Environmental Product Declaration

In accordance with ISO 14025 and EN 15804 for:

PENEBAR™ SW-55
PENEBAR™ SW-45

from

PENETRON https://www.penetron.com

Programme:	The International EPD® System, www.environdec.com
Programme operator:	EPD International AB
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Programme information

Programme:	The International EPD® System EPD International AB Box 210 60 SE-100 31 Stockholm Sweden www.environdec.com info@environdec.com

Product category rules (PCR): *The International EPD System Product Category Rules and PCR Basic Module. Construction Products and Construction Services. Version 1.0. 2012 CPC:375 and Sub-PCR-G Concrete and concrete elements (EN16757-2017)*
Independent verification of the declaration and data, according to EN ISO 14025:2010: ☐ internal ☒ external
Third party verifier: *Angela Fisher, Aspire Sustainability* *In case of recognised individual verifiers:* Approved by: The International EPD® System
Procedure for follow-up of data during EPD validity involves third party verifier: ☐ Yes ☐ No

The EPD owner has the sole ownership, liability, and responsibility for the EPD. EPDs within the same product category but from different programmes may not be comparable. EPDs of construction products may not be comparable if they do not comply with EN 15804.

Company information

Owner of the EPD:
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Description of the organisation:
Founded in the late 1970s, PENETRON developed cementitious waterproofing products and additives to create an optimal crystalline technology. The know-how and experience gained over the past 40 years has enabled PENETRON to offer a broad range of concrete solutions, including crystalline waterproofing, water-stops and liquid sealers. The PENETRON system has been proven effective on countless major projects worldwide. The technical excellence of the products and a knowledgeable and dependable team of people have made the company the industry leader

Name and location of production site: The EPD refers to the production of PENEBAR™ SW-55 and PENEBAR™ SW-45 in the PENETRON® manufacturing site, placed in Allentown, Pennsylvania - USA.

Product information

Product name: PENETRON products:
PENEBAR™ SW-55 and
PENEBAR™ SW-45

Product identification: PENEBAR™ SW-55 and PENEBAR™ SW-45

Product description:
PENEBAR™ SW-55 is a bentonite infused butyl rubber waterstop developed to stop water penetration through cast-in-place concrete joints by expanding in a controlled fashion when exposed to water and making a positive seal inside and against the concrete. Its ability to expand and seal concrete joints allows it to replace the more passive tied in PVC waterstop systems and eliminate welding irons, split-forming and special shapes. PENEBAR™ SW-55 can be applied to non-moving, concrete construction joints for both horizontal and vertical applications. It can be used on new or existing concrete, irregular surfaces and through-wall or slab penetrations, such as pipes, utility lines, piling and steel members. Other typical applications that are ideal for PENEBAR™ SW-55 include underground structures, basements, precast panels, tunnels, manholes, lift pits, retaining walls, concrete pipes and storage tanks. PENEBAR™ SW-55 is provided in two packaging typologies: Type A, i.e. 30 meters of product per carton; Type B, i.e. 24 meters of product per carton. The information for the present environmental declaration regards 1kg of PENEBAR™ SW-55, considering that the density of PENEBAR™ SW-55 is equal to 0,712 kg/m..

PENEBAR™ SW-45 is a bentonite infused butyl rubber sealing compound designed to expand rapidly when exposed to moisture, making it a self-healing joint material for construction joint applications. PENEBAR™ SW-45 can be applied to building foundations, slabs, retaining walls, storage tanks and other similar non-moving cold construction joints. PENEBAR™ SW-45 is provided in two packaging typologies: Type A, i.e. 30 meters of product per carton; Type B, i.e. 24 meters of product per carton. The information for the present environmental declaration regards 1kg of PENEBAR™ SW-45, considering that the density of PENEBAR™ SW-45 is equal to 0,735 kg/m.).

PENEBAR™ products manufacturing process starts
with the raw material supply and transportation of all raw materials to manufacturing site. Raw materials are transferred to the mixers by forklift. Initially, butyl rubber is mixed in a kneader with all the CTS materials. Plastic waste from materials packaging is sent to Easton (PA) landfill via truck. The remaining materials are added to the first mix in a separate kneader and the paper waste from packaging is sent to Easton (PA) landfill via truck. The final mix is moved through a skip conveyor to the roll mill for the rolling process, and, lately, it is moved through a slitting conveyor and cut into strips. Then, the product is let naturally cured. Extrusion and rolling are then performed before proceeding with the manual packaging. Silicone-coated release paper is applied to the product. Then, Tthe final product is put into paper boxes, palletized on wooden pallet and stretched with stretch film. The pallets are finally moved to the stock through forklift. For the entire manufacturing processes, dust is collected through a suction Dust Collector and cooling is performed through a Cooling tower pump and a Cooling tower fan.
UN CPC code: 362
Geographical scope: USA

LCA information

Functional unit / declared unit: 1kg of PENEBAR™ products
Reference service life: Not Applicable
Time representativeness: Information on the production of PENEBAR™ products has been collected in October 2020-April 2021, based on average data related to the period January 2019 - December 2019. All generic data refer to the Ecoinvent v3.6 database, including updated datasets
Database and LCA software used: ecoinvent v.3.6 and SimaPro v9.1.
System diagram: A1-A3 Modules
Description of system boundaries: Cradle-to-gate. The declared modules are identified in Figure 1 (MND=Module Not Declared) and a flow diagram describing the system boundary is provided in Figure 2.
A1 Module includes the supply of raw materials reported in the “Content declaration” section.
A2 Module includes the transportation of each raw material to the manufacturing site.
A3 Module includes all the activities/processes taking place in the manufacturing site.
Excluded lifecycle stages: Modules B, C and D are not considered because the precise function of the product at the building level is unknown.
Allocation and Cut-off rules: According to the reference PCR, in Life Cycle Inventory, the minimum percentage of total mass and energy flows equal to 95% has been respected, considering the flows included in the modules A1-A3 of the system boundary. In particular, machines used in the production have been cut-off; indeed, machines represent, on average on both the products, the 0,1% of total renewable and non-renewable energy No allocations were made to the input or output data of PENEBAR™ products since PENEBAR™ does not report co-products nor reuse, recycling or recovery of flows during its internal manufacturing processes.
Assumptions and Estimates: In order to be more conservative, the amounts of Corrugated board box for bagging, pallets and packaging film for packaging have been referred to the highest values between the Type A and Type B packaging (the highest values are always referred to Type A packaging). Assumption that all raw materials are transported by truck (16-32 metric ton, euro5). Assumption that all manufacturing processes are modelled considering the energy consumption, the possible materials and transports involved, the possible waste produced. In particular, energy consumption per kg of product has been evaluated starting from the horse power of each equipment, the total time in operation to process one batch, the number of batches in 8 hour8-hour shift and the amount of PENEBAR™ produced in 8 hour shift. In case internal transports are performed by electrical machines (such as skip and slitting conveyors),

it is assumed that they are modelled in terms of consumed energy.
For lack of data and for evaluating the environmental impacts directly related to the products, environmental impacts from machines, infrastructure, construction, production equipment, and tools that are not directly consumed in the production process are not accounted for in the LCI. Release paper has been modelled considering its main materials, i.e., kraft paper and silicone.
Data collection: Specific data have been collected by PENETRON including the amount of materials, the energy consumption, the transport distances and typologies, the waste production, the emissions. Total annual production is referred to the 12-month-period from January 2019 to December 2019. The quantities related to the A1 stage refer to Table 1 and Table 2. Energy consumption of each process of each product are based on the motor ratings and the time each motor runs during the production of a batch of each material. Distances are precise data collected considering the distance covered by a truck from the starting site to the destination site, precisely from the suppliers to Allentown (for raw material supply), from Allentown to Easton (for waste treatment to landfill). The distances were collected by using google maps. For internal distances, distances typically driven by the forklift to transport materials inside the facility are used; in particular, the stocking racks are next to the wrapping station and the finished product is just turned and lifted into the racks using the forklift.. In the A3 stage, emissions are equal to 0.; indeed, the dry materials are loaded into the blending equipment which is all electric; after blending, the individual batches are put in bins and cured for 24 hours, then run through the extruder to provide the correct profile; it is then rolled and packaged and put into stock. The entire process uses electricity and does not produce any emissions. For the trade secret materials, the emissions are monitored and have been included in the model. The waste is determined by calculating how much raw material packaging is discarded during the production of a batch. The weight of the empty packaging after loading the raw materials was determined by weighing the empty packaging and then the amount per ton was calculated based on the amount of empty packaging that would be disposed of to produce 1 ton of finished product. Generic data have been used for the sub-materials and sub-processes where specific data were not available, i.e. background materials/processes. Sources of generic data are Ecoinvent v3.6 (data from allocation, cut-off by classification) and literature data.

More information:
https://www.penetron.com/products/PENEBAR-SW-55 and
https://www.penetron.com/products/PENEBAR-SW-45-RAPID
Name and contact information of LCA practitioner: Maria Chiara Caruso, Stress S.c.ar.l. email: mariachiara.caruso@stress-scarl.it

Life cycle stage	PRODUCTION			CONSTRUCTION		USE							END OF LIFE				BENEFITS
Modules	*A1*	*A2*	*A3*	*A4*	*A5*	*B1*	*B2*	*B3*	*B4*	*B5*	*B6*	*B7*	*C1*	*C2*	*C3*	*C4*	*D*
	Raw material supply	Transport	Manufacturing	Transport	Construction	Use	Maintenance	Repair	Replace	Refurbishment	Operation energy use	Operational water use	Demolition	Transport	Waste processing	Disposal	Reuse/ Recovery/ recycling potential
Cradle to gate	X	X	X	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND

Figure 1: Flow diagram of the LCA study of PENEBAR™ products according to EN 15804

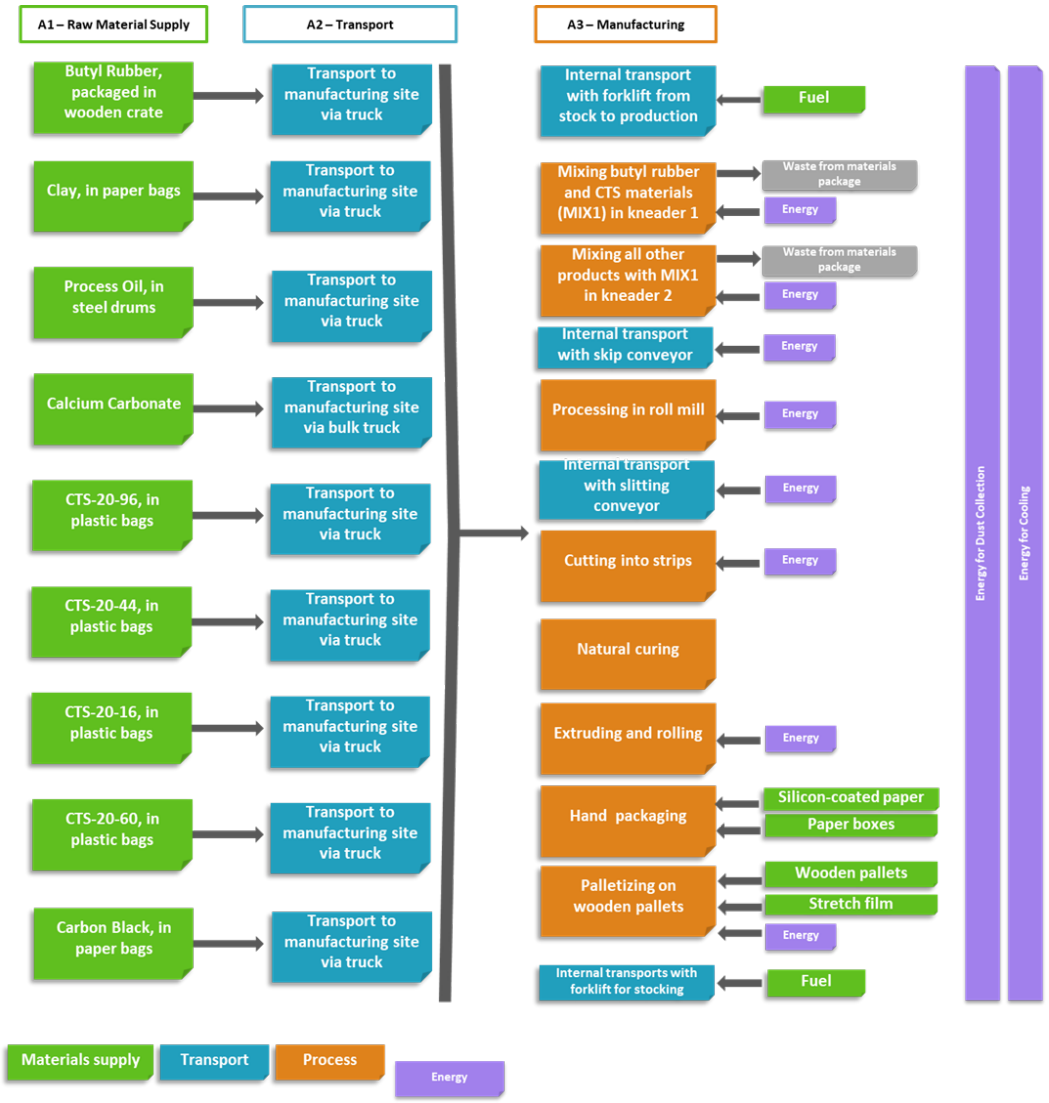

Figure 2: Flow diagram describing the PENEBAR™ products system boundary

Content declaration

Product

PENEBAR™ SW-55

Materials / chemical substances	[Unit]	%	Environmental / hazardous properties
Butyl Rubber	kg	15	No environmental or hazardous properties for all the product materials are present
Clay	kg	50	
Process Oil	kg	10	
Calcium Carbonate	kg	21,3	
CTS-20-96	kg	0,2	
CTS-20-44	kg	0,7	
CTS-20-16	kg	0,2	
CTS-20-60	kg	1	
Carbon Black	kg	1,6	

PENEBAR™ SW-45

Materials / chemical substances	[Unit]	%	Environmental / hazardous properties
Butyl Rubber	kg	15	No environmental or hazardous properties for all the product materials are present
Clay	kg	60	
Process Oil	kg	10	
Calcium Carbonate	kg	11,3	
CTS-20-96	kg	0,2	
CTS-20-44	kg	0,7	
CTS-20-16	kg	0,2	
CTS-20-60	kg	1	
Carbon Black	kg	1,6	

The list of PENEBAR™ SW-55 and PENEBAR™ SW-45 components does not include products included in the “Candidate List of Substances of Very High Concern for Authorizations” by European Chemicals Agency (ECHA).

Recycled material

Provenience of recycled materials (pre-consumer or post-consumer) in the product: All PENEBAR™ products components are virgin raw materials. No recycled materials are used.

Environmental performance

1kg of PENEBAR™ SW-55

Potential environmental impact

PARAMETER		UNIT	A1	A2	A3	TOTAL A1-A3
Global warming potential (GWP)	Fossil	kg CO_2 eq.	1,14E+00	2,64E-01	2,20E-01	1,62E+00
	Biogenic	kg CO_2 eq.	4,97E-03	9,11E-05	6,09E-02	6,59E-02
	Land use and land transformation	kg CO_2 eq.	2,73E-02	9,64E-05	4,59E-04	2,79E-02
	TOTAL	kg CO_2 eq.	1,17E+00	2,64E-01	2,81E-01	1,72E+00
Depletion potential of the stratospheric ozone layer (ODP)		kg CFC 11 eq.	1,82E-07	4,56E-08	1,73E-08	2,45E-07
Acidification potential (AP)		kg SO_2 eq.	4,89E-03	6,72E-04	7,39E-04	6,30E-03
Eutrophication potential (EP)		kg PO_4^{3-} eq.	1,82E-03	1,47E-04	7,71E-04	2,74E-03
Formation potential of tropospheric ozone (POCP)		kg NMVOC	6,11E-03	6,50E-04	5,06E-04	7,27E-03
Abiotic depletion potential – Elements		kg Sb eq.	1,80E-04	7,07E-06	1,19E-06	1,88E-04
Abiotic depletion potential – Fossil resources		MJ, net calorific value	2,37E+01	3,85E+00	2,49E+00	3,01E+01
Water scarcity potential		m^3 eq.	4,26E-01	1,32E-02	5,29E-02	4,92E-01

Use of resources

PARAMETER		UNIT	A1	A2	A3	TOTAL A1-A3
Primary energy resources – Renewable	Use as energy carrier	MJ, net calorific value	1,24E+00	4,41E-02	1,29E+00	2,57E+00
	Used as raw materials	MJ, net calorific value	0,00E+00	0,00E+00	0,00E+00	0,00E+00
	TOTAL	MJ, net calorific value	1,24E+00	4,41E-02	1,29E+00	2,57E+00
Primary energy resources – Non-renewable	Use as energy carrier	MJ, net calorific value	2,64E+01	4,14E+00	3,60E+00	3,41E+01
	Used as raw materials	MJ, net calorific value	0,00E+00	0,00E+00	0,00E+00	0,00E+00
	TOTAL	MJ, net calorific value	2,64E+01	4,14E+00	3,60E+00	3,41E+01
Secondary material		kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Renewable secondary fuels		MJ, net calorific value	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Non-renewable secondary fuels		MJ, net calorific value	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Net use of fresh water		m^3	1,13E-02	4,36E-04	1,65E-03	1,34E-02

Waste production and output flows

Waste production

PARAMETER	UNIT	A1	A2	A3	TOTAL A1-A3
Hazardous waste disposed	kg	2,57E-05	1,03E-05	1,44E-06	3,74E-05
Non-hazardous waste disposed	kg	1,38E-01	1,87E-01	2,21E-02	3,48E-01
Radioactive waste disposed	kg	1,01E-04	2,56E-05	1,47E-05	1,42E-04

Output flows

PARAMETER	UNIT	A1	A2	A3	TOTAL A1-A3
Components for reuse	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Material for recycling	kg	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
Exported energy, electricity	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Exported energy, thermal	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00

Other environmental indicators

During the silo filling process, Noise corresponding to around 70 dB is measured.

1 kg of PENEBAR™ SW-45

Potential environmental impact

PARAMETER		UNIT	A1	A2	A3	TOTAL A1-A3
Global warming potential (GWP)	Fossil	kg CO_2 eq.	9,71E-01	3,08E-01	2,18E-01	1,50E+00
	Biogenic	kg CO_2 eq.	3,71E-03	1,06E-04	6,08E-02	6,46E-02
	Land use and land transformation	kg CO_2 eq.	2,72E-02	1,13E-04	4,49E-04	2,78E-02
	TOTAL	kg CO_2 eq.	1,00E+00	3,08E-01	2,79E-01	1,59E+00
Depletion potential of the stratospheric ozone layer (ODP)		kg CFC 11 eq.	1,75E-07	5,32E-08	1,72E-08	2,45E-07
Acidification potential (AP)		kg SO_2 eq.	4,47E-03	7,84E-04	7,32E-04	5,98E-03
Eutrophication potential (EP)		kg PO_4^{3-} eq.	1,67E-03	1,72E-04	7,68E-04	2,61E-03
Formation potential of tropospheric ozone (POCP)		kg NMVOC	5,83E-03	7,59E-04	4,99E-04	7,08E-03
Abiotic depletion potential – Elements		kg Sb eq.	1,77E-04	8,25E-06	1,17E-06	1,87E-04
Abiotic depletion potential – Fossil resources		MJ, net calorific value	2,25E+01	4,49E+00	2,47E+00	2,95E+01
Water scarcity potential		m^3 eq.	4,03E-01	1,54E-02	5,25E-02	4,71E-01

Use of resources

PARAMETER		UNIT	A1	A2	A3	TOTAL A1-A3
Primary energy resources – Renewable	Use as energy carrier	MJ, net calorific value	1,12E+00	5,15E-02	1,26E+00	2,43E+00
	Used as raw materials	MJ, net calorific value	0,00E+00	0,00E+00	0,00E+00	0,00E+00
	TOTAL	MJ, net calorific value	1,12E+00	5,15E-02	1,26E+00	2,43E+00
Primary energy resources – Non-renewable	Use as energy carrier	MJ, net calorific value	2,50E+01	4,83E+00	3,58E+00	3,34E+01
	Used as raw materials	MJ, net calorific value	0,00E+00	0,00E+00	0,00E+00	0,00E+00
	TOTAL	MJ, net calorific value	2,50E+01	4,83E+00	3,58E+00	3,34E+01
Secondary material		kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Renewable secondary fuels		MJ, net calorific value	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Non-renewable secondary fuels		MJ, net calorific value	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Net use of fresh water		m^3	1,06E-02	5,08E-04	1,64E-03	1,28E-02

Waste production and output flows

Waste production

PARAMETER	UNIT	A1	A2	A3	TOTAL A1-A3
Hazardous waste disposed	kg	2,43E-05	1,20E-05	1,41E-06	3,77E-05
Non-hazardous waste disposed	kg	1,27E-01	2,19E-01	2,17E-02	3,68E-01
Radioactive waste disposed	kg	9,75E-05	2,98E-05	1,47E-05	1,42E-04

Output flows

PARAMETER	UNIT	A1	A2	A3	TOTAL A1-A3
Components for reuse	kg	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Material for recycling	kg	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
Exported energy, electricity	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00
Exported energy, thermal	MJ	0,00E+00	0,00E+00	0,00E+00	0,00E+00

Other environmental indicators

During the silo filling process, Noise corresponding to around 70 dB is measured.

References

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