

ENVIRONMENTAL PRODUCT DECLARATION

IN ACCORDANCE WITH ISO 14025 AND ISO 21930:2017, OPT. EN 15804+A2

SmartEPD-2024-030-0156-01

GD 677 NA



 H.B. Fuller |  KÖMMERLING



Date of Issue:
Aug 14, 2024

Expiration:
Aug 14, 2029

Last updated:
Aug 14, 2024

General Information	3
Reference Standards	3
Verification Information	3
Limitations, Liability, and Ownership	4
Organization Information	4
Product Information	5
Plants	5
Product Specifications	5
Material Composition	5
Software and LCI Data Sources	6
EPD Data Specificity	6
Renewable Electricity	6
System Boundary	7
Product Flow Diagram	8
Life Cycle Module Descriptions	8
LCA Discussion	8
Results	10
Environmental Impact Assessment	10
Resource Use Indicators	11
Waste and output Flow Indicators	11
Carbon Emissions and Removals	12
Scenarios	13
End of Life (C1 - C4)	13
Interpretation	13
Additional Environmental Information	13
Further Information	14



References 15



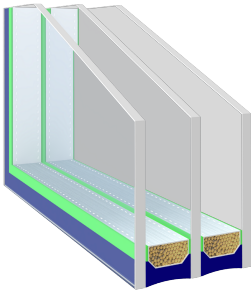
General Information

H.B. Fuller Company

1200 Willow Lake Blvd, St Paul, MN 55110, USA

+1 651-236-5900

sustainability@hbfuller.com hbfuller.com



Product Name:	GD 677 NA
Declared Unit:	1 linear meter
Declaration Number:	SmartEPD-2024-030-0156-01
Date of Issue:	August 14, 2024
Expiration:	August 14, 2029
Last updated:	August 14, 2024
EPD Scope:	Cradle to gate with other options A1 - A3, C1 - C4, D
Market(s) of Applicability:	

Reference Standards

Standard(s):	ISO 14025 and ISO 21930:2017, opt. EN 15804+A2
Core PCR:	Smart EPD® Part A Product Category Rules for Building and Construction Products and Services v.1.01 Date of issue: January 15, 2024 Valid until: January 15, 2029
Sub-category PCR review panel:	Contact Smart EPD for more information.
General Program Instructions:	Smart EPD General Program Instructions v.1.0, November 2022

Verification Information

ACLCA PCR Guidance Version:	1.0
ACLCA PCR Conformance Level:	Transparency
LCA Author/Creator:	Juan David Villegas juan@parqhq.com
EPD Program Operator:	Smart EPD info@smartepd.com www.smartepd.com 585 Grove St., Ste. 145 PMB 966, Herndon, VA 20170, USA

Verification:

Independent critical review of the LCA and data, according to ISO 14044 and ISO 14071 :

External

🌐 Lucas Pedro Berman | 🏢 Senda - Consultoria Ambiental & Energetica
✉ info@sendaconsultorias.com

Independent external verification of EPD, according to ISO 14025 and reference PCR(s) :

External

🌐 Lucas Pedro Berman | 🏢 Senda - Consultoria Ambiental & Energetica
✉ info@sendaconsultorias.com

Limitations, Liability, and Ownership

Environmental declarations from different programs, even if well in accordance with ISO 14025, may not be comparable. Comparison of the environmental performance of products using EPD information shall be based on the product's use and impacts at the building level, and therefore EPDs may not be used for comparability purposes when not considering the whole building life cycle. EPD comparability is only possible when all stages of a life cycle have been considered. However, variations and deviations are possible. Example of variations: Different LCA software and background LCI datasets may lead to differences results for upstream or downstream of the life cycle stages declared. The EPD owner has sole ownership, liability, and responsibility for the EPD.

Organization Information

At H.B Fuller | Kömmerling (H.B. Fuller) sustainability is a core pillar of the business growth strategy aiming to generate value for all the stakeholders through innovation and high-performance solutions combined with a reduced environmental footprint and operational excellence. The company actively optimizes its processes to reduce resource usage, and engage employees to be knowledgeable about and accountable for reaching sustainability targets. H.B. Fuller monitors its environmental footprint and continuously innovates for improved sustainability in their products and manufacturing practices. H.B. Fuller also collaborates with customers to create adhesive solutions that allow them to meet their sustainability goals. H.B. Fuller adhesives help customers save energy, reduce waste, and enable recycling and reuse.

Further information can be found at: <https://www.hbfuller.com/en/brands/kommerling>

Product Description

Kömmerling GD677NA is a reactive chemistry product known for its superior heat and weathering resistance. It exhibits excellent adhesion to glass and spacer materials. This product meets the ASTM E2190 and CGSB 12 8 standards. Its primary use is as a polyurethane secondary sealant for insulating glass in windows. The declared unit is 1 linear meter of GD 677 NA applied with a sealing depth of 3 mm and air space of 12 mm. These dimensions were used as a typical value for reference. To obtain the environmental impacts for the same product, applied with different nozzles and widths, please refer to the table "Further Information" at the end of the document and multiply the results by the corresponding multiplication factor, as indicated.

Further information can be found at: <https://www.hbfullerproducts.com/products/kommerling-gd677na>

Product Information

Declared Unit:	1 linear meter
Mass:	0.0437 kg
Product Specificity:	☒ Product Average
	☒ Product Specific

Plants



Pirmasens
Kömmerring Chemische Fabrik GmbH, Zweibrücker Straße, Pirmasens, Germany

Product Specifications

Product SKU(s):	GD 677 NA Part A and Part B as shipped (including packaging)
Product Classification Codes:	EC3 - Openings -> Glazing -> FenestrationParts -> FenestrationAccessories

Material Composition

Material/Component Category	Origin	% Mass
Polybutadiene	GLO	8-12
In process recycled content	GLO	6-10
Filler	GLO	64-68
Diluents, emulsifiers	GLO	13-19
Other	GLO	0-2

Packaging Material	Origin	kg Mass
Steel	RER	0.00243
Wood (Pallet)	RER	0.00266

Biogenic Carbon Content	kg C per linear meter
Biogenic carbon content in product	None
Biogenic carbon content in accompanying packaging	0.00118

Hazardous Materials
Diphenylmethanediisocyanate, polymeric (CAS 9016-87-9)
4,4'-methylenediphenyl diisocyanate (CAS 101-68-8)

EPD Data Specificity

Primary Data Year:	FY 2023
Manufacturing Specificity:	✗ Industry Average ✗ Manufacturer Average ✓ Facility Specific

Software and LCI Data Sources

LCA Software:	 SimaPro v. 9.5
LCI Foreground Database(s):	 Ecoinvent v. 3.9.1
LCI Background Database(s):	 Ecoinvent v. 3.9.1

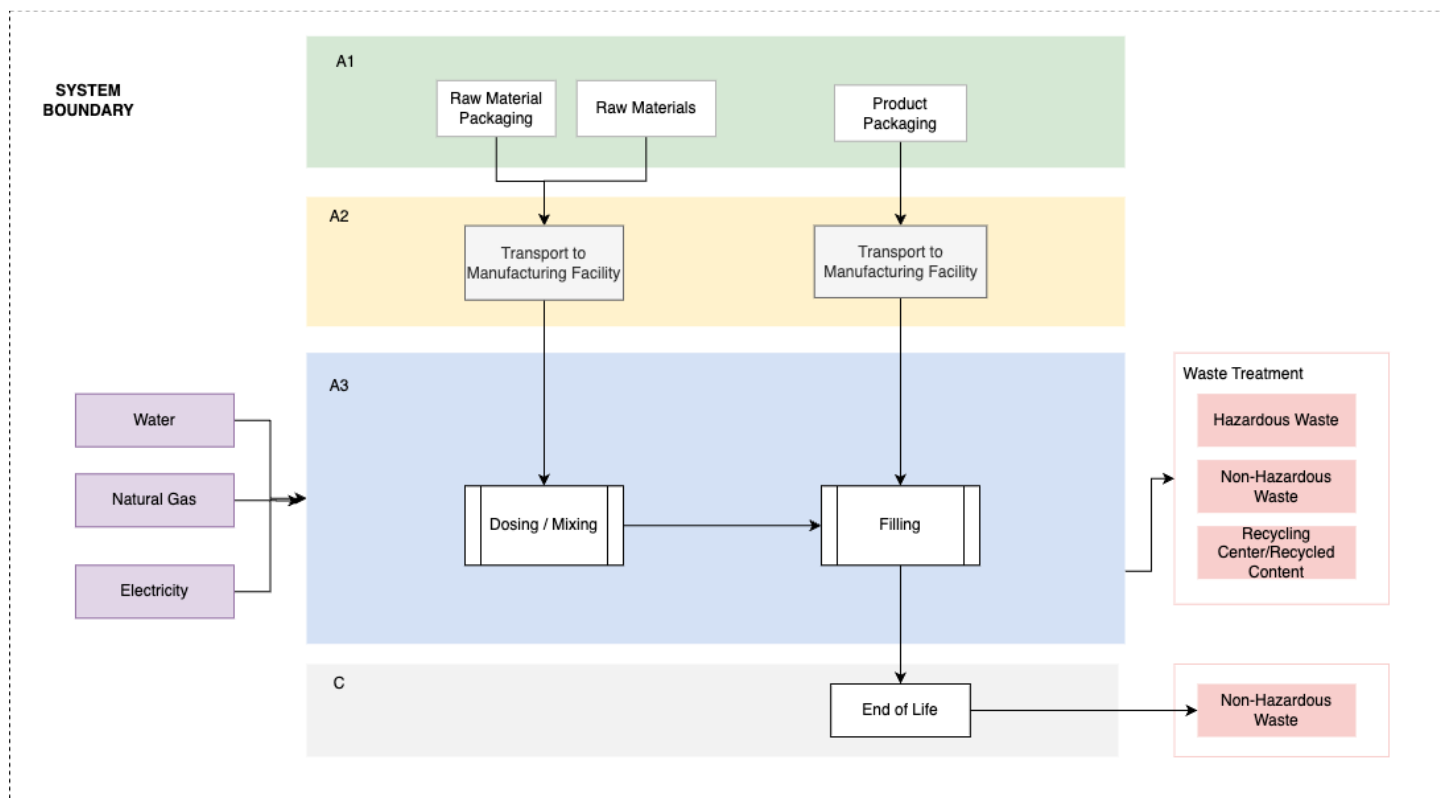
Renewable Electricity

Renewable electricity is used:	Yes
Electricity Source:	Offsite
Renewable type:	wind, solar, biomass, hydro
Percent of EPD Owner's product-related electricity covered:	58.9 %
Grid type used to model remaining electricity:	consumption grid
Commitment pledged for entire EPD validity period:	Yes

System Boundary

Production	A1	Raw material supply	✓
	A2	Transport	✓
	A3	Manufacturing	✓
Construction	A4	Transport to site	ND
	A5	Assembly / Install	ND
Use	B1	Use	ND
	B2	Maintenance	ND
	B3	Repair	ND
	B4	Replacement	ND
	B5	Refurbishment	ND
	B6	Operational Energy Use	ND
	B7	Operational Water Use	ND
End of Life	C1	Deconstruction	✓
	C2	Transport	✓
	C3	Waste Processing	✓
	C4	Disposal	✓
Benefits & Loads Beyond System Boundary	D	Recycling, Reuse Recovery Potential	✓

Product Flow Diagram



Life Cycle Module Descriptions

The raw materials are shipped via ground freight (truck) and/or ship to the H.B. Fuller site at Pirmasens in Germany. Once the raw materials are received, they are stored in a warehouse. Blending or mixing components that require blending is done in mixing vats. Ingredients are dosed either mechanically (automatically) or measured and added by hand (manually.) Mixing is carried out in a semi-automated process by 3-shaft mixers.

Once the ingredients have been blended according to standard operating procedures, the intermediate product is filled into tins, drums and pails. Power usage per mass of product is based on reports from their system. Other utilities such propane fuel used in forklifts, diesel and cooling water are monitored for the entire facility and mass-allocated to the product. The impact of infrastructure and capital goods was excluded from the LCA, as it is explicitly accepted in the PCR. Non hazardous waste consisted of uncontaminated packaging material. This stream was assumed, as per information provided by H.B. Fuller, to be sent 100% to recycling to facilities located at 60 km, using heavy-duty trucks. Hazardous waste (mainly contaminated packaging) is sent to facilities located at 60 km.

LCA Discussion

Allocation Procedure

Allocation of co-products was avoided, to the per mass of product. Mass allocation was performed only for the following joint production processes: Packaging waste transported to a recycling plant, hazardous waste transported to an incineration facility, propane use (forklift and foil shrinking station), and diesel consumption.

Cut-off Procedure

A cut-off rule of 1% was applied to all raw materials, packaging materials, energy, water and waste flows.

Data Quality Discussion

The inventory data used in this study were either directly measured, calculated, or estimated based on primary data sources, ensuring high precision. Background data from ecoinvent v3.9.1 database also has documented precision to the extent available. The product system's mass balance and inventory completeness were thoroughly checked. Some exclusions were made in line with the PCR requirements. However, no data was intentionally omitted. Primary data were collected with a similar level of detail, while background data came from the ecoinvent v3.9.1 database. The modelling approach and other methodological choices were applied consistently throughout the model. Reproducibility: This study ensures reproducibility by providing comprehensive disclosure of input-output data, dataset choices, and modelling approaches. A knowledgeable third party should be able to approximate the results using the same data and modelling methods. Primary data were collected for the Fiscal year of 2023, from December 2022 to November 2023 to ensure representativeness. Secondary data from the ecoinvent v3.9.1 database is typically representative of recent years. Primary data represent H.B. Fuller's production facilities. The use of country-specific data ensures high geographical representativeness, and proxy data were only used when country-specific data were unavailable. Both primary and secondary data were tailored to the specific technologies studied, ensuring high technological representativeness.

Results

Environmental Impact Assessment Results

EF 3.1

per 1 linear meter of product.

LCIA results are relative expressions and do not predict impacts on category endpoints, the exceeding of thresholds, safety margins or risks.

1 linear meter of applied product (sealing depth 3 mm / 12 mm air space)

Impact Category	Method	Unit	A1A2A3	C1	C2	C3	C4	D
GWP-total	EF 3.1	kg CO2 eq	1.20e-1	0	7.57e-4	0	5.20e-2	0
GWP-biogenic	EF 3.1	kg CO2 eq	4.33e-3	0	0	0	4.32e-3	0
GWP-fossil	EF 3.1	kg CO2 eq	1.15e-1	0	7.56e-4	0	2.13e-2	0
GWP-luluc	EF 3.1	kg CO2 eq	3.51e-5	0	3.73e-7	0	4.43e-7	0
ODP	EF 3.1	kg CFC11 eq	3.16e-9	0	1.65e-11	0	6.13e-11	0
AP	EF 3.1	mol H+ eq	6.63e-4	0	1.65e-6	0	1.22e-5	0
EP-freshwater	EF 3.1	kg P eq	1.25e-5	0	5.37e-8	0	1.57e-6	0
EP-marine	EF 3.1	kg N eq	1.04e-4	0	4.17e-7	0	6.56e-6	0
EP-terrestrial	EF 3.1	mol N eq	1.13e-3	0	4.23e-6	0	5.59e-5	0
POCP	EF 3.1	kg NMVOC eq	5.39e-4	0	2.56e-6	0	1.47e-5	0
ADP-minerals&metals	EF 3.1	kg Sb eq	3.46e-7	0	2.47e-9	0	2.63e-9	0
ADP-fossil	EF 3.1	MJ	2.46e+0	0	1.07e-2	0	1.34e-2	0
WDP	EF 3.1	m3 world eq	2.68e-2	0	4.42e-5	0	2.53e-4	0

Abbreviations:

GWP = Global Warming Potential, 100 years (may also be denoted as GWP-total, GWP-fossil (fossil fuels), GWP-biogenic (biogenic sources), GWP-luluc (land use and land use change)), ODP = Ozone Depletion Potential, AP = Acidification Potential, EP = Eutrophication Potential, SFP = Smog Formation Potential, POCP = Photochemical oxidant creation potential, ADP-Fossil = Abiotic depletion potential for fossil resources, ADP-Minerals&Metals = Abiotic depletion potential for non-fossil resources, WDP = Water deprivation potential, PM = Particular Matter Emissions, IRP = Ionizing radiation, human health, ETP-fw = Eco-toxicity (freshwater), HTP-c = Human toxicity (cancer), HTP-nc = Human toxicity (non-cancer), SQP = Soil quality index.

Comparisons cannot be made between product-specific or industry average EPDs at the design stage of a project, before a building has been specified. Comparisons may be made between product-specific or industry average EPDs at the time of product purchase when product performance and specifications have been established and serve as a functional unit for comparison. Environmental impact results shall be converted to a functional unit basis before any comparison is attempted. Any comparison of EPDs shall be subject to the requirements of ISO 21930 or EN 15804. EPDs are not comparative assertions and are either not comparable or have limited comparability when they have different system boundaries. EPDs are not comparative assertions and are either not comparable or have limited comparability when they have different system boundaries, are based on different product category rules or are missing relevant environmental impacts. Such comparison can be inaccurate, and could lead to erroneous selection of materials or products which are higher-impact, at least in some impact categories.

Resource Use Indicators

per 1 linear meter of product.

1 linear meter of applied product (sealing depth 3 mm / 12 mm air space)

Indicator	Unit	A1A2A3	C1	C2	C3	C4	D
PERE	MJ	1.22e-1	0	1.69e-4	0	4.60e-4	0
PERM	MJ	0	0	0	0	0	0
PERT	MJ	1.22e-1	0	1.69e-4	0	4.60e-4	0
PENRE	MJ	2.46e+0	0	1.07e-2	0	1.34e-2	0
PENRM	MJ	8.52e-4	0	5.38e-7	0	1.18e-6	0
PENRT	MJ	2.46e+0	0	1.07e-2	0	1.34e-2	0
SM	kg	3.49e-3	0	0	0	0	0
RSF	MJ	0	0	0	0	0	0
NRSF	MJ	0	0	0	0	0	0
FW	m3	7.17e-4	0	1.32e-6	0	4.56e-5	0

Abbreviations:

RPRE or PERE = Renewable primary resources used as energy carrier (fuel), RPRM or PERM = Renewable primary resources with energy content used as material, RPRT or PERT = Total use of renewable primary resources with energy content, NRPRE or PENRE = Non-renewable primary resources used as an energy carrier (fuel), NRPRM or PENRM = Non-renewable primary resources with energy content used as material, NRPRT or PENRT = Total non-renewable primary resources with energy content, SM: Secondary materials, RSF = Renewable secondary fuels, NRSF = Non-renewable secondary fuels, RE = Recovered energy, ADPF = Abiotic depletion potential, FW = Use of net freshwater resources, VOCs = Volatile Organic Compounds.

Waste and Output Flow Indicators

per 1 linear meter of product.

1 linear meter of applied product (sealing depth 3 mm / 12 mm air space)

Indicator	Unit	A1A2A3	C1	C2	C3	C4	D
HWD	kg	7.01e-4	0	0	0	0	0
NHWD	kg	0	0	0	0	3.74e-2	0
RWD	kg	7.70e-7	0	3.53e-9	0	8.30e-9	0
CRU	kg	0	0	0	0	0	0
MFR	kg	1.65e-3	0	0	0	8.58e-3	0
MER	kg	0	0	0	0	0	0

Abbreviations:

HWD = Hazardous waste disposed, NHWD = Non-hazardous waste disposed, RWD = Radioactive waste disposed, HLRW = High-level radioactive waste, ILLRW = Intermediate- and low-level radioactive waste, CRU = Components for re-use, MFR or MR = Materials for recycling, MER = Materials for energy recovery, MNER = Materials for incineration, no energy recovery, EE or EEE = Recovered energy exported from the product system, EET = Exported thermal energy.

Carbon Emissions and Removals
per 1 linear meter of product.

1 linear meter of applied product (sealing depth 3 mm / 12 mm air space)

Indicator	Unit	A1A2A3	C1	C2	C3	C4	D
BCRP	kg CO2	0	0	0	0	0	0
BCEP	kg CO2	0	0	0	0	0	0
BCRK	kg CO2	4.33e-3	0	0	0	0	0
BCEK	kg CO2	0	0	0	0	4.33e-3	0
BCEW	kg CO2	0	0	0	0	0	0
CCE	kg CO2	0	0	0	0	0	0
CCR	kg CO2	0	0	0	0	0	0
CWNR	kg CO2	0	0	0	0	0	0

Abbreviations:
BCRP = Biogenic Carbon Removal from Product, BCEP = Biogenic Carbon Emission from Product, BCRK = Biogenic Carbon Removal from Packaging, BCEK = Biogenic Carbon Emission from Packaging, BCEW = Biogenic Carbon Emission from Combustion of Waste from Renewable Sources Used in Production Processes, CCE = Calcination Carbon Emissions, CCR = Carbonation Carbon Removals, CWNR = Carbon Emissions from Combustion of Waste from Non-Renewable Sources used in Production Processes, GWP-luc = Carbon Emissions from Land-use Change.

Scenarios

End of Life

C1 - C4 Modules

Collection Process

Collected Separately: 0.046 kg

Recovery

Recycling: 0.00858 kg

Incineration: 0.0374 kg

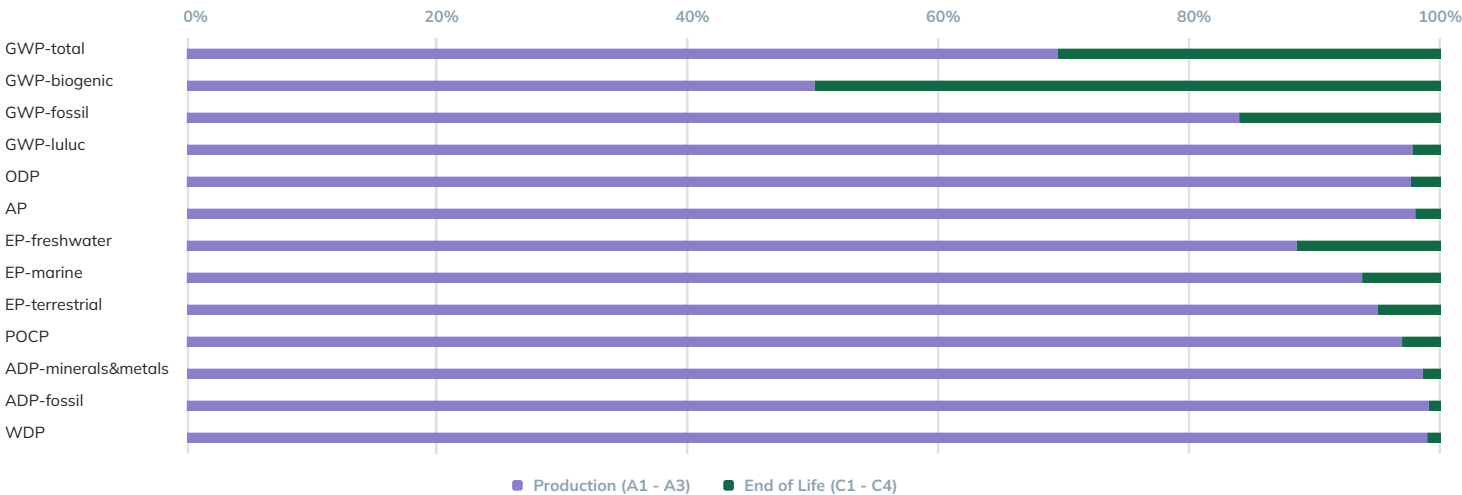
Reuse, Recovery and / or Recycling Potentials & Relevant Scenario Information

D Module

Further assumptions for scenario development: Recycling of of material recovered during installation was not declared in this module as it reenters the system boundaries at modules. A1-A3. Recycling of packaging material was also not declared in module D following the conservative approach recommended in section 6.4.3.3 of EN 15804 +A2 and following the "additionality" principle, given the high rates of industrial packaging recycling in Germany.

Interpretation

The module of raw material extraction and processing (A1) was the main driver of most environmental impacts, with particular influence of the upstream manufacture of resins, followed by the impact of the end-of-life incineration treatment. Biogenic carbon is removed from the atmosphere by product packaging and emitted at the end of life. The module of raw material extraction and processing (A1) was the main driver of most resource use indicators, except for the use of renewable energy, driven by the manufacturing stage use of grid electricity at Pirmasens (54% renewable). Use of SM and generation of MR results are driven by the circularity programs in place at H.B. Fuller, namely the recycling of packaging material and the use of "rework" or unused sealant collected from construction sites.



Additional Environmental Information

H.B. Fuller is committed to the protection of the environment. In keeping with this commitment, we continue to take actions — including implementing programs to reduce our demand for water, minimize the generation and disposal of waste and limit our emissions of air pollutants and greenhouse gases. Accountability and transparency are fundamental to the trust we build, therefore H.B. Fuller regularly reports to CDP Climate Change and CDP Water Security as well as completes EcoVadis sustainability assessment of our environmental, social, ethics and supply chain practices.

Recently, H.B. Fuller committed to set near-term company-wide reduction targets for our Scope 1, 2 and 3 greenhouse gas (GHG) emissions, in line with Science Based Target Initiative (SBTi) standards. When adopted and approved, these targets are expected to require ambitious reductions in our absolute GHG emissions levels, consistent with limiting global temperature rise to 1.5°C, using a 2025 baseline.

Further Information

Multiplication Factors per Declared Unit at 3 mm Sealing Depth

Air Space, mm	Consumption ml / linear m	Consumption g / linear m	Multiplication Factor
8	24	40.30	0.92
10	30	50.37	1.15
12	26	43.66	1.00*
14	42	70.52	1.62
16	48	80.60	1.85
18	54	90.67	2.08
20	60	100.75	2.31
22	67	112.50	2.58
24	72	120.89	2.77

* Declared Unit for this EPD is 1 linear meter applied with a sealing depth of 3 mm and air space of 12 mm.

Multiplication Factors per Declared Unit at 4 mm Sealing Depth

Air Space, mm	Consumption ml / linear m	Consumption g / linear m	Multiplication Factor
8	26	43.66	1.00
10	40	67.16	1.54
12	48	80.60	1.85
14	56	94.03	2.15
16	64	107.46	2.46
18	72	120.89	2.77
20	80	134.33	3.08
22	88	147.76	3.38
24	96	161.19	3.69

Multiplication Factors per Declared Unit at 5 mm Sealing Depth

Air Space, mm	Consumption ml / linear m	Consumption g / linear m	Multiplication Factor
8	40	67.16	1.54
10	50	83.95	1.92
12	60	100.75	2.31
14	70	117.54	2.69
16	80	134.33	3.08
18	90	151.12	3.46
20	100	167.91	3.85
22	110	184.70	4.23
24	120	201.49	4.62

References

- ISO 14040:2006, "Environmental management - Life cycle assessment - Principles and framework".
- ISO 14044:2006, "Environmental management - Life cycle assessment - Requirements and guidelines".
- EN 15804:2012+A2:2019. Sustainability of construction works. Environmental product declarations. Core rules for the product category of construction products. Brussels: European Committee for Standardization (CEN).
- Smart EPD™ Part A Product Category Rules for building and construction products and services, Standard 1000, version 1.01 January 15, 2024.
- ecoinvent v3.9.1, December 2022, <https://ecoinvent.org/the-ecoinvent-database/data-releases/ecoinvent-3-9-1/>
- Dong, Y., Hossain, M. U., Li, H., & Liu, P. (2021). Developing conversion factors of LCIA methods for comparison of LCA results in the construction sector. Sustainability, 13(16), 9016.
- UN Environment, 2011 Global Guidance on LCA database development. Life Cycle Initiative.
- ISO 14025:2006, "Environmental labels and declarations - Type III environmental declarations - Principles and procedures".