Environmental Product Declaration Type III ITB No. 208/2021

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GSW Office systems – aluminum profiles




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Basic information

This declaration is the type III Environmental Product Declaration (EPD) based on EN 15804:2012+A1 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. Their aspects were verified by the independent body according to ISO 14025. Basically, a comparison or evaluation of EPD data is possible only if all the compared data were created according to EN 15804:2012+A1 (see point 5.3 of the standard).

Life cycle analysis (LCA): A1-A3, C1-C4 and D modules in accordance with EN 15804:2012+A1
(Cradle to Gate with options)

The year of preparing the EPD: 2020

Service Life: In practice, a service life of 50 years can be assumed in normal use for such application

PCR: ITB-PCR A (PCR based on EN 15804+A1)

Declared Unit (DU): 1 running meter of profile

Reasons for performing LCA: B2B

Representativeness: Polish production, year 2019

MANUFACTURER AND PRODUCTS DESCRIPTION

The company Glass System is a producer of glass wall systems for use in office architecture. The company is located in Warsaw (Poland).

The environmental declaration covers aluminum profiles used in the construction of the following internal partition systems: GSW Pro (internal wall system), GSW Office (a single glazed system), GSW Office Plus (a double glazed system), GSW Office FR (a single-glazed system of fireproof walls), GSW Office Plus FR (a double-glazed fireproof system). The glass wall systems have been tested in accordance with the guidelines of EAD 210005-00-505 for the purposes of issuing the European Technical Assessment (ETA), which enables the marking of products with the CE mark. Thanks to this, they can be used throughout the European Union. Technical data on steel profiles products can be found at manufacturer site

https://glasssystem.com/wp-content/uploads/2020/09/GSW-Office-Specification.pdf

Profiles are made of aluminum 95% by weight and about 5% TPE. The production scheme of profiles is shown in a figure below.

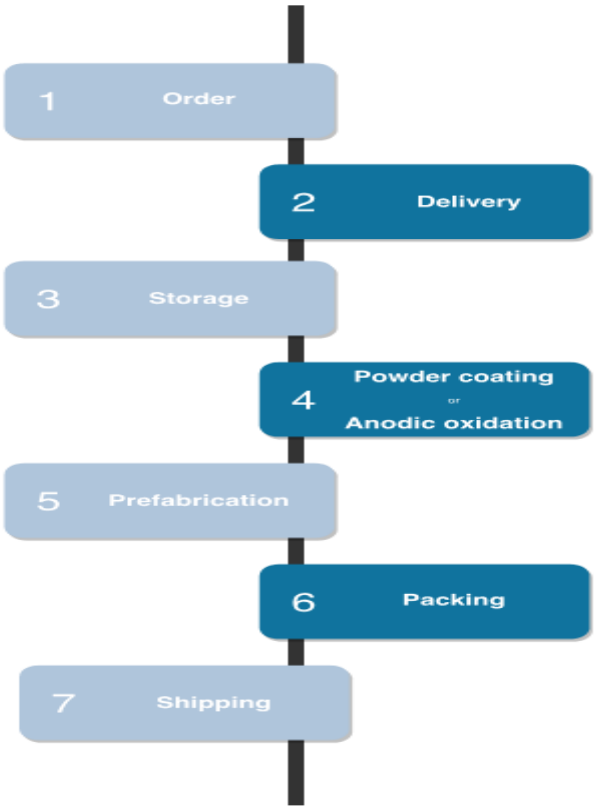

Figure1. Preparation of elements of partition wall systems (A3)

LIFE CYCLE ASSESSMENT (LCA) – general rules applied

Unit

The declared unit is 1 running meter of aluminum profile product (intended for the installation of GSW Officesystems)

System boundary

The life cycle analysis of the declared steel products covers “Product Stage” A1-A3, and End of Life stage C1, C2, C3, C4 and gains and loads beyond system in D module (Cradle to Gate with options) in accordance with EN 15804:2012+A1 and ITB PCR A.

Allocation

The allocation rules used for this EPD are based on general ITB’s PCR A. Production of products is a line process in one manufacturing plant located in Warsaw, Poland. Allocation of impact is done on a product mass basis (100% of whole production). All impacts from raw materials (95% is aluminum, 5% TPE) are allocated in A1 module of the LCA, the input contributing more than 0.5% to the overall mass or energy of the system have been omitted. It is estimated that the sum of any excluded flows contribute less than 1% to the impact assessment categories. The manufacturing of required machinery and other infrastructure is not considered in the LCA. 100% of impacts from production were inventored and allocated to product covered by this declaration. Module A2 includes transport of raw materials such as aluminum and TPE from suppliers to manufacturer (based on verified data). Energy supply was inventoried and 100% was allocated to the product assessed (~3 kWh/ 1 running meter of profile in A3). Emissions in the factory are assessed using national KOBIZE 2019 emission factors for energy carriers.

System limits

100% input materials and 100% energy consumption (electricity, oil) was inventoried in the manufacturing plant and were included in provided declaration. In the assessment, all significant parameters from gathered production data are considered, i.e. all material used per formulation profile, utilized themral energy, and electric power consumption, direct production waste. Tires consumption for transport was not taken into account. It is assumed that the total sum of omitted processes does not exceed 2% of all impact categories. In accordance with EN 15804 machines and facilities (capital goods) required for and during production are excluded, as is transportation of employees. Different types of profiles may have specific environmental factors to be converted from the reference profile (Table 5) according to the table (Table 4). The aluminum profiles take into account the seals already applied.

A1 and A2 Modules: Raw materials supply and transport

Raw material (aluminium, TPE) come from local suppliers. General environmental profiles from Plastics Europe and European Aluminium were used. Data on transport (100% of input material) of the different input products to the manufacturing plants were inventoried in detail and modelled by assessor. For calculation purposes European fuel averages are applied.

A3: Production

The production process A3 includes processes as presented in figure 1.

End of life scenarios (C and D modules)

The end-of-life scenario for all products has been generalized. Aluminium is considered as infinitely recyclable material. Typically is recovered by demolition contractors, who sell the recovered material as a scrap (material recovery rate in analysed case is 96%). According to the scenario, 0.2 MJ of the energy is set to recover the profile from the material derived from the demolition was assumed (electric small equipment). It is assumed that at the end of life the transport distance from the product deconstruction place to waste processing (C2) is 50 km on > 16 t loaded lorry with 75% capacity utilization and fuel consumption of 35 l per 100 km. Materials recovered from dismantled products are recycled (96%) and landfilled (4%) according to the treatment practice of construction waste as presented in Table 1. The reuse, recovery and recycling potential for a new product system is considered beyond the system boundaries (module D) based on net scrap approach.

Table 1. End of life scenarios for Glass system products

Progress products	Material recovery	Recycling	Landfilling
Steel products	100%	96%	4%

Data collection period

The data for manufacture of the declared products refer to period between 01.01.2019 – 31.12.2019 (1 year). The life cycle assessments were done for Poland as reference area.

Data quality - production

The values determined to calculate A3 originate from verified LCI inventory data. A1 values (TPE, aluminum) were prepared considering European Association data.

Assumptions and estimates

The impacts of the representative products were aggregated using weighted average. All production processes were assigned to different types of products in an equal way. Only one end-of-life scenario has been adopted.

Table 2. Assumptions for Glass system products

Module	Scenario assumptions
A1 and A3	A1- 100% of aluminium input has environmental data A3 - Actual (2019) manufacturing data form 1 production site Utilization of packaging material was not taken into consideration.
A2	Actual data form production site is provided and verified
C1	According to the best practice data - approx. 0.2 MJ/kg consumed for material recovery
C2	50 km on > 16 t loaded lorry with 75% capacity utilization and fuel consumption of 35 l per 100 km.
C3	Treatment of TPE and aluminium for recycling based on Ecoinvent v.3.7.data and model
C4	0.05 kg is landfilled. Treatment of TPE waste - Ecoinvent v.3.7.data and model
D	96% product is recycled. A potential environmental benefit is calculated for the end-of-life stage (module D) for all the considered impact categories. Hence, end of life credits are calculated in Module D based on a net aluminium recycling of 96% attend of life minus 50% at production stage i.e. a quantity representing 46% of the aluminium content of the door. The net amount scrap approach is used, thus module D shows an environmental benefit.

Calculation rules

LCA was done in accordance with ITB PCR A document. Characterization factors are CML ver. 4.2 based. ITB-LCA algorithms were used for impact calculations. A1 was calculated based on generic data, A3 and A2 are calculated based on the LCI questionnaire provided by the manufacturer.

Databases

The background data for the processes come from the following databases: Plastic Europe, Aluminium-Europe, Ecoinvent v.3.7(end of life- aluminium processes), KOBiZE(2019) and Tauron (Polish electricity mix and combustion factors for fuels). Specific (LCI) data quality analysis was audited. The time related quality of the data used is valid (5 years).

Health and safety aspects

There are no critical health and safety aspects in life cycle of aluminium profiles. The pre-treatments of aluminium profile do not contain substances of very high concern (SVHC substances). There are no relevant aspects of occupational health and safety during the further processing, installation and use of products. Under normal installation, no measurable environmental impacts can be associated with the indoor use of aluminium profiles.

LIFE CYCLE ASSESSMENT (LCA) – Results

The declaration refers to the unit DU – 1 running meter of the aluminum profile product.

Table 3. System boundaries (life stage modules included) in a product environmental assessment

Environmental assessment information (MA – Module assessed, MNA – Module not assessed, 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
MA	MA	MA	MNA	MNA	MNA	MNA	MNA	MNA	MNA	MNA	MNA	MA	MA	MA	MA	MA

Table 4. Conversion factor that enables the conversion of a reference profile (table 5) to a specific profile.

Profile name	***Conversion factor***
GSW Pro 50, base profile	*0,5*
GSW Pro 110, montage profile	*0,8*
GSW Pro 110, base profile	*1,4*
GSW Pro, clamp	*0,7*
GSW Pro 50, cover profile	*0,3*
GSW Pro 110, cover profile	*0,6*
GSW Pro 50, front end cup (5mm)	*0,4*
GSW Pro, front profile	*0,7*
GSW Office, panel's base profile	*0,7*
GSW Office, panel's connector	*0,3*
GSW Office - base profile of the post	*0,5*
GSW Office, post pressure profile	*0,3*
GSW Office, corner post base profile	*0,4*
GSW Office, cover profile	*0,3*
GSW Office, adaptor cover profile FR	*0,6*
GSW Office, corner post cover profile	*0,4*
GSW Office, panel cover profile 140	*0,9*
GSW Office, base profile monolithic	*0,9*
GSW Office H, frame profile	*1,7*
GSW Office C, frame profile	*1,7*
GSW Office L, frame profile	*1,1*
GSW Office C, cover profile	*0,9*
GSW Office, frame profile	*1,7*
GSW Office, door Urban Plus	*2,5*
GSW Office, rebate profile	*0,7*
GSW Office Urban door Plus profile (single)	*0,3*
GSW Office Plus, base profile	*1,3*
GSW Office Plus, pull up profile	*0,6*
GSW Office Plus, hidden cover profile	*1,3*
GSW Office Plus, cover profile	*0,3*
GSW Office Plus, hidden cover profile	*0,2*
GSW Office Plus, inner shell profile	*0,3*
GSW Office Plus, base profile monolithic	*1,6*
GSW Office Plus H, Frame profile	*2,1*
GSW Office Plus H, Frame profile	*2,1*
GSW Office FR Plus adapter P16+VSG	*0,8*
GSW Office FR Plus, frame profile	*2,1*

LIFE CYCLE ASSESSMENT (LCA) – Results

Table 5. Environmental product characteristic – 1 running meter of reference profile

Environmental impacts: (DU) 1 running meter of profile									
Indicator	**Unit**	**A1**	**A2**	**A3**	**C1**	**C2**	**C3**	**C4**	**D**
Global warming potential	kg CO_2 eq.	8.66E+00	3.59E-02	2.76E+00	2.19E-02	8.90E-03	7.61E-01	7.14E-02	-4.33E+00
Depletion potential of the stratospheric ozone layer	kg CFC 11 eq.	5.62E-07	0.00E+00	4.14E-08	2.41E-10	0.00E+00	4.28E-08	1.92E-09	-2.81E-07
Acidification potential of soil and water	kg SO_2 eq.	8.98E-03	2.63E-04	8.84E-03	1.92E-05	6.57E-05	9.06E-03	5.94E-05	-4.49E-03
Formation potential of tropospheric ozone	kg Ethene eq.	4.85E-02	1.90E-05	1.11E-02	9.95E-05	4.76E-06	4.60E-04	6.04E-05	-2.43E-02
Eutrophication potential	kg $(PO_4)^{3-}$ eq.	1.47E-01	4.63E-05	2.59E-04	8.01E-07	1.16E-05	3.63E-03	9.24E-05	-7.37E-02
Abiotic depletion potential (ADP-elements) for non-fossil resources	kg Sb eq.	1.68E-05	0.00E+00	2.76E-03	1.62E-04	0.00E+00	4.90E-05	1.38E-07	-8.41E-06
Abiotic depletion potential (ADP-fossil fuels) for fossil resources	MJ	1.88E+02	3.27E-01	2.76E+01	2.50E-01	8.17E-02	9.04E+00	3.44E-01	-9.40E+01
Environmental aspects: (DU) 1 running meter of profile									
Indicator	**Unit**	**A1**	**A2**	**A3**	**C1**	**C2**	**C3**	**C4**	**D**
Use of renewable primary energy excluding renewable primary energy resources used as raw materials	MJ	INA	INA	INA	INA	INA	INA	INA	INA
Use of renewable primary energy resources used as raw materials	MJ	INA	INA	INA	INA	INA	INA	INA	INA
Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials)	MJ	4.05E+01	5.23E-02	1.66E+00	3.75E-02	1.31E-02	0.00E+00	0.00E+00	-2.03E+01
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials	MJ	INA	INA	INA	INA	INA	INA	INA	INA
Use of non-renewable primary energy resources used as raw materials	MJ	INA	INA	INA	INA	INA	INA	INA	INA
Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials)	MJ	1.97E+02	3.43E-01	3.54E+01	2.75E-01	8.57E-02	0.00E+00	0.00E+00	-9.87E+01
Use of secondary material	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	7.83E+00	3.22E-01	0.00E+00
Use of renewable secondary fuels	MJ	0.00E+00	3.43E-03	0.00E+00	0.00E+00	8.57E-04	0.00E+00	0.00E+00	0.00E+00
Use 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
Net use of fresh water	m^3	8.15E-02	1.00E-06	5.53E-04	7.90E-05	2.50E-07	0.00E+00	0.00E+00	-4.08E-02
Other environmental information describing waste categories: (DU) 1 running meter of profile									
Indicator	**Unit**	**A1**	**A2**	**A3**	**C1**	**C2**	**C3**	**C4**	**D**
Hazardous waste disposed	kg	5.94E-06	4.60E-06	2.15E-03	3.33E-07	1.15E-06	0.00E+00	1.41E-04	-2.97E-06
Non-hazardous waste disposed	kg	1.19E-02	4.27E-03	2.15E-01	3.01E-03	1.07E-03	0.00E+00	0.00E+00	-5.95E-03
Radioactive waste disposed	kg	3.34E-06	0.00E+00	0.00E+00	3.33E-07	0.00E+00	1.25E-01	1.77E-07	-1.67E-06
Components for re-use	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.66E-02	2.98E-01	0.00E+00
Materials for recycling	kg	0.00E+00	0.00E+00	3.28E-03	0.00E+00	0.00E+00	1.96E-05	3.20E-07	0.00E+00
Materials for energy recover	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
Exported energy	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

Comparability

Basically, a comparison or an evaluation of EPD data is only possible if all the data sets to be compared were created according to EN 15804 and the building context, respectively the product-specific characteristics of performance, are taken into account.

RESULTS INTERPRETATION

The majority of the environmental impacts come from the aluminum manufacturing process (A1 module). Within the manufacturing processes, the primary aluminum production is dominant, especially the alumina production and the electrolysis. The profile is considered as composed of 50% primary aluminum. The LCA modelling and the impact of the primary aluminum production are detailed in the reports provided by https://www.european-aluminium.eu. The processes of processing aluminum elements into the product profile already account for a much smaller share of the impact (about 25% for GWP). The production of 1 meter of aluminum profile (reference profiles) gives about 11 kg of CO_2 emission into the atmosphere in product stage (A1-A3). The contribution of Module C4 (disposal) is very limited compared to module A1-A3 and module D. Only a small fraction (4%) of the product is directed to landfilling. The recycling benefits are considered in module D. A recycling rate of 96% is used considering that recycling material input in the primary production is 50%, so the benefit is significant. This demonstrates the importance to consider module D into the building life cycle assessment

VERIFICATION

The process of verification of this EPD was 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 15804:2012+A1 and ITB PCR A
Independent verification corresponding to ISO 14025 (sub clause 8.1.3.) ☒ external ☐ internal
External verification of EPD: Ph.D. Eng. Halina Prejzner LCA, LCI audit and input data verification: Ph.D. Eng. Michał Piasecki, m.piasecki@itb.pl Verification of LCA: Ph.D. Eng. Justyna Tomaszewska, j.tomaszewska@itb.pl

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 15804:2012+A1:2013 Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products
- https://www.plasticseurope.org/pl
- https://www.european-aluminium.eu/
- KOBiZE Wskaźniki emisyjności CO_2, SO_2, NO_x, CO i pyłu całkowitego dla energii elektrycznej, grudzień 2019
- World Steel Association 2017 Life Cycle inventory methodology report for steel products

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CERTIFICATE № 208/2021
of TYPE III ENVIRONMENTAL DECLARATION

Products:

GSW Office systems - aluminum profiles

Manufacturer:

Glass System Polska Sp. z o.o.

ul. Idzikowskiego 16, 00-710 Warsaw, Poland

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

PN-EN 15804

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

This certificate, issued for the first time on 1st April 2021 is valid for 5 years
or until amendment of mentioned Environmental Declaration

Acting 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, April 2021