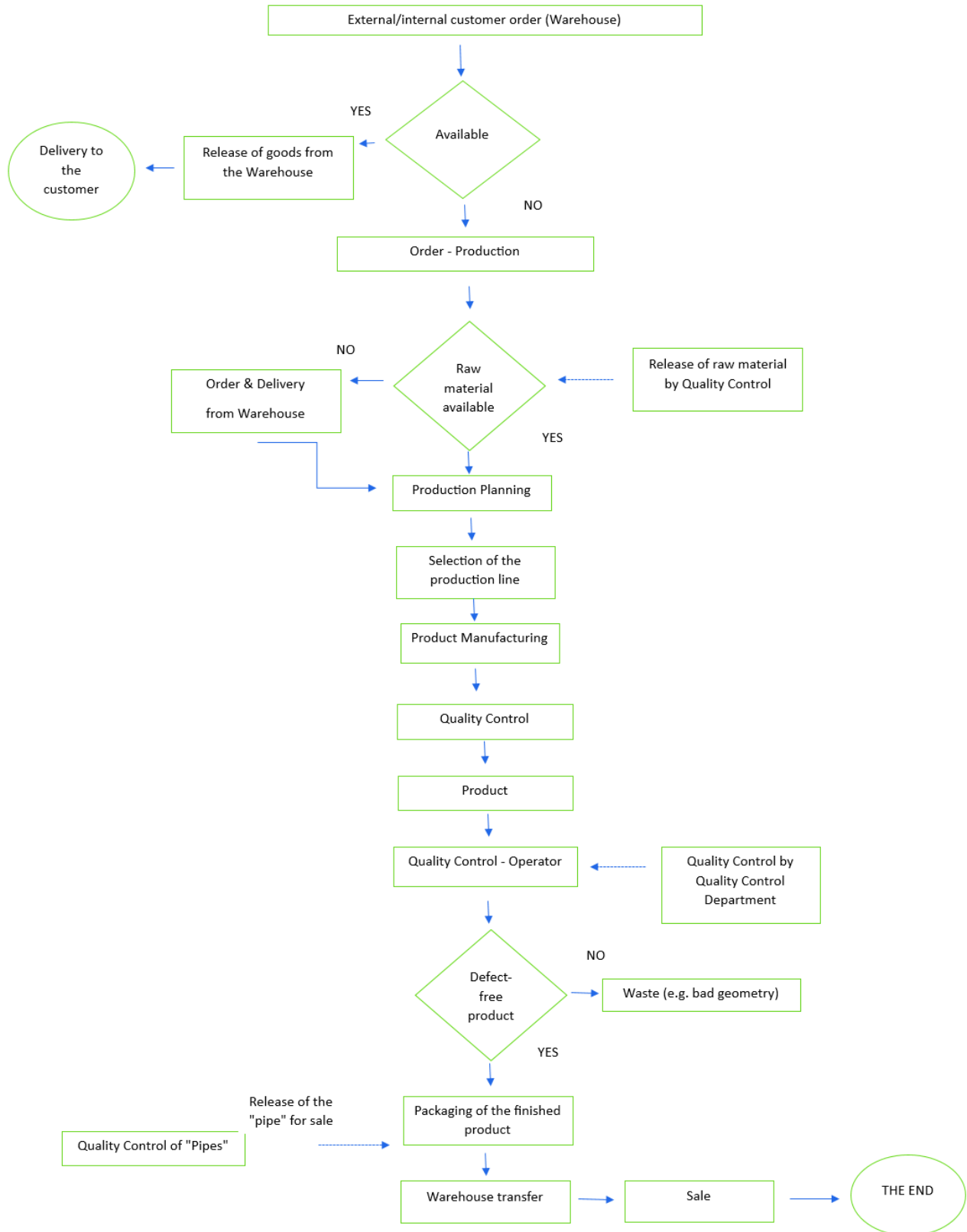


Fig. 3. A scheme of multilayer pipes production by Tweetop Sp. z o. o.

### Modules A1 and A2: Raw materials supply and transport

Raw materials such as polyethylene HDPE, aluminium sheet, adhesives or dyes are produced in Poland and others European plants of leading chemical manufacturers whereas other ancillary items come from both local and foreign suppliers. Data on transport of the different products to the manufacturing plants is collected and modelled for factory by assessor. Means of transport include big trucks (>16 t) are applied. Based on data provided by the manufacturer, all input of transport resources was inventoried in details. European standards for average combustion were used for calculations.

### Module A3: Production

The production is done by Tweetop Sp. z o. o. plant in Szczecin, Poland. A scheme of multilayer pipes production process is presented in Fig. 3. The facility is ISO 9001 and ISO 14001 certified.

### Modules C1-C4 and D: End-of-life (EoL)

It is assumed that at the end-of-life, 100% of multilayer pipes are demounted using manual cutting machine (module C1) and it is transported to waste processing plant distant by 100 km, on 16-32 t lorry (Euro 6) (module C2). Materials recovered from dismantled products are prepared to recycling (module C3) and landfilling (module C4) according to a realistic treatment practice for industrial waste what is presented in Table 1.

It is assumed that 95 % of aluminium undergo recycling after sorting and cutting while the remaining 5 % is forwarded to landfill as mixed construction and demolition wastes. In turn, 70 % of polyethylene is recovered while the 30 % remaining waste materials are forwarded to landfill in the form of mixed construction and demolition wastes. A potential credit resulting from the recycling of aluminium and preparing polyethylene to regranulate are presented in module D. Utilization of packaging material was not taken into consideration.

Table 1. End-of-life scenario for multilayer pipes manufactured by Tweetop Sp. z o. o.

Material	Waste processing (material recovery)	Landfilling
aluminium	95 %	5 %
polyethylene	70 %	30 %

### Data quality

The data selected for LCA analysis originates from ITB-LCI questionnaires completed by Tweetop Sp. z o. o. using the inventory data, ITB and Ecoinvent database v. 3.10 and KOBiZE. KOBiZE data is supplemented with Ecoinvent v. 3.10 data on the national electricity mix impact where no specific indicator data is provided. No specific data collected is older than five years and no generic datasets used are older than ten years. The representativeness, completeness, reliability, and consistency are judged as good.

## Type III Environmental Product Declaration No. 673/2024

### Data collection period

The data for manufacture of the declared products refers to period between 01.01.2023 – 31.12.2023 (1 year). The life cycle assessments were prepared for Poland and Europe as reference area.

### Assumptions and estimates

Impacts were inventoried and calculated for AL-PERT – multilayer pipes with aluminium insert and EVOH-PERT - multilayer pipes with plastic insert. The results are an average for all diameters of a given pipe type. For calculating averages and converting from annual production meters to kg, the mass of the representative diameter was used, in both cases, Tweetop DN 16 x 2.0. The results for 1 kg of multilayer pipes with aluminium are presented in Tables 3-6 and for 1 kg of multilayer pipes with EVOH in Tables 7-10.

### Calculation rules

LCA was performed using ITB-LCA tool developed in accordance with EN 15804 + A2.

### Databases

The data for the processes comes from Ecoinvent v. 3.10 and ITB-Database. Specific data quality analysis was a part of external audit. Polish electricity mix used (production) is 0.685 kg CO<sub>2</sub>/kWh (KOBiZE 2023).

## LIFE CYCLE ASSESSMENT (LCA) – Results

### Declared unit

The declaration refers to declared unit (DU) – 1 kg of multilayer pipes with aluminium and EVOH insert manufactured by TWEETOP Sp. z o. o.

*Table 2. System boundaries for the environmental characteristic of multilayer pipes with aluminium (AL-PERT) and EVOH (EVOH-PERT) insert manufactured by TWEETOP Sp. z o. o.*

Environmental assessment information (MD – Module Declared, MND – Module Not Declared, INA – Indicator Not Assessed)																
Product stage			Construction process		Use stage							End of life				Benefits and loads beyond the system boundary
Raw material supply	Transport	Manufacturing	Transport to construction site	Construction-installation process	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstruction demolition	Transport	Waste processing	Disposal	Reuse-recovery-recycling potential
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
MD	MD	MD	MND	MND	MND	MND	MND	MND	MND	MND	MND	MD	MD	MD	MD	MD

## Type III Environmental Product Declaration No. 673/2024

Table 3. LCA results for AL-PERT – multilayer pipes with aluminium insert – environmental impacts (DU: 1 kg)

Indicator	Unit	A1	A2	A3	A1-A3	C1	C2	C3	C4	D
Global Warming Potential	eq. kg CO <sub>2</sub>	5.03E+00	8.82E-02	6.02E-01	5.72E+00	7.77E-03	2.22E-02	1.84E-01	2.89E-02	-2.19E-01
Greenhouse gas potential - fossil	eq. kg CO <sub>2</sub>	5.10E+00	8.82E-02	5.98E-01	5.79E+00	7.72E-03	2.22E-02	1.78E-01	2.89E-02	-1.85E-01
Greenhouse gas potential - biogenic	eq. kg CO <sub>2</sub>	-9.00E-02	5.80E-05	3.81E-03	-8.61E-02	4.94E-05	1.46E-05	6.64E-03	2.12E-05	-3.35E-02
Global warming potential - land use and land use change	eq. kg CO <sub>2</sub>	2.21E-02	2.93E-05	2.05E-04	2.24E-02	2.72E-06	7.39E-06	6.33E-05	1.72E-06	-3.37E-04
Stratospheric ozone depletion potential	eq. kg CFC 11	2.22E-07	1.75E-09	1.18E-07	3.42E-07	1.49E-10	4.42E-10	1.74E-08	7.19E-11	-2.61E-09
Soil and water acidification potential	eq. mol H <sup>+</sup>	2.53E-02	1.84E-04	6.46E-03	3.20E-02	8.23E-05	4.63E-05	5.77E-04	1.99E-05	-8.91E-04
Eutrophication potential - freshwater	eq. kg P	1.57E-03	5.97E-06	9.82E-04	2.55E-03	1.41E-05	1.50E-06	1.41E-05	3.09E-07	-1.06E-04
Eutrophication potential - seawater	eq. kg N	4.48E-03	4.41E-05	9.11E-04	5.43E-03	1.17E-05	1.11E-05	2.59E-04	6.38E-05	-1.78E-04
Eutrophication potential - terrestrial	eq. mol N	4.61E-02	4.76E-04	7.97E-03	5.45E-02	1.00E-04	1.20E-04	2.24E-03	8.10E-05	-1.51E-03
Potential for photochemical ozone synthesis	eq. kg NMVOC	2.15E-02	3.05E-04	2.39E-03	2.42E-02	2.82E-05	7.69E-05	6.43E-04	3.48E-05	-4.95E-04
Potential for depletion of abiotic resources - non-fossil resources	eq. kg Sb	4.71E-05	2.93E-07	8.46E-07	4.82E-05	1.12E-08	7.39E-08	5.61E-07	6.42E-09	-2.97E-06
Abiotic depletion potential - fossil fuels	MJ	9.72E+01	1.24E+00	1.56E+01	1.14E+02	1.27E-01	3.13E-01	1.39E+00	6.21E-02	-2.79E+00
Water deprivation potential	eq. m <sup>3</sup>	1.10E+00	6.06E-03	1.88E-01	1.29E+00	2.58E-03	1.53E-03	1.71E-02	3.41E-04	-7.03E-02

Table 4. LCA results for AL-PERT – multilayer pipes with aluminium insert – additional impacts indicators (DU: 1 kg)

Indicator	Unit	A1	A2	A3	A1-A3	C1	C2	C3	C4	D
Particulate matter	disease incidence	INA	INA	INA	INA	INA	INA	INA	INA	INA
Potential human exposure efficiency relative to U235	eg. kBq U235	INA	INA	INA	INA	INA	INA	INA	INA	INA
Potential comparative toxic unit for ecosystems	CTUe	INA	INA	INA	INA	INA	INA	INA	INA	INA
Potential comparative toxic unit for humans (cancer effects)	CTUh	INA	INA	INA	INA	INA	INA	INA	INA	INA
Potential comparative toxic unit for humans (non-cancer effects)	CTUh	INA	INA	INA	INA	INA	INA	INA	INA	INA
Potential soil quality index	dimensionless	INA	INA	INA	INA	INA	INA	INA	INA	INA



## Type III Environmental Product Declaration No. 673/2024

Table 5. LCA results for AL-PERT – multilayer pipes with aluminium insert - the resource use (DU: 1 kg)

Indicator	Unit	A1	A2	A3	A1-A3	C1	C2	C3	C4	D
Consumption of renewable primary energy - excluding renewable primary energy sources used as raw materials	MJ	6.48E+00	2.13E-02	6.51E-01	7.16E+00	9.20E-03	5.36E-03	4.92E-02	9.66E-04	-6.36E-01
Consumption of renewable primary energy resources used as raw materials	MJ	1.47E+00	0.00E+00	0.00E+00	1.47E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total consumption of renewable primary energy resources	MJ	7.96E+00	2.13E-02	6.51E-01	8.63E+00	9.20E-03	5.36E-03	4.92E-02	9.66E-04	-6.36E-01
Consumption of non-renewable primary energy - excluding renewable primary energy sources used as raw materials	MJ	6.24E+01	1.24E+00	1.62E+01	7.98E+01	1.34E-01	3.13E-01	-2.23E+01	-9.33E+00	2.10E+01
Consumption of non-renewable primary energy resources used as raw materials	MJ	3.49E+01	0.00E+00	4.87E-01	3.53E+01	0.00E+00	0.00E+00	2.38E+01	9.39E+00	-2.38E+01
Total consumption of non-renewable primary energy resources	MJ	9.72E+01	1.24E+00	1.67E+01	1.15E+02	1.34E-01	3.13E-01	1.48E+00	6.21E-02	-2.79E+00
Consumption of secondary materials	kg	3.30E-02	5.75E-04	9.76E-04	3.45E-02	1.02E-05	1.45E-04	2.36E-03	2.25E-05	-5.93E-01
Consumption of renewable secondary fuels	MJ	3.46E-02	7.27E-06	5.76E-06	3.46E-02	5.60E-08	1.83E-06	2.29E-05	4.17E-07	-2.70E-05
Consumption of 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
Net consumption of freshwater resources	m <sup>3</sup>	3.95E-02	1.67E-04	2.63E-03	4.23E-02	4.12E-05	4.20E-05	2.45E-04	-9.08E-04	-2.11E-03

Table 6. LCA results for AL-PERT – multilayer pipes with aluminium insert – waste categories (DU: 1 kg)

Indicator	Unit	A1	A2	A3	A1-A3	C1	C2	C3	C4	D
Hazardous waste neutralized	kg	9.91E-02	1.81E-03	1.73E-04	1.01E-01	2.62E-08	4.56E-04	6.34E-03	1.24E-04	-1.26E-02
Non-hazardous waste neutralised	kg	1.86E+01	3.82E-02	5.70E-02	1.87E+01	7.49E-04	9.63E-03	1.92E-01	1.22E+00	-8.60E-01
Radioactive waste	kg	1.20E-04	4.00E-07	5.36E-05	1.74E-04	1.09E-07	1.01E-07	8.29E-06	1.60E-08	-1.54E-05
Components for re-use	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
Materials for recycling	kg	7.35E-04	9.42E-06	3.11E-03	3.85E-03	7.70E-07	2.37E-06	7.69E-01	1.05E-06	-2.30E-01
Materials for energy recovery	kg	3.91E-06	7.98E-08	7.81E-04	7.85E-04	1.08E-09	2.01E-08	2.38E-07	4.30E-09	-1.88E-07
Energy exported	MJ	5.58E-02	5.22E-04	2.72E-02	8.35E-02	3.68E-04	1.32E-04	6.85E-03	2.58E-05	-2.06E-02

## Type III Environmental Product Declaration No. 673/2024

Table 7. LCA results for multilayer pipes with EVOH insert – environmental impacts (DU: 1 kg)

Indicator	Unit	A1	A2	A3	A1-A3	C1	C2	C3	C4	D
Global Warming Potential	eq. kg CO <sub>2</sub>	2.34E+00	4.37E-01	6.02E-01	3.38E+00	7.77E-03	1.75E-02	9.72E-02	2.99E-02	-3.00E-01
Greenhouse gas potential - fossil	eq. kg CO <sub>2</sub>	2.44E+00	4.37E-01	5.98E-01	3.48E+00	7.72E-03	1.75E-02	9.72E-02	2.99E-02	-2.95E-01
Greenhouse gas potential - biogenic	eq. kg CO <sub>2</sub>	-1.13E-01	2.87E-04	3.81E-03	-1.09E-01	4.94E-05	1.15E-05	-3.24E-05	2.13E-05	-4.46E-03
Global warming potential - land use and land use change	eq. kg CO <sub>2</sub>	1.51E-02	1.45E-04	2.05E-04	1.55E-02	2.72E-06	5.82E-06	5.15E-05	1.60E-06	-4.09E-04
Stratospheric ozone depletion potential	eq. kg CFC 11	1.04E-07	8.68E-09	1.18E-07	2.31E-07	1.49E-10	3.48E-10	2.59E-10	7.22E-11	-3.45E-09
Soil and water acidification potential	eq. mol H <sup>+</sup>	8.32E-03	9.10E-04	6.46E-03	1.57E-02	8.23E-05	3.64E-05	1.53E-04	1.99E-05	-1.20E-03
Eutrophication potential - freshwater	eq. kg P	5.08E-04	2.96E-05	9.82E-04	1.52E-03	1.41E-05	1.18E-06	9.90E-06	2.98E-07	-1.57E-04
Eutrophication potential - seawater	eq. kg N	1.61E-03	2.18E-04	9.11E-04	2.74E-03	1.17E-05	8.75E-06	9.69E-05	6.61E-05	-2.59E-04
Eutrophication potential - terrestrial	eq. mol N	1.63E-02	2.36E-03	7.97E-03	2.66E-02	1.00E-04	9.44E-05	4.79E-04	8.11E-05	-2.63E-03
Potential for photochemical ozone synthesis	eq. kg NMVOC	1.26E-02	1.51E-03	2.39E-03	1.65E-02	2.82E-05	6.05E-05	1.44E-04	3.52E-05	-8.56E-04
Potential for depletion of abiotic resources - non-fossil resources	eq. kg Sb	2.25E-05	1.45E-06	8.46E-07	2.48E-05	1.12E-08	5.82E-08	3.48E-07	6.29E-09	-8.00E-07
Abiotic depletion potential - fossil fuels	MJ	7.05E+01	6.14E+00	1.56E+01	9.23E+01	1.27E-01	2.46E-01	2.95E-01	6.21E-02	-4.22E+00
Water deprivation potential	eq. m <sup>3</sup>	6.90E-01	3.00E-02	1.88E-01	9.08E-01	2.58E-03	1.20E-03	1.38E-02	2.95E-04	-1.69E-01

Table 8. LCA results for multilayer pipes with EVOH insert – additional impacts indicators (DU: 1 kg)

Indicator	Unit	A1	A2	A3	A1-A3	C1	C2	C3	C4	D
Particulate matter	disease incidence	INA	INA	INA	INA	INA	INA	INA	INA	INA
Potential human exposure efficiency relative to U235	eg. kBq U235	INA	INA	INA	INA	INA	INA	INA	INA	INA
Potential comparative toxic unit for ecosystems	CTUe	INA	INA	INA	INA	INA	INA	INA	INA	INA
Potential comparative toxic unit for humans (cancer effects)	CTUh	INA	INA	INA	INA	INA	INA	INA	INA	INA
Potential comparative toxic unit for humans (non-cancer effects)	CTUh	INA	INA	INA	INA	INA	INA	INA	INA	INA
Potential soil quality index	dimensionless	INA	INA	INA	INA	INA	INA	INA	INA	INA

## Type III Environmental Product Declaration No. 673/2024

Table 9. LCA results for multilayer pipes with EVOH insert - the resource use (DU: 1 kg)

Indicator	Unit	A1	A2	A3	A1-A3	C1	C2	C3	C4	D
Consumption of renewable primary energy - excluding renewable primary energy sources used as raw materials	MJ	3.04E+00	1.05E-01	6.51E-01	3.80E+00	9.20E-03	4.22E-03	3.87E-02	9.31E-04	-7.19E-01
Consumption of renewable primary energy resources used as raw materials	MJ	1.15E+00	0.00E+00	0.00E+00	1.15E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Total consumption of renewable primary energy resources	MJ	4.19E+00	1.05E-01	6.51E-01	4.95E+00	9.20E-03	4.22E-03	3.87E-02	9.31E-04	-7.19E-01
Consumption of non-renewable primary energy - excluding renewable primary energy sources used as raw materials	MJ	3.45E+01	6.14E+00	1.62E+01	5.68E+01	1.34E-01	2.46E-01	-2.44E+01	-9.71E+00	-4.22E+00
Consumption of non-renewable primary energy resources used as raw materials	MJ	3.60E+01	0.00E+00	4.87E-01	3.65E+01	0.00E+00	0.00E+00	2.47E+01	9.78E+00	0.00E+00
Total consumption of non-renewable primary energy resources	MJ	7.05E+01	6.14E+00	1.67E+01	9.34E+01	1.34E-01	2.46E-01	2.95E-01	6.22E-02	-4.22E+00
Consumption of secondary materials	kg	1.79E-02	2.85E-03	9.76E-04	2.18E-02	1.02E-05	1.14E-04	1.94E-03	2.25E-05	-6.60E-01
Consumption of renewable secondary fuels	MJ	3.46E-02	3.60E-05	5.76E-06	3.47E-02	5.60E-08	1.44E-06	1.57E-05	4.21E-07	-6.08E-05
Consumption of 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
Net consumption of freshwater resources	m <sup>3</sup>	1.79E-02	8.26E-04	2.63E-03	2.13E-02	4.12E-05	3.31E-05	2.09E-04	-9.23E-04	-5.40E-03

Table 10. LCA results for multilayer pipes with EVOH insert – waste categories (DU: 1 kg)

Indicator	Unit	A1	A2	A3	A1-A3	C1	C2	C3	C4	D
Hazardous waste neutralized	kg	1.01E-01	8.96E-03	1.73E-04	1.11E-01	2.62E-08	3.59E-04	6.15E-03	1.10E-04	-2.29E-01
Non-hazardous waste neutralised	kg	1.82E+01	1.89E-01	5.70E-02	1.85E+01	7.49E-04	7.58E-03	1.90E-01	1.24E+00	-6.88E-01
Radioactive waste	kg	5.00E-05	1.98E-06	5.36E-05	1.06E-04	1.09E-07	7.93E-08	6.48E-07	1.53E-08	-2.01E-05
Components for re-use	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
Materials for recycling	kg	7.58E-04	4.67E-05	3.11E-03	3.91E-03	7.70E-07	1.87E-06	5.27E-01	1.05E-06	-1.57E-04
Materials for energy recovery	kg	4.05E-06	3.96E-07	7.81E-04	7.86E-04	1.08E-09	1.58E-08	2.17E-07	4.29E-09	-3.16E-07
Energy exported	MJ	5.73E-02	2.59E-03	2.72E-02	8.71E-02	3.68E-04	1.04E-04	4.76E-04	1.31E-05	-1.43E-02

## Type III Environmental Product Declaration No. 673/2024

### Verification

The process of verification of this EPD is in accordance with ISO 14025 and ISO 21930. After verification, this EPD is valid for a 5-year-period. EPD does not have to be recalculated after 5 years, if the underlying data have not changed significantly.

The basis for LCA analysis was EN 15804 + A2 and ITB PCR A
Independent verification corresponding to ISO 14025 (subclause 8.1.3) <input checked="" type="checkbox"/> external <input type="checkbox"/> internal
External verification of EPD: Halina Prejzner, PhD Eng LCA, LCI audit and input data verification: Mateusz Kozicki, PhD Verification of LCA: Michał Piasecki, PhD. DSc. Eng

Note 1: The declaration owner has the sole ownership, liability and responsibility for the information provided and contained in EPD. Declarations within the same product category but from different programs may not be comparable. 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. Depending on the application, a corresponding conversion factor such as the specific weight per surface area must be taken into consideration.

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 (17065/17025 certified). 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 v. 1.6 General Product Category Rules for Construction Products
- ISO 21003-1:2008 Multilayer piping systems for hot and cold water installations inside buildings - Part 1: General
- ISO 21003-2:2008 Multilayer piping systems for hot and cold water installations inside buildings - Part 2: Pipes
- ISO 21003-3:2008 Multilayer piping systems for hot and cold water installations inside buildings - Part 3: Fittings
- ISO 21003-5:2008 Multilayer piping systems for hot and cold water installations inside buildings - Part 5: Fitness for purpose of the system
- ISO/TS 21003-7:2019 Multilayer piping systems for hot and cold water installations inside buildings - Part 7: Guidance for the assessment of conformity
- ISO 22391-1:2009 Plastics piping systems for hot and cold water installations — Polyethylene of raised temperature resistance (PE-RT) - Part 1: General
- ISO 22391-2:2009 Plastics piping systems for hot and cold water installations — Polyethylene of raised temperature resistance (PE-RT) - Part 2: Pipes
- ISO 22391-3:2009 Plastics piping systems for hot and cold water installations — Polyethylene of raised temperature resistance (PE-RT) - Part 3: Fittings
- ISO 22391-5:2009 Plastics piping systems for hot and cold water installations — Polyethylene of raised temperature resistance (PE-RT) - Part 5: Fitness for purpose of the system
- ISO/TS 22391-7:2018 Plastics piping systems for hot and cold water installations — Polyethylene of raised temperature resistance (PE-RT) - Part 7: Guidance for the assessment of conformity
- 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
- ISO 15686-1:2011 Buildings and constructed assets – Service life planning – Part 1: General principles and framework

## Type III Environmental Product Declaration No. 673/2024

- ISO 15686-8:2008 Buildings and constructed assets – Service life planning – Part 8: Reference service life and service-life estimation
- EN 15804:2012+A2:2019 Sustainability of construction works – Environmental product declarations – Core rules for the product category of construction products
- ISO 14067:2018 Greenhouse gases - Carbon footprint of products - Requirements and guidelines for quantification
- EN 15942:2012 Sustainability of construction works – Environmental product declarations – Communication format business-to-business
- KOBIZE Emissions (CO<sub>2</sub>, SO<sub>2</sub>, NO<sub>x</sub>, CO and total dust) from electricity, 2023

**LCA, LCI audit and input data verification**  
**Mateusz Kozicki, PhD**

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

*qualified electronic signature*

*qualified electronic signature*

  
**Instytut Techniki Budowlanej**



**Instytut Techniki Budowlanej**

00-611 Warsaw, Filtrowa 1

**Thermal Physics, Acoustics and Environment Department**

02-656 Warsaw, Ksawerów 21

# **CERTIFICATE No 673/2024 of TYPE III ENVIRONMENTAL DECLARATION**

Products:

**Multilayer pipes for Tweetop PERT systems**

Manufacturer:

**Tweetop Sp. z o.o.**

Ludowa 24c, 71-700 Szczecin, 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 19<sup>th</sup> September 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



Deputy Director  
for Research and Innovation

Krzysztof Kuczyński, PhD

Warsaw, September 2024