

ENVIRONMENTAL PRODUCT DECLARATION

in accordance with /ISO 14025/ and /EN 15804/

Owner of the declaration	GDA - Gesamtverband der Aluminiumindustrie e.V.
Publisher	Institut Bauen und Umwelt e.V. (IBU)
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
Declaration number	EPD-GDA-2019130-IBG1-EN
Issue date	16/01/2020
Valid to	15/01/2025

Cold-Formed Aluminium Sheet for Outdoor Use

**GDA- Gesamtverband der
Aluminiumindustrie e.V.**

www.ibu-epd.com / <https://epd-online.com>



The logo of GDA (Gesamtverband der Aluminiumindustrie e.V.) consists of the letters "GDA" in a white, stylized, sans-serif font. The letters are interconnected, with the "G" and "D" sharing a vertical stroke and the "A" being slightly offset. The entire logo is set against a solid blue square background.



1. General Information

GDA - Gesamtverband der
Aluminiumindustrie e.V.

Programme holder

IBU - Institut Bauen und Umwelt e.V.
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10178 Berlin
Germany

Declaration number

EPD-GDA-2019130-IBG1-EN

This declaration is based on the following product category rules:

Products manufactured from aluminium and aluminium alloys, 07/2014
(PCR tested and approved by the independent advisory board (SVR))

Issue date

16/01/2020

Valid to

15/01/2025

Dipl. Ing. Hans Peters
(President of Institut Bauen und Umwelt e.V.)

Dr. Alexander Röder
(Executive Director IBU)

Cold-formed aluminium sheet for
outdoor use

Owner of the declaration

Gesamtverband der Aluminiumindustrie e.V.
Fritz-Vomfelde-Strasse 30
40547 Düsseldorf
Germany

Declared product/declared unit

1 kg cold-formed aluminium sheet

Scope:

This document relates to the manufacture of 1 kg of cold-formed aluminium sheet. This model EPD is based on a representative aluminium application made of thin sheets for outdoor use from one manufacturer. It can be assumed that the representativeness of the data is good due to the comparable production technologies of the individual companies. The data was collected during 2017.

The owner of the declaration is liable for the basic information and supporting evidence; any liability of the IBU in relation to manufacturer's information, LCA data and supporting evidence is excluded. This document is a translation from German to English. It is based on the original declaration number EPD-GDA-2019130-IBG1-DE.

Verification

European standard /EN 15804/ serves as the core PCR

Verification of the declaration and statements by an independent body in accordance with /ISO 14025:2010/

☐ internal ☒ external

Dipl. Natw. ETH Sascha Iqbal,
Independent verifier appointed by SVR

2. Product

2.1 Product description/Product definition

Small formats, standing seam systems, façade panels and roof drainage systems and the associated accessories fall under cold-formed aluminium applications for outdoors. CE labelling for these products is provided as a supplement to the delivery note and in the packaging units of the individual products.

Small format:

Roof or façade applications which are made of thin aluminium sheets are known as small format: Roof panel, roof panel R.16, roof shingle, roof diamond 29 x 29, roof diamond 44 x 44, roof and façade panel FX.12, wall shingle, wall diamond 20 x 20, wall diamond 29 x 29 and wall diamond 44 x 44. These are individual pressed and edged aluminium alloy

elements. The individual elements are combined to form a rainproof roof or façade cladding (depending on the product variant) by means of overlapping mounting and/or edge folds.

Standing seam system:

Manually produced aluminium standing seam systems are roof and façade systems made of moulded thin sheets. Double standing seam systems are used mainly as roof coverings and edge fold systems for façades.

Siding façade panel:

The Siding façade panel: consists of rolling-formed aluminium panels. The panels are available in various widths and lengths and are used on façades. The

elements are interconnected by means of tongue and groove connections to form façade cladding.

Roof drainage systems:

The aluminium roof drainage system comprises gutters, pipes and the associated accessories. All system components consist mainly of aluminium.

The representative product was selected following consideration of three different products from the manufacturer.

EU regulation no. /305/2011/ (CPR) applies for putting the product on the market in the EU/EFTA (with the exception of Switzerland). The product requires a declaration of performance taking into account the following standards:

- / EN 14783/, Fully supported metal sheet and strip for roofing, external cladding and internal lining - Product specification and requirements
- DIN EN 14782:2015-09 - Draft Self-supporting metal sheet for roofing, external cladding and internal lining - Product specification and requirements
- DIN EN 612:2005-04 Eaves gutters with bead stiffened fronts and rainwater pipes with seamed joints made of metal sheet (not part of CE labelling)
- DIN EN 1462:2004-12 Brackets for eaves gutters - Requirements and testing (not part of CE labelling)

The respective national regulations apply to use.

2.2 Application

Small formats are used as roof and façade coverings. Siding façade panels are used as façade cladding. Manually produced aluminium standing seam systems are fitted as roof and façade cladding. Roof drainage systems serve to drain rainwater from roof surfaces.

2.3 Technical data

The constructional data presented here is relevant for the product.

Constructional data

Name	Value	Unit
Bulk density in accordance with DIN 1306/	2700	kg/m ³
Melting point /Kammer 2009/	660	°C
Electrical conductivity at 20°C /Kammer 2009/	37.7	m/Ωmm ²
Thermal conductivity /ISO 7345/	235	W/(mK)
Thermal expansion coefficient /ISO 6892-1/	23.1	10 ⁻⁶ K ⁻¹
Elasticity coefficient /ISO 6892-1/	70000	N/mm ²
Specific thermal capacity /ISO 7345/	0.9	kJ/kgK
Yield strength Rp 0.2 min. /ISO 6892-1/	35 - 250	N/mm ²
Tensile strength Rm min. /ISO 6892-1/	100 - 350	N/mm ²
Elongation at break A5 min. /ISO	1 - 30	%

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Alloys in accordance with /EN 507/ and /EN 1396/

The product's performance values according to the declaration of performance in relation to its main features in accordance with:

- DIN EN 507:2019-10 Roofing and cladding products from metal sheet - Specification for fully supported products of aluminium sheet
- DIN EN 1396:2015-06 Aluminium and aluminium alloys - Coil coated sheet and strip for general applications - Specifications (not part of CE labelling)

Small format:

- /EN 14783/
- /EN 14782/

Manually produced standing seam systems:

- /EN 14783/

Façade cladding:

- /EN 14782/

Roof drainage:

- /EN 612/
- /EN 1462/

2.4 Delivery status

Small format packaging:

Small formats are packed in boxes. Different carton sizes are used depending on the product. The packaging unit is normally between 10 and 15 m².

Siding façade panel packaging:

In endless board on wooden pallets (< 6 m).

Standing seam system packaging:

The material is normally supplied as a 60 or 500 kg rolled coil. Wooden pallets and cardboard wrapping are used as packaging.

Roof drainage system packaging:

Gutter bundle in various iron frames, Pipe/cartons, 3050 x 295 x 460 mm (Gutter and pipe with polyethylene film).

2.5 Base materials/auxiliary materials

The most important basic material is aluminium which is obtained by electrolysis from bauxite or from recycling aluminium scrap.

Further basic materials used include alloying elements such as silicon, iron, magnesium and zinc in varying concentrations. The end products contain over 90% aluminium.

Typical aluminium alloys for the construction industry comply with the 3000 and 5000 series in accordance with /EN 573-3/. Approximately 90% water-based alloy-specific synthetic and mineral-based oil emulsions are used as auxiliary materials in the rolling process. These emulsions are maintained within a closed cycle.

Does the product contain substances which are on the candidate list /(16/07/2019) at a mass concentration above 0.1 %: no

Does the product contain further Category 1A or 1B CMR materials which are not on the candidate list at a mass concentration of above 0.1% in at least one partial product: no

Were biocidal products added to this building product or was it treated with biocidal products (is this therefore a processed product in terms of the /Biocide Product Directive/): no

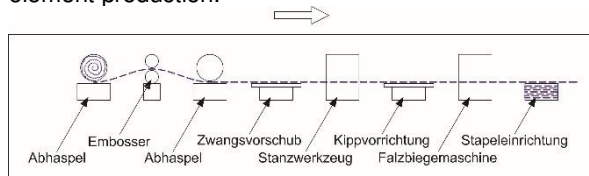
2.6 Manufacturing

The colour-coated aluminium strips supplied as a pre-product (see EPD Coil Coated Aluminium Sheet No. EPD-GDA-2019131-IBG1-EN) are clamped in a defined width in coils up to max. 1600 mm diameter on to a payoff reel and inserted into the production line.

Example: PREFA roof panel manufacturing process

The metal strip for stucco embossing is shaped with an embossing roller. The synchronised, defined lengths are inserted with a pneumatic synchronised feed. When cutting to length, the cutting outlines are embossed and partly provided with function embossings. The cut pieces are fed to a turning device via a conveyor belt and finished in the folding machine. The roofing slabs are then placed in an intermediate store where the carton is pushed in if the number of pieces is sufficient.

PREFA roof shingles or roof diamonds are manufactured via a similar line to the roofing slabs. Schematic (exemplary) process sequence diagram for element production:



2.7 Environment and health during use

In recent years, the European semi-finished aluminium goods industry has successfully made great efforts to conserve the environment and resources.

For example, continuous optimisations of the rolling and coating processes for aluminium panels make a contribution to resource efficiency (/European Aluminium Association 2018/). This is ensured by management systems (such as /ISO 14001/, /ISO 50001/ and /ISO 45001/) and continuously monitored by accredited certification bodies. No specific environmental effects occur in the manufacture of cold-formed aluminium sheets since no thermal processes take place. Residues which accrue (oils) are collected in the factory and thermally recycled externally. No measures are required beyond those prescribed by law.

2.8 Product processing/installation

The products are sold to commercial enterprises which have the necessary tools (e.g. Sheet metal workers' tools) and know how to be able to process these products professionally. Various accessories can be added during installation (e.g. Roof ridge ventilators, snow stoppers or gable strips). No specific

environmental protection measures are necessary when working cold-formed aluminium sheets. The general work protection and health instructions for building sites apply.

2.9 Packaging

Cartons, polyethylene films, Europallets and wooden pallets are used as packaging material. The packaging materials can be reused or recycled after use. Wooden pallets, plastics and paper can therefore be collected separately and recycled. The most frequently used packaging materials are paper and plastic film.

2.10 Condition of use

The condition of use of the material, which is supplied as a semi-finished product, depends on prior treatment by metalworking and installing companies. With appropriate use of the product, no change in material composition either during working or during use is to be expected.

2.11 Environment and health during use

No effect relationships with regard to the environment and health are known if cold-formed aluminium sheets are used appropriately.

2.12 Reference period of use

The period of use for many aluminium applications in the construction sector is frequently determined by the building's period of use. Repair and maintenance are minimal due to the self-passivating surface. With appropriate use, a period of use of more than 70 years can be assumed.

2.13 Extraordinary influences

Fire

Aluminium and aluminium alloys comply with building material class A1 according to /DIN 4102/ and /EN 13501/ as well as /Directive 96/603/EC/ and therefore do not make any contribution in case of fire. The melting point of aluminium is 660 °C.

Name	Value
Building material class	A1
Flaming droplets	NA
Flue gas development	None
Toxicity of flue gases	NA

Water

No environmental effects are known of in case of the unforeseen impact of water on aluminium sheets. The product itself is not affected by water.

Mechanical destruction

All materials remain in a bonded state following mechanical destruction.

2.14 End-of-life phase

The product is not intended to be reused. The material is completely recyclable. After use, the product can be recycled by a specialist aluminium recycling company. The material produced from this recycling can be reused just like primary material. Current data collected by European Aluminium (EA) has ascertained an average recycling rate of over 95% for

aluminium applications in the construction sector in Germany and the EU.

2.15 Disposal

Aluminium scrap from building applications is an important raw material for future aluminium supplies. The recycling infrastructure is established and available worldwide.

The waste code for aluminium according to the /European Waste Catalogue/ (EAK) is 17 04 02.

The disposal of packaging materials is important for conserving resources. The waste codes for paper, plastic, wood, metal and composite packaging are: 15 01 01, 15 01 02, 15 01 03, 15 01 04, 15 01 05.

2.16 Further information

Further information is available at: www.aluinfo.de.

3. LCA: Calculation rules

3.1 Declared unit

The declared unit relates in each case to 1 kg of cold-formed aluminium sheet.

Specification of the declared unit

Name	Value	Unit
Declared unit	1	kg
Conversion factor to 1 kg	1	-

3.2 System boundary

EPD type: Cradle to gate with options.

This LCA includes the lifecycle stage of product manufacture and also end of life (EoL).

- The product stage covers Module A1 (Raw materials provision), A2 (Transport) and A3 (Manufacture).
- The EoL includes environmental effects which occur due to waste treatment (material recycling of aluminium sheet). The quantity of aluminium which is recycled (material for recycling, MFR) is declared in C3. The material losses assumed are balanced out in C4.
- Credits from reuse, recovery and recycling potential are shown in Module D in accordance with /EN 15804/.

Due to the low environmental influence of the packaging, its disposal was cut off in Module A5 and the end-of-life of the packaging was not included (cut-off).

3.3 Estimations and assumptions

The data record from the EPD entitled "Coil coated aluminium sheet" (Declaration number: EPD-GDA-2019131-IBG1-EN) was used for the pre-product. It is assumed that the aluminium ingots are transported a distance of 350 km to the place of manufacture. This assumption is based on empirical values from the Federation.

3.4 Cut-off rules

All operating data collected was included in the balance. Processes whose total contribution to the final result by mass and in all impact categories examined

is less than 1% were ignored. It can be assumed that the ignored processes contribute less than 5 % each to the impact categories included.

3.5 Background data

The /GaBi 8/ software system for an integrated approach developed by thinkstep was used to model the life-cycle for the manufacture of the uncoated aluminium sheet. The consistent data in the /GaBi database/ is documented and can be viewed online at <http://www.gabi-software.com/international/support/gabi/gabi-database-2018-lci-documentation/>.

The base data in the /GaBi database/ was used for energy, transport and auxiliary materials.

3.6 Data quality

The data collected by the members of European Aluminium (EA) from the production year of 2015 was used to model the aluminium upstream chain. All other relevant background data used was taken from the database behind the /Gabi 8/ software. The background data used is less than 5 years old.

3.7 Period under review

The data basis for this LCA is based on data collected in 2017. The period under review is 12 months.

3.8 Allocation

The quantity of scrap required for manufacturing is first deducted from the aluminium scrap accruing in the system from production and in end-of-life. The system's net quantity of scrap is thus calculated, i.e. the quantity of scrap which exceeds the system boundary.

This results in a credit with primary material less the costs for re-smelting. This credit (substitution of primary material) is assigned to Module D taking into account a recovery rate (recycling rate 90 %).

3.9 Comparability

In principle, a comparison or the evaluation of EPD data is only possible if all data to be compared was compiled in accordance with /EN 15804/ and the building context or product-specific performance characteristics have been included.

The /GaBi- database/ was used to model the product lifecycle.

4. LCA: Scenarios and further technical information

The end-of-life for average aluminium sheets consists of 90 % recycling and 10 % disposal in landfill with the corresponding credits and loads. Disposal of the

packaging in Module A5 was ignored due to its small influence (cut-off).

Module D contains the costs of recovery (re-smelting) and also credits to the value of costs for primary material.

The credits and loads used are based on a Europe-wide average for aluminium scrap and not inherently on the specific scrap value of the aluminium sheets manufactured.

End-of-life (C4)

Name	Value	Unit
To landfill	10	%

Reuse, recovery and recycling potential (D), relevant scenario information

Name	Value	Unit
Recycling rate	90	%

5. LCA: Results

DESCRIPTION OF THE SYSTEM BOUNDARY (X = INCLUDED IN LCA; MND = MODULE NOT DECLARED; MNR = MODULE NOT RELEVANT)

Production stage			Construction process stage		Use stage							End of life stage				Credits and loads beyond the system boundary
Raw material supply	Transport	Manufacturing	Transport from the gate to the site	Assembly	Use / application	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstruction / demolition	Transport	Waste processing	Disposal	Reuse, recovery or recycling potential
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
X	X	X	MND	MND	MND	MND	MNR	MNR	MNR	MND	MND	MND	X	X	X	X

RESULTS OF THE LCA – ENVIRONMENTAL IMPACTS: 1 kg cold-formed aluminium sheet

Parameter	Unit	A1-A3	C2	C3	C4	D
Global warming potential	[kg CO ₂ eq.]	6.39E+0	5.94E-3	0.00E+0	9.65E-4	-4.44E+0
Depletion potential of the stratospheric ozone layer	[kg CFC11 eq.]	1.74E-10	1.63E-16	0.00E+0	2.15E-16	-6.18E-11
Acidification potential of land and water	[kg SO ₂ eq.]	3.02E-2	2.48E-5	0.00E+0	5.70E-6	-2.26E-2
Eutrophication potential	[kg (PO ₄) ³ eq.]	2.06E-3	6.33E-6	0.00E+0	7.88E-7	-1.44E-3
Formation potential for tropospheric ozone photochemical oxidants	[kg Ethene eq.]	1.52E-3	-9.26E-6	0.00E+0	4.43E-7	-1.20E-3
Abiotic depletion potential for non-fossil resources	[kg Sb eq.]	2.97E-6	4.91E-10	0.00E+0	3.70E-10	-2.16E-6
Abiotic depletion potential for fossil resources	[MJ]	7.18E+1	8.14E-2	0.00E+0	1.25E-2	-4.66E+1

RESULTS OF THE LCA – RESOURCE USE: 1 kg cold-formed aluminium sheet

Parameter	Unit	A1-A3	C2	C3	C4	D
Renewable primary energy as energy carrier	[MJ]	3.23E+1	4.50E-3	0.00E+0	1.61E-3	-2.48E+1
Renewable primary energy resources as material utilisation	[MJ]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
Total use of renewable primary energy resources	[MJ]	3.23E+1	4.50E-3	0.00E+0	1.61E-3	-2.48E+1
Non-renewable primary energy as energy carrier	[MJ]	8.32E+1	8.16E-2	0.00E+0	1.30E-2	-5.49E+1
Non-renewable primary energy resources as material utilisation	[MJ]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
Total use of non-renewable primary energy resources	[MJ]	8.32E+1	8.16E-2	0.00E+0	1.30E-2	-5.49E+1
Use of secondary materials	[kg]	3.94E-1	0.00E+0	0.00E+0	0.00E+0	0.00E+0
Use of renewable secondary fuels	[MJ]	1.77E-12	0.00E+0	0.00E+0	0.00E+0	0.00E+0
Use of non-renewable secondary fuels	[MJ]	2.08E-11	0.00E+0	0.00E+0	0.00E+0	0.00E+0
Use of net fresh water	[m³]	8.01E-2	8.30E-6	0.00E+0	2.47E-6	-6.30E-2

RESULTS OF THE LCA: OUTPUT FLOWS AND WASTE CATEGORIES: 1 kg cold-formed aluminium sheet

Parameter	Unit	A1-A3	C2	C3	C4	D
Hazardous waste disposal	[kg]	1.18E-7	4.72E-9	0.00E+0	2.23E-10	-3.86E-8
Non-hazardous waste disposal	[kg]	1.67E+0	6.84E-6	0.00E+0	6.08E-2	-1.34E+0
Radioactive waste disposal	[kg]	4.48E-3	1.12E-7	0.00E+0	1.86E-7	-3.27E-3
Components for reuse	[kg]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
Materials for recycling	[kg]	0.00E+0	0.00E+0	5.68E-1	0.00E+0	0.00E+0
Materials for energy recovery	[kg]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
Exported electrical energy	[MJ]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
Exported thermal energy	[MJ]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0

6. LCA: Interpretation

Modules A1-A3 bear the main environmental loads of the lifecycle. Pre-production provision for the manufacture of the cold-formed aluminium sheet dominates in all impact categories. The influence is to be classified as significant (> 50 %).

Compared to the old EPD from 2013, the global warming potential in the manufacturing phase is significantly reduced as approximately 43 % of secondary material is used in the cold-formed aluminium sheet. The environmental effects have been

reduced in all further impact categories through the increased secondary share. By contrast, the environmental effects of cold-forming are insignificant in all impact categories (< 10%).

The credit in the end-of-life results from the material recycling of the cold-formed aluminium sheet. The energy used for recycling aluminium is up to 95% less compared to primary manufacture.

7. Requisite evidence

The weathering of roof and façade products is subject to several influencing factors. In addition to the alloy and surface coating, the environment (industry, seaside, etc.) and the regional weather situation and local environmental influences are all influencing factors. The erosion of the surface can only be specifically measured on the respective object.

7.1 Evidence

Different evidence is relevant depending on the application.

8. References

/Ordinance on Biocidal Products/

EU Ordinance No. 528/2012 of the European Parliament and Council of 22nd May 2012 on the Provision on the Market and Use of Biocidal Products, 2012

/DIN 1306/

DIN 1306:1984-06 Density; concepts, presentation of values.

/DIN 4102/

DIN 4102:1998- 05, Fire behaviour of building materials and building components.

/EN 13501-1/

/DIN EN 13501-1:2010-01/, Fire classification of construction products and building elements.

/EN 1396/

DIN EN 1396:2015-06 Aluminium and aluminium alloys - Coil coated sheet and strip for general applications - Specifications.

/EN 1462/

DIN EN 1462:2004-12 Brackets for eaves gutters - Requirements and testing.

/EN 14782/

DIN EN 14782:2015-09 - Draft Self-supporting metal sheet for roofing, external cladding and internal lining - Product specification and requirements.

/EN 14783/

DIN EN 14783:2013-07 Fully supported metal sheet and strip for roofing, external cladding and internal lining - Product specification and requirements.

/EN 507/

DIN EN 507:2019-10 Roofing and cladding products from metal sheet - Specification for fully supported products of aluminium sheet.

/EN 573-3/

DIN EN 573- 3:2013- 12, Aluminium and aluminium alloys - Chemical composition and form of semi-finished products - Part 3: Chemical composition and form of products.

/EN 612/

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/European Waste Catalogue/

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/GaBi database/

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/GaBi 8/

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/ISO 14001/

DIN EN ISO 14001:2015- 11, Environmental management systems - Requirements with guidance on use (ISO 14001: 2015).

/ISO 45001/

ISO 45001:2018- 03, Occupational health and safety management systems - Requirements with guidance for use.

/ISO 50001/

ISO 50001:2018- 08, Energy management systems - Requirements with guidance for use.

/ISO 6892-1/

DIN EN ISO 6892-1:2020-06 Metallic materials - Tensile testing - Part 1: Method of test at room temperature.

/ISO 7345/

DIN EN ISO 7345:2018-07 Thermal performance of buildings and building components - Physical quantities and definitions.

/Kammer 2009/

Kammer 2009: Aluminium pocketbook 2009, 16th Edition, Dr.-Ing. C.Kammer, Aluminium-Verlag Marketing und Kommunikation GmbH, Düsseldorf.

/Candidate list/

European Chemicals Agency (ECHA), candidate list of substances of very high concern for authorisation: <https://echa.europa.eu/candidate-list-table> (Date: 16/07/2019; 201 entries)

/PCR Part A/

PCR Part A, calculation rules for the LCA and requirements of the project report, Version 1.7, Institut Bauen und Umwelt e.V., www.bau-umwelt.com, 2018

/PCR Part B/

PCR Part B: Requirements of the EPD for aluminium and aluminium alloy products, Version 1.6, Institut Bauen und Umwelt e.V., www.ibu-epd.com, 2017

/Directive 96/603/EG/

/Directive 96/603/EG/ Establishing the list of products belonging to Classes A "No contribution to fire" provided for in Decision 94/611/EC implementing Article 20 of Council Directive 89/106/EEC on construction products

/IBU 2016/

IBU (2016): General EPD programme instructions from Institut Bauen und Umwelt e.V. (IBU). Version 1.1, Institut Bauen und Umwelt e.V., Berlin.

/ISO 14025/

DIN EN /ISO 14025:2011-10/, Environmental labels and declarations - Type III environmental declarations - Principles and procedures.

/EN 15804/

/EN 15804:2012-04+A1 2013/, Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products.

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