THERMOSHIELD® thermal insulation coating

Liquid Thermal Insulation

This Environmental Product Declaration (EPD) discloses potential environmental outcomes compliant with ISO 14025 for business to business communication.

The declared product Thermoshield Paint was made by Thermoshield Australia Pty Ltd in Australia in 2018. It is sold with a warranty for 10 years use.

Thermoshield Australia Pty Ltd is an Australian owned and operated company.

Thermoshield Liquid Thermal Insulation is proudly Australian made in Victoria since 1997.

It manufactures the liquid coating applied to reduce and avoid transfer of extreme heat conditions to indoor spaces.

Thermoshield Liquid Thermal Insulation facilitates improved ambient temperatures indoors to be cooler in summer and warmer in winter.

It avoids extra demand for additional powered air-conditioning systems so it is also cost effective.

Thermoshied Liquid Thermal Insulation is applied to commercial buildings, industrial equipment, homes, trucks and silos.

The product is packaged as depicted in Figure 1a.

The product contains hollow ceraminc beads that create dead air space that acts as insulation as depicted in Figure 1b.

Figure 1a Thermoshield Thermal Insulation

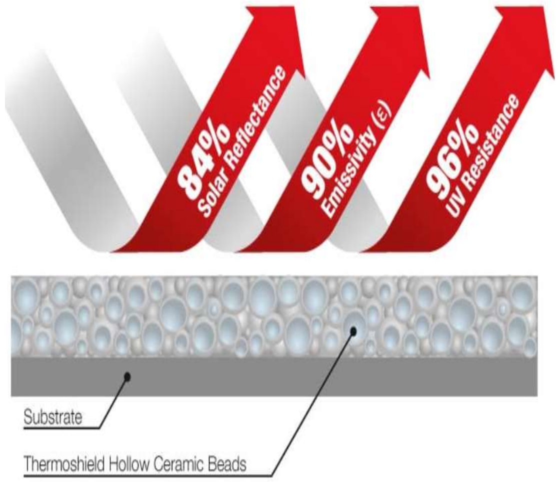

Figure 1b How Thermoshield Works

The product also contains corrosion inhibitors for longer-term metal cladding edge and substrate protection.

The specifiedd thickness Thermoshield coating has an R6.3 insulation value equivalent rating.

It is fire rated and compliant with section -J of the Australian Building Code.

The Thermoshield manufacuring site operates under management systems certified compliant to ISO-9001 for Quality Control and continuous performance improvement.

Company sites are also certified compliant to ISO 14001 and environmental improvement.

More advice and information. is available at www.thermoshield.com.au.

.

Liquid Thermal Insulation

Table of Contents

Heading **Page**

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: shloka@evah.com.au

THERMO SHIELD® thermal insulation coating

Liquid Thermal Insulation

1. Details of This Declaration

Program Operator	GreenTag Global Pty Ltd hereafter called Global GreenTag noted at www.globalgreentag.com
EPD Number	THE-PAI-01-2019
Date issue	7th Dec 2019
Validity	7th Dec 2022
Reference PCR	Compliant with Thermal Insulation PCR: TIN 2017
Time	Made and sold from 2017 to 2019
Geography	Made in Australia. Uses are assumed as for Australasia
Application	Exterior function in residential, commercial and industrial buildings
Declared unit	Thermoshield Liquid Thermal Insulation 1kg dry mass cradle to gate
Functional unit	Thermoshield Insulation 0.5kg/m^2 coating for 10years, cradle to end of life.
Additional information	As the coating weathers, corrosion inhibitors protect the substrate. Rain washing provides free maintenance service. After 10 years recoating is recommended after a wash-down and sanding to remove debris. So, no additional use, maintenance and disposal phase operations are required or included in this declaration. The original coating continues to contribute its insulating value.

2. Product Characterisation

Definition	Thermoshield Liquid Thermal Insulation for building exteriors in residential, commercial and industrial sectors

3. Verification of this Declaration

This EPD was approved on 7th December 2019 according to requirements of ISO14025 8.1.3b.

Role	Name	Position	Signature
PCR Review Chair	Murray Jones	Ecquate Pty Ltd CEO	M Jones 07-12-2019
LCI & LCIA Developer	Delwyn Jones	The Evah Institute CEO	Delwyn Jones 07 12 2019
EPD Developer	Shloka Ashar	Sustainability Studio Principal	S Ashar 10-12-2019
3rd Party LCI Verifier	Mathilde Vlieg	VliegLCA Principal	amm Vlieg 11 12 2019

THERMOSHIELD® thermal insulation coating

Liquid Thermal Insulation

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	Name	Supply Chain Operations	Source	% Range
Vehicle	Deionised Water	Catch, Sanitise, Pump, Deionise	Victoria	>40<50
Binder	Acrylic Copolymer	Drill, Extract, Polymerise	Australia	>20<30
White Fill	Powdered Limestone	Mine, Crush, Sieve, Haul	Australia	≥10 <20
Pigment	Titanium Dioxide	Mine, Digest, Precipitate, Mill, Coat	Australia	≥5 <10
Rust Inhibitor	Zinc Phosphate	Mine, Reclaim, Digest, Precipitate, Mill	Victoria	≥4 <10
Insulation	Glass Beads	Mine, Acquire, Refine, Fuse, Spheres	Victoria	≥3 <10
Carrier	Ester Alcohol	Drill, Extract, Distil, Esterify	USA	≥1.5 <5
Emulsifier	Polypropylene Glycol	Drill, Refine, Extract, Polymerise	Victoria	≥1.0 <2
Thickener	Sodium Acrylate	Farm, Extract, Polymerise	UK	≥1.0 <2
Preservative	Proprietary Fungicide	Drill, Extract, React, Refine, Blend	NSW	≥0.5 <1
Thickener	Hydoxyethyl Cellulose	Farm, Extract, Polymerise	Victoria	≥0.4 <1
Antioxidant	Ammonia	Extract, React, Refine	NSW	≥0.2 <1
Defoamer	Silicones	Acquire, Refine, Polymerise	UK	≥0.2 <1

5. Packaging, Installation, Use & Disposal

Packaging	Cans, cardboard forms & cartons, plastic wrap & strapping on reused pallets.
Service life	10-year life is assumed.
Environmental Health & Safety	Apart from compliance to occupational and workplace health safety and environmental laws no additional personal protection is considered essential.
Scrap	Less than 5% is assumed to landfill at any stage reported.
Clean & Maintain	No extra cleaning and maintenance operations are required or included in this declaration.
Recycling	Most post-consumer scrap remains intact under new product.
Re-use	This study assumes 90% product is serviceable for reuse over 10 more years.
Disposal	Incineration is rare in Australia so none is modelled.

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 fate.
Effluent	The LCI results raised no concerns in emissions to water[1].
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.

1 In accordance with national standards in ANZECC Guideline for Fresh & Marine Water Quality (2000)

THERMO SHIELD
thermal insulation coating

Liquid Thermal Insulation

7. Life Cycle Inventory Results Cradle to Gate

Table 2a is an inventory of material and energy use.

Table 2a Energy Inputs/kg

Total Input use of	Unit	Result
Primary Renewable Energy Not Feedstock	MJ_{ncv}	0.22
Renewable Secondary Fuels	MJ_{ncv}	8.4E-02
Primary Energy Renewable Feedstock Material	MJ_{ncv}	0.05
Total Primary Renewable Energy Resources	MJ_{ncv}	0.27
Non-Renewable Secondary Fuels	MJ_{ncv}	3.3E-04
Primary Energy Non-Renewable Not Feedstock	MJ_{ncv}	12
Non-Renewable Primary Energy Feedstock	MJ_{ncv}	5.7
Total Non-Renewable Primary Energy Resources	MJ_{ncv}	18

Table 2b shows resource inputs and output.

Table 2a Resource Inputs and Outputs/kg

Total Input use of	Unit	Result
Net Fresh Water	l	13
Secondary Water	l	4.3
Secondary Material	kg	6.8E-03
Hazardous waste disposed	kg	0.02
Non- Hazardous waste disposed	kg	0.20
Radioactive Waste disposed	kg	0.00
Components for reuse	kg	0.03
Material for recycling	kg	0.02
Material for Energy recovery	kg	3.6E-03
Exported electrical energy	MJ_{ncv}	0.00
Exported Thermal Energy	MJ_{ncv}	8.1E-06

THERMOSHIELD® thermal insulation coating

Liquid Thermal Insulation

8. Life Cycle Impact Results

Table 3 shows the Life Cycle Impact Assessment results/ m^2 functional unit for 10 years product use.

Table 3 Life Cycle Impacts ReCiPe Method Results/ m^2 Cradle to Fate

Impact Potential	Unit	Result
Global Warming (100year Horizon)	kg CO_{2eq100}	1.07
Stratospheric Ozone Depletion	kg $R11_{eq}$	3.7E-11
Acidification of Land and Water	kg SO_{2eq}	1.2E-02
Eutrophication Potential	kg $PO^{3-}{}_{4eq}$	5.9E-04
Photochemical Ozone Creation	kg C_2H_{4eq}	1.4E-03
Ecosystem Quality Damages	PDF*m^2*yr	2.2E-05
Human Health Damages	DALY	9.7E-05
Abiotic Resource Depletion Fossil Fuel	MJ_{ncv}	1.0
Abiotic Resource Depletion Minerals	MJ_{ncv}	1.0E-03
Abiotic Resource Depletion Elemental	Sb_{eq}	6.1E-03

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.

These include:

- 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.

THERMOSHIELD® thermal insulation coating

Liquid Thermal Insulation

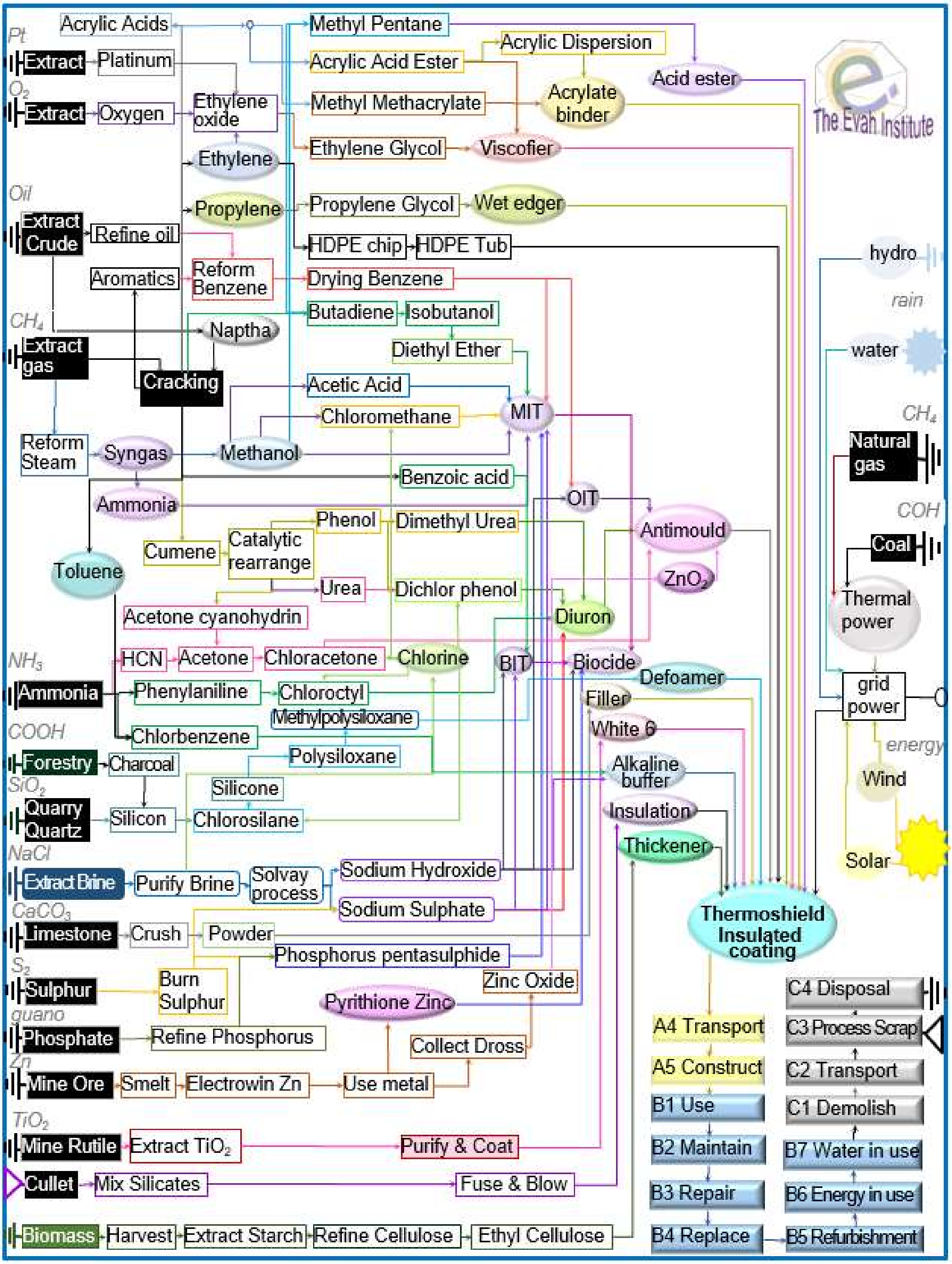

Figure 2 Major Product Operations

10. Life Cycle Assessment Method

LCA Author	The Evah Institute as described at www.evah.com.au
Study Period	Factory data was collected from 2017 to 2019
LCA Method	Compliant with ISO 14040 and ISO 14044 Standards
LCIA method	ReCiPe 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 to make, pack and install the product are included.

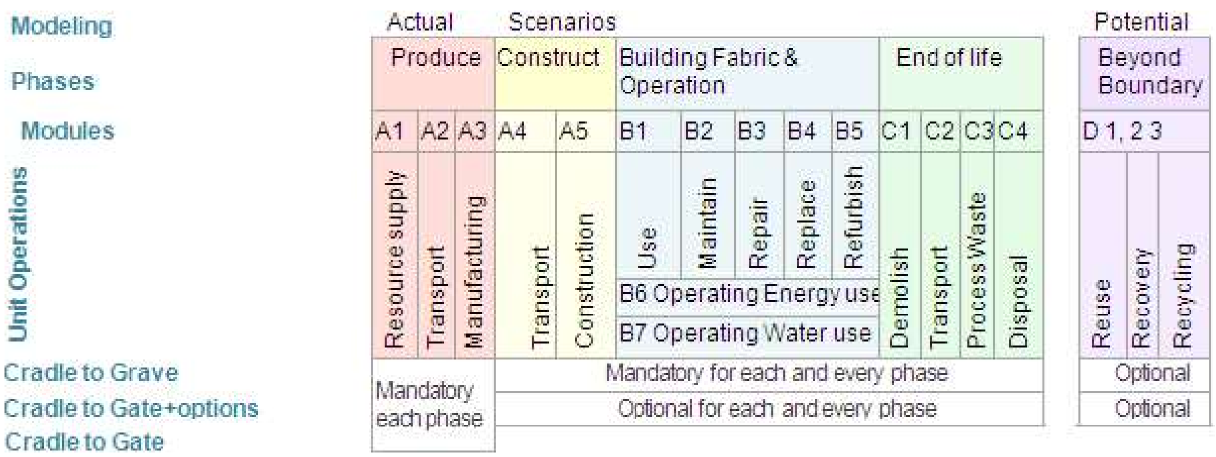

Figure 3 Phases and Stages Cradle to Fate

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 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.

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[2].

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.

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

12. Supply Chain Modelling Assumptions

Global 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 2019
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	10^{th} generation study is ± 5 to 15% uncertain due to reliability of background data
Completeness	All significant operations are tracked and documented from the cradle to fate
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
Validity Checks	Are made versus Plastics Europe, Ecobilan, GaBi & or Industry LCA literature

THERMO SHIELD
thermal insulation coating

Liquid Thermal Insulation

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 (2016) 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

THERMO SHIELD thermal insulation coating

Liquid Thermal Insulation

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 5 √

e) References to literature and databases from which data was extracted as noted in Table 5 √

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 fate 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 4 and 5 applied to all. √