Environmental Product Declaration

Global GreenTag^{CertTM} EPD Program

Compliant to ISO 14025

Infinity

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This Environmental Product Declaration (EPD) discloses potential environmental outcomes compliant with ISO 14025 for business to business communication. The Armstrong World Industries Infinity declared product was made by Armstrong Commercial Flooring in Australia from 2017 for sale with a 15 year warranty for use as floor covering in commercial and health care sectors.

Armstrong Commercial Flooring is a responsible environmental practice leader manufacturing best practice Australian-made resilient vinyl flooring.

The company is committed to protecting the environment through using resources intelligently and exercising environmental stewardship.

Its commitment is to a decreased environmental footprint overall.

Armstrong has a closed-loop flooring recycling program.

Reducing energy, water and waste and driving sustainable building by continued innovation it is also being a responsible partner in communities in which it operates.

Many agencies have certified Armstrong Flooring products as best environmental practice.

Armstrong's operating principles are to ensure employees' rights and morale, high safety standards and fair business relations.

Actively involved in socially beneficial programs Armstrong is a partner in several environmental and educational organisations.

Armstrong Commercial Flooring has certified ISO 9001 Quality Management and ISO 14001 Environmental Management System operations.

More information is at http://www.armstrong.com/

Figure 1 Infinity

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Different program EPDs may not be comparable as e.g. Australian transport is more than elsewhere. **Further explanatory information is found at** http://www.globalgreentag.com/ or contact: certification1@globalgreentag.com

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1. Details of This Declaration

Program Operator	GreenTag Global Pty Ltd hereafter called Global GreenTag noted at www.globalgreentag.com
EPD Number	AWF-2019-HOM-04
Date issue	5 July 2019
Validity	5 July 2022
Reference PCR	Compliant with Floor Coverings PCR:FC 2017
Time	Made and sold from 2017 for 20 years use
Geography	Made in Australia. Uses are assumed as for Australasia
Application	Commercial and Health Care building interiors
Declared unit	Infinity /kg cradle to gate
Functional unit	Twenty years use of Infinity 3kg/m^2 floorcovering cradle to grave

2. Product Characterisation

Definition	Armstrong Flooring Infinity floor covering for commercial and health care sectors
Standard	AS/NZS 4586:2013 Slip resistance classification of new pedestrian surface materials.

3. Verification of this Declaration

This EPD was approved on 05 07 2019 according to requirements of ISO14025 8.1.3b.

Role	Name	Position	Signature
PCR Review Chair	Murray Jones	Ecquate Pty Ltd CEO	11-07-2019
LCI & LCA Developer	Delwyn Jones	The Evah Institute CEO	11 07 2019
EPD Developer	Mathilde Vlieg	VliegLCA	5-7-2019
3rd Party LCI Verifier	Omar Biaz	Global GreenTag Lead Assessor and LCI Verifier	5/09/2019
Internal EPD Audit	David Baggs	Global GreenTag CEO & Program Director	06/09/19

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4. Base Material Origin and Detail

Table 1 lists key components by function, type, key supply chain operations, origin and % mass share.

Table 1 Base Material

Function	Component	Production	Origin	%
Filler	Limestone	Mine, Crush, Sieve & Haul	Australia	>40<60
Binder	Suspension PVC	Extract, Chlorinate, Polymerise	Pacific Rim	>40<60
Plasticiser	Dioctyl Terephthalate	Drill, Farm, Extract, Blend	Australia	>10<20
Stabiliser	Calcium Zinc Stearate	Mine, Farm, Press, Refine, Mill	Australia	>1<5
Durability	Thermoplastic Urethane	Drill, Farm, Refine, Polymerise	Singapore	>1<5
White	Titania	Mine, Digest, Separate, Coat	Australia	>1<5
Coating	Polyurethane	Farm, Drill, Extract, Polymerise	Singapore	<1.0
Stabiliser	Epoxidised Soy Oil	Farm, Press, Refine, Mill	Pacific Rim	<1.0
Antioxidant	Phosphite Chelator	Acquire, Refine, Polymerise	China	<1.0
Colour	Inorganic Pigment	Acquire, Recycle, Sieve, Mill	Global	<0.1
Colour	Organic Pigment	Drill, Extract, Sieve, Mill	Global	<0.1
Crosslinker	Polyaziridine	Acquire Extract, Polymerise, Mix	Singapore	<0.1
Adhesive	DPGME[1]	Drill, Extract, Mill, Polymerise	Pacific Rim	<0.1
Matte Agent	Silicates	Drill, Extract, Sieve, Mill	Pacific Rim	<0.1
Leveller	Acetylenic diol	Drill, Farm, Extract, Blend	Singapore	<0.1
Thickener	Urethane, Starch Water	Drill, Farm, Refine Polymerise	Global	<0.1

5. Packaging, Installation, Use & Disposal

Packaging	Cardboard forms & cartons, plastic wrap & strapping on reused pallets.
Service life	Residential and commercial refits vary but 20-year life is assumed typical.
Environmental Health & Safety	Apart from compliance to occupational and workplace health safety and environmental laws no additional personal protection is considered essential.
Scrap	Mill off-cuts are minimised. Installation scrap of 5% is assumed to landfill.
Clean & Maintain	The recommended cleaning and maintenance raise no ecosystem or human health concerns. Care and maintenance guides are on company websites.
Scenario	Weekly detergent spray, light mop, monthly wet machine scrub and cloth dry.
Recycling	Post-consumer & post-industrial scrap is reworked into new product.
Re-use	This study assumes 60% product is serviceable for reuse over 40 more years.
Disposal	It assumes 30% is recycled. Incineration is rare in Australia so none is modelled.

1 Dipropylene glycol methyl ether

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6. Whole of life Performance

Health Protection	The product does not contain levels of carcinogenic, toxic or hazardous substances that warrant ecological or human health concern cradle to grave. It passed the Ecospecifier Cautionary Assessment Process (ESCAP) and no issues or red-light concerns existed for product human or ecological toxicity.
Effluent	The LCI results and ESCAP raised no red-light concerns in emissions to water[2].
Waste	Cradle to grave waste to landfill was <0.01% hazardous in fuel supply chains.
Environmental Protection	Continuous improvement under the maker's certified ISO14001 EMS aims to avoid toxics, waste and pollution plus reduce their material and energy use.
Environmental Health Effects	Installed products are certified as having VOC's compliant with Green Star® IEQ VOC credits for indoor environment[3] quality credits. No other potential in-use impacts on environment or health are known.

7. Life Cycle Inventory Results

Table 2 is an inventory of gross mass water and energy use as impacts/m^2 functional unit for 20 years product use.

Table 2 Cradle to Grave Inventory of Flows/Functional Unit

Total Input use of	Unit	Result
Product Mass	kg	3.0
Embodied Water	kl	460
Gross Energy and Feedstock	MJ	278

8. Life Cycle Impact Results

Table 3 shows the Life Cycle Impact Assessment results/m^2 functional unit for 20 years product use.

Table 3 Cradle to Grave Potential Impact Results/ Functional Unit

Evaluation Category	Unit	Result
Global warming Potential	kg CO_{2e}	16.8
Ozone Depletion	kg $R11_e$	2.6E-07
Acidification	kg SO_{2e}	0.55
Ecosystem Quality Damages	PDF*m^2*yr	1.4E-04
Human Health Damages	DALY	1.5E-03
Fossil Fuel Depletion	$MJ_{surplus}$	12.8
Mineral Resource	$MJ_{surplus}$	0.21
EcoIndicator 99	ecopoint	0.95

2 In accordance with national standards in ANZECC Guideline For Fresh & Marine Water Quality (2000)
3 In accordance with national standards and practice

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9. Supply Chain Modelling

Processes to acquire, refine, transport, fabricate, coat, use, clean, repair, reuse and dispose of metal, masonry, ceramic, timber, glass, plastic and composites are modelled.

A flow chart in Figure 2 shows key product supply chain operations from cradle to fate including:

- Mining, extracting and refining resources to make commodities and packaging;
- Acquiring, cultivating, harvesting, extracting, refining produce and biomass;
- Fuel production to supply power and process energy and freight;
- Chemicals use in processing resources, intermediates and ancillaries;
- Process energy, fuel and freight of resources, intermediates and ancillaries;
- Use, cleaning, recoating, repair, recycling, re-use and landfill, as well as
- Infrastructure process energy transformed and material wear loss e.g. tyres.

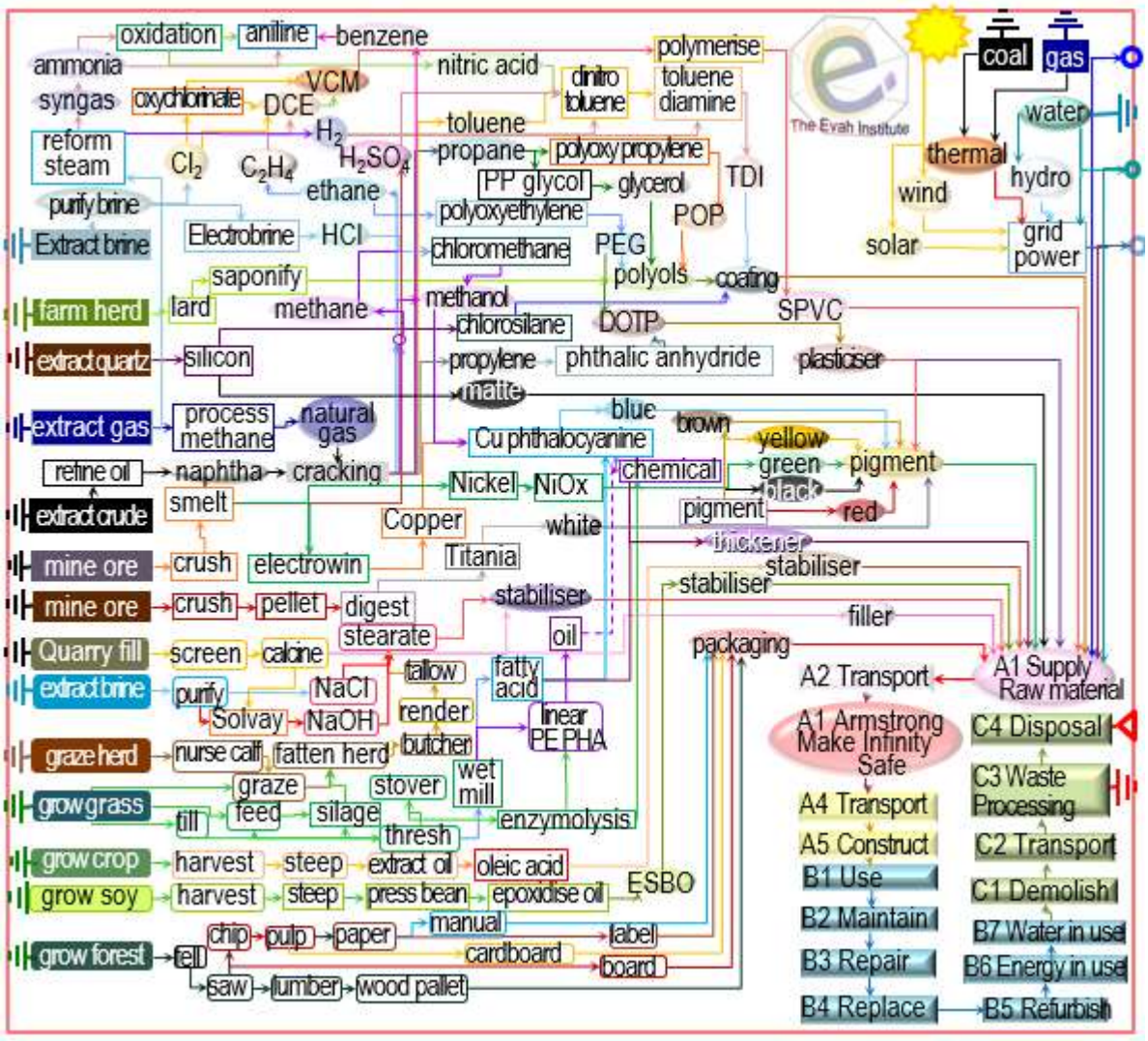

Figure 2 Major Product Operations

10. Life Cycle Assessment Method

LCA Author	The Evah Institute as described at www.evah.com.au
Study Period	Factory data was collected from 2016 to 2018
LCA Method	Compliant with ISO 14040 and ISO 14044 Standards
LCIA method	EcoIndicator 99 Life Cycle Impact (LCIA) Assessment
Scope	Cradle to Fate including all supply chain phases and stages depicted in Figure 2.
Phases	The LCA covered all known flows in all known stages cradle to end of life fate.
Assumptions	Typical use is to Australian Facility Management professional practice.
Scenarios	Use, cleaning, maintenance plus disposal and re-use were scenario-based using Facility Management Association denoted and published typical operations.
System Boundaries	The LCA system boundary depicted in Figure 3 includes all operations A1-A3 production with upstream supply & transport; A4 package & deliver & A5 construct; B1 use with cleaning, B2 maintain, B3 repair B5 refurbish, C1 demolish, C2 transport and C4 disposal.
Processes	All significant resource acquisition, water, fuel & energy use, power generation & distribution, freight, refining, intermediates, manufacture, scrap re-use, packing and dispatch, installation, use, maintenance, landfill waste and emission flows from all supply chain operations involved to make, pack and install the product are included.

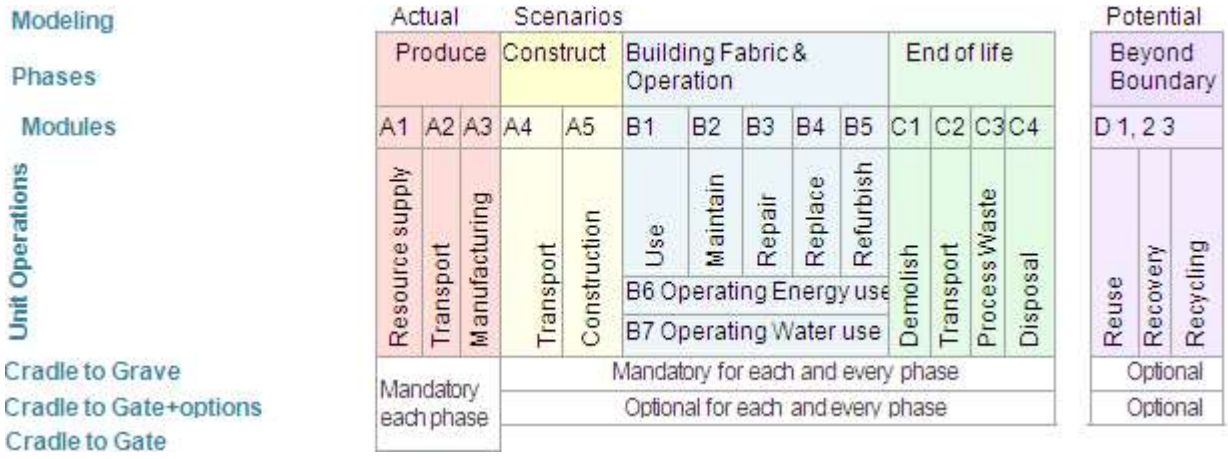

Figure 3 Phases and Stages Cradle to Grave

Evah industry databases cover all known domestic and global scope 1 and 2 operations. They exclude scope 3 burdens from capital facilities, equipment churn, noise and dehydration as well as incidental activities and employee commuting. The databases exist in top zones of commercial global modelling and calculating engines. Electricity supply models in active databases are updated annually. As each project is modelled and new data is available the databases are updated and audited by external Type 1 ecolabel certifiers. Quality control methods are applied to ensure:

- Coverage of place in time with all information[4] for each dataset noted, checked and updated;
- Consistency to Evah guidelines for all process technology, transport and energy demand;
- Completeness of modelling based on in-house reports, literature and industry reviews;
- Plausibility in 2-way checks of LCI input and output flows of data checked for validity, plus Mathematical correctness of all calculations in mass and energy balance cross checks.

4 Jones D G (2004) LCI Database for Commercial Building Report 2001-006-B-15 Icon.net, Australia

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11. Data Sources Representativeness and Quality

Primary data used for modelling the state of art of each operation includes all known process for:

- Technology sequences;
- Energy and water use;
- Landfill and effluent plus
- Reliance on raw and recycled material;
- High and reduced process emissions;
- Freight and distribution systems.

Primary data is sourced from clients, annual reports and their publications on corporate locations, logistics, technology use, market share, management systems, standards and commitment to improved environmental performance. Information on operations is also sourced from client:

- Supply chain mills, their technical manuals, corporate annual reports and sector experts, and
- Manufacturing specifications websites and factory site development licensed applications.

Background data is sourced from the International Energy Agency, IBISWorld, USGS Minerals, Franklin Associates, Boustead 6, Plastics Europe, CML2, Simapro 8, EcoInvent 3 and NREL USLCI model databases. Information on operations is also sourced from:

- Library, document, NPI and web searches, review papers, building manuals and
- Global Industry Association and Government reports on Best Available Technology (BAT).

For benchmarking, comparison and integrity checks inventory data is developed to represent BAT, business as usual and worst practice options with operations covering industry sector supply and infrastructure in Australia and overseas.

Such technology, performance and license conditions were modelled and evaluated across mining, farming, forestry, freight, infrastructure and manufacturing and building industry sectors since 1995.

As most sources do not provide estimates of accuracy, a pedigree matrix of uncertainty estimates to 95% confidence levels of geometric standard deviation[2] (σ_g) is used to define quality as in Table 4[5].

Table 4 Data Quality Parameters and Uncertainty (U)

Correlation	Metric σ_g	U ±0.01	U ±0.05	U ±0.10	U ±0.20	U ±0.30
Reliability	Reporting	site audit	expert verify	region	sector	academic
	Sample	>66% trend	>25% trend	>10% batch	>5% batch	<1% batch
Completion	Including	>50%	>25%	>10%	>5%	<5%
	Cut-off	0.01%w/w	0.05%w/w	0.1%w/w	0.5%w/w	1%w/w
Temporal	Data Age	<3 years	≤5 years	<10 years	<15 years	>16 years
	Duration	>3 years	<3 years	<2 years	1 year	<1 year
Geography	Focus	process	line	plant	corporate	sector
	Range	continent	nation	plant	line	process
Technology	Typology	actual	comparable	in class	convention	in sector

No data set with >±30% uncertainty is used without notation in the LCA as well as the EPD.

5 Evah Institute data quality control system accords with UNEP SETAC Global LCI Database Quality 2010 Guidelines

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12. Supply Chain Modelling Assumptions

Australian building sector rules and Evah assumptions applied are defined in Table 5.

Table 5 Scope Boundaries Assumptions and Metadata

Quality/Domain	National including Import and Export
Process Model	Typical industry practice with currently most common or best (BAT) technology
Resource flows	Regional data for resource mapping, fuels, energy, electricity and logistics
Temporal	Project data was collated from 2016 to 2018
Geography	Designated client, site, regional, national, Pacific Rim then European jurisdiction
Representation	Designated client, their suppliers and energy supply chains back to the cradle
Consistency	Model all operations by known given operations with closest proximity
Technology	Pacific Rim industry supply chain technology typical of 2016 to 2019
Functional Unit	Typical product usage with cleaning& disposal/m^2 over the set year service life
System Control	
Primary Sources	Clients and supplier mills, publications, websites, specifications & manuals
Other Sources	IEA 2019, GGT 2019, Boustead 2013, Simapro 2016, IBIS 2019, EcoInvent 2019
Data mix	Power grid and renewable shares updated to latest IEA 2019 reports
Operational	Company data for process performance, product share, waste and emissions
Logistics	Local data is used for power, fuel mix, water supply, logistics share & capacity
New Data Entry	VliegLCA, Evah Institute 2019; Global Green Tag Researchers 2019
Data Generator	Manufacturers, Evah Institute 2019; GGT 2019; Meta: IBIS 2019, Other pre 2019
Data Publisher	The Evah Institute Pty Ltd to Global GreenTag and designated client only
Persons input	All contributors cited in Evah & Global GreenTag records or websites
Data Flow & Mix	
System Boundary	Earth's cradle of all resource & emission flows to end of use, fitout or build life
System flows	All known from and to air, land, water and community sources & sinks
Capital inclusions	Natural stocks, industry stockpiles, capital wear, system losses and use
Arid Practice	Dry technology adopted; Water use is factored by 0.1 as for e.g. mining
Transportation	Distance >20% than EU; >20% fuel efficient larger vehicles, load & distance
Industrial	Company or industry sector data for manufacturing and minerals involved
Mining	All raw material extraction is based on Australian or Pacific Rim technology
Imported fuel	Mix is from nearest sources is e.g. UAE, SE Asia, Canada or New Zealand
Finishes	Processing inputs with finishing burdens are factored in. If not, that is denoted
Validation	
Accuracy	10th generation study is ± 5 to 15% uncertain due to some background data
Completeness	All significant operations are tracked and documented from the cradle to grave
Precision	Tracking of >90% flows applies a 90:10 rule sequentially to 99.9% and beyond
Allocation	%100 to co products on reaction stoichiometry by energetic or mass fraction
Burdens	All resource use from & emissions to community air land, water is included
Plausibility	Results are checked and benchmarked against BAT, BAU & worst practice
Sensitivity	Calculated U is reported & compared to libraries of Bath U RICE & EcoInvent 3.2
Validity Checks	Are made versus Plastics Europe, Ecobilan, GaBi & or Industry LCA Literature

13. References for this LCA & EPD

Australian & New Zealand (ANZECC) Guidelines For Fresh & Marine Water Quality (2000) http://www.environment.gov.au/water/quality/national-water-quality-management-strategy
Basel Convention (2011) Control of Transboundary Movement of Hazardous Waste & Disposal http://www.basel.int/portals/4/basel%20convention/docs/text/baselconventiontext-e.pdf
Boustead (2014) Model 6 LCI database http://www.boustead-consulting.co.uk/publicat.htm USA & UK
EcoInvent (2019) LCI Model 3 database http://www.ecoinvent.ch/ EcoInvent, Switzerland
Evah (2019) LCA Tools, Databases & Methodology at http://www.evah.com.au/tools.html
Franklin Associates (2019) US LCI Database http://www.fal.com/index.html Eastern Research Group US
GreenTag™ Certification (2019) http://www2.ecospecifier.org/services_offered/greentag_certification
GreenTag™ (2019) Product Category Rules http://www.globalgreentag.com/greentag-epd-program
Jones D., Mitchell. P. & Watson P. (2004) LCI Database for Australian Commercial Building Material: Report 2001-006-B-15, Sustainable Built Assets, CRC for Construction Innovation
Jones D.G et al. (2009) Chapter 3: Material Environmental LCA in Newton P et al., (eds) Technology, Design & Process Innovation in the Built Environment, Taylor & Francis, UK
IBISWorld (2014) Market Research, http://www.ibisworld.com.au/ IBISWorld Australia
International Energy Agency (2019) Energy Statistics http://www.iea.org/countries/membercountries/
ISO 9001:2008 Quality Management Systems Requirements
ISO 14001:2004 Environmental management systems: Requirements with guidance for use
ISO 14004:2004 EMS: General guidelines on principles, systems & support techniques
ISO 14015:2001 EMS: Environmental assessment of sites & organizations (EASO)
ISO 14020:2000 Environmental labels & declarations — General principles
ISO 14024:2009 Environmental labels & declarations -- Type I Principles & procedures
ISO 14025:2006 Environmental labelling & declarations Type III EPDs Principles & procedures
ISO 14031:1999 EM: Environmental performance evaluation: Guidelines
ISO 14040:2006 EM: Life cycle assessment (LCA): Principles & framework
ISO 14044:2006 EM: LCA: Requirement & guideline for data review: LCI; LCIA, Interpretation results
ISO 14064:2006 EM: Greenhouse Gases: Organisation & Project reporting, Validation & verification
ISO 15392:2008 Sustainability in building construction General principles
ISO 15686-1:2011 Buildings & constructed assets Service life planning Part 1: General principles
ISO 15686-2:2012 Buildings & constructed assets Service life (SL) planning Part 2: prediction
ISO 15686-8:2008 Buildings & constructed assets SL planning Part 8: Reference & estimation
ISO 21929-1:2011 Sustainability in building construction Sustainability indicators Part 1: Framework
ISO 21930:2007 Building construction: Sustainability, Environmental declaration of building products
ISO/TS 21931-1:2010 Sustainability in building construction: Framework for assessment, Part 1:
ISO 21932:2013 Sustainability in buildings and civil engineering works -- A review of terminology
Plastics Europe (2019) Portal http://www.plasticseurope.org/plastics-sustainability/eco-profiles.aspx
Pre (2016) SimaPro 8 Software, The Netherlands http://www.pre-sustainability.com/simapro-manuals
Myhre et al, 2013, Anthropogenic and Natural Radiative Forcing Chapter 8 in Stocker et al (eds.) Climate Change 2013, AR5 of the IPCC, Cambridge U Press UK. http://www.ipcc.ch/report/ar5/wg1/
Roache S. K. (2012) IMF Report WP/12/115 China's Impact on World Commodity Markets http://www.imf.org/external/pubs/ft/wp/2012/wp12115.pdf International Monetary Fund
UNEP (2016) Persistent Organic Pollutants http://www.chem.unep.ch/pops/ The UN
USLCI (2019) Life-Cycle Inventory Database https://www.lcacommons.gov/nrel/search, USA
U.S. Geological Survey National Minerals (2019) http://minerals.usgs.gov/minerals/pubs/country/ USA
US EPA (2016) Database of Sources of Environmental Releases of Dioxin like Compounds in U.S http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=20797 p 1-38, 6-9, USA

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14. Reviewers Report Conclusions

The independent LCA reviewer's report confirmed that the LCA project report and addition information addressed the EPD.

The verifier was not involved in developing the LCA or EPD and has no conflict of interests from their organisational position.

While the report is confidential its conclusions confirmed that documentation according to set ISO Standard requirements was provided including evidence from the:

The Evah Institute, the LCA developer:

a) Recipes of input and output data of unit processes used for LCA calculations √

b) Datasheets of measures, calculations, estimates and emails with sources as in Table 6 √

e) References to literature and databases from which data was extracted as noted in Table 6 √

g) Notes on supply chain processes and scenarios satisfying requirements of this Standard √

i) Embodied Energy shares as used for sensitivity analyses re ISO 14044:2006, 4.5.3.3 √

j) Proof percentages or figures in calculations in the end of life scenario √

k) Notes on proof of % and allocation calculations √

o) All operations covered Vs criteria and substantiation used to determine system boundaries √

Product Manufacturer in:

c) Specifications used to create the manufacturer's product √

d) Citations, references, specifications or regulations & data showing completeness √

f) Specification demonstrating that the building product can fulfil the intended use √

The Certifier Global GreenTag on:

l) Notes and calculation of averages of different locations yielding generic data √

m) Substantiating additional environmental information ISO 14025:2006, 7.2.4 √

n) Procedures for data collection, questionnaires, instructions, confidentiality deeds √

Requiring No Evidence:

As the EPD is cradle to grave as well as PCR compliant the independent reviewer did not need to:

h) Substantiate a few stages as all stages were substantiated √

p) Substantiate alternatives when no other choices and assumptions were applied √

q) Demonstrate consistency for few stages as the same rules in Tables 5 and 6 applied to all. √

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Further and explanatory information is found at

http://www.globalgreentag.com/

or contact:

certification1@globalgreentag.com

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