

Global GreenTag^{Cert™}

INTERNATIONAL EPD PROGRAM

PCR SIP: 2018



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ENVIRONMENTAL PRODUCT DECLARATION (EPD) PROGRAM

Type III EPDs

Product Category Rules (PCR) based on Life Cycle Analysis

STRUCTURAL INSULATED PANELS PCR 2017-2020

PCR SIP 2017-2020

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Section One

I. Application

This document is set out for two parts. Section one applies to a particular product category while section two pertains to all product categories. The latter is called the PCR master document. When new product assessments are needed, section one is revised and new rules defined for that category. As environmental health legislation is enacted, rules in the master document shall be revised with file name and revisions clearly marked so all such PCRs are identifiable for those points in time.

II. Authors

These product category rules, compiled by Delwyn Jones, Director Sustainability, The Evah Institute a Division of Ecquate Pty Ltd and Shloka Ashar, Product Certifier, Global GreenTag have been customised for this product class by Nana Bortsie-Aryee, Product Certifier, Global GreenTag. Rules were approved for Global GreenTag adoption by David Baggs, Program Director, Global GreenTag International Pty Ltd.

III. Terms of Validity

- Product Category Rules Structural Insulated Panels PCR SIP: 2018
- PCR issue date 09/02/2018 and
- Period of validity to 09/02/2021

IV. Goal

The intended goal of this PCR is a guide for developing EPDs for sets of defined product with specified functionality. Users include specifiers, manufacturers and stakeholders. It is valid for all such defined products and related components according to standards and technical approvals herein.

V. Product Set Definition

The declared product set includes structural insulated panels plus fixings of a core of insulation foam sandwiched between two facing sheets suitable for interior and exterior applications of:

- Cladding, ceiling, walling, flooring and controlled environment functions made of:
- Ceramic, metal, mineral, polymer, wood or fibre layers bonded physically or chemically to a
- Mineral, cement, polymer, foam, pulp, etc fibrous or woven core offering characteristic
- Corrosion and or moisture resistance plus acoustic and or thermal insulation properties.

Specifications must conform to relevant International and Australian Standards including:

- EN 14509:2006 Self-supporting double skin metal faced insulating panels. Factory made products.
- BCA Guide - Specification B1.2 Design of Buildings in Cyclonic Areas.
- BCA section C1.10a Fire Hazard Properties – Floors, Walls and Ceilings.
- ISO/WD 17738-1 Exterior insulation and finish systems;
- ISO 12576:2001 Insulating material for buildings Conformity;
- ANSI/APA PRS 610.1-2013 Standard for Performance-Rated Structural Insulated Panels in Wall Applications.

System outcomes and results are declared per kg/m² and reflect product performance at reference conditions of strength, wear, temperature and humidity defined by 14025:2006, 6.7.

VI. Declared Units

The declared unit is a structural insulated panel for commercial, industrial or residential buildings.

VII. Functional Units

Here the functional unit is 60 years use of structural insulated panel /m² floor area cradle to grave.

Section Two

1. Introduction

Building and construction stakeholders seek information to enable decision making on environmental issues. This is now supported by initiatives including ecolabels and environmental product declarations (EPD) and Building Product Declarations (EBD). Stakeholders need clear, truthful and unbiased guidance. Expressing information with consistent meaning and quality is vital so it is imperative that EPDs and ecolabels be founded on life-cycle inventory (LCI) and related information.

Product category rules (PCR) aim to guide users developing EPDs according to established standards. These rules were compiled by Delwyn Jones, Director Sustainability, The Evah Institute a Division of Ecquate Pty Ltd and Shloka Ashar, Product Certifier, Global GreenTag. They were approved for Global GreenTag adoption by David Baggs, Program Director, Global GreenTag International Pty Ltd.

2. Background

These rules are intended for clients and stakeholders of Global GreenTag^{Cert™} and the Evah Institute working to develop valid EPDs. They are to cover all environmental aspects considered across all building product types under assessment. A PCR will be valid for all such product and buildings according to prevailing AS/NZS performance standards in each product type and exposure. This PCR was developed to comply with provisions of:

- ISO 14040: 2006 standards, Environmental management, Life cycle assessment (LCA);
- ISO 14025: 2006 Environmental labelling and declarations Type III environmental declarations, Principles and procedures;
- EN 15804:2012+A1:2013 re Sustainability of Construction Works, General Principles
- ISO 21930: 2007 Building construction: Sustainability in building construction, Environmental declaration of building products;

It is based on building materials:

- Environmental and human health assessment carried out in databases held at The Evah Institute 2008 to 2016 of >4000 products in which manufacturers participated.
- LCA study carried out in Construction Innovation Cooperative Research Centre's LCADesign development projects 2001 to 2009 in which 28 cross sector industry agencies participated.

The EPD shall present key data reported in life cycle phases of acquisition, manufacturing, construction, in-use and disposition plus gross data aggregated across all phases cradle to grave. Where data is lacking it may be based on fewer phases (information modules) as in ISO 21930:2007 clause 5.5. Comparability of EPDs shall be in accordance with ISO 14025, clause 4 and 5.6 needs.

3. Program Operator

The PCR Program Operator is Global GreenTag International Pty Ltd, ABN 44600051554, PO Box 311 Cannon Hill QLD 4170 Australia, Telephone+ 617 3399 9686, www.globalgreentag.com, Email admin@globalgreentag.com

The PCR Moderator responsible for the master document is Murray Jones, Director, Ecquate ABN15129886675, PO Box 123 Thirroul NSW 2515 Australia, Telephone + 617 3103 4979 <http://www.evah.com.au>, Email murrayjones@internode.on.net.

4. Period of Validity

Section 2 of this document is valid from 22/02/2017 for 3 years and then 22/02/2020. As new environmental health legislation is enacted the rules shall be revised with file name and revisions clearly marked so that the relevant PCRs are identifiable for those points in time.

5. Normative References

Normative references applicable to this EPD are listed in Appendix A and related methodology references are listed in Appendix B. International Standards for environmental labelling are:

- General principles: ISO 14020;
- Self-declared environmental claims, type II environmental labelling (ISO 14021), as well as
- Principles and procedures of environmental labels and declarations, types I and III environmental labelling e.g. in ISO 14024 and ISO 14025.

The ISO 21930:2007(E) standard covering environmental aspects is one of a suite including ISO:

- 15392 Sustainability in building construction: General principles;
- 21932 Buildings and constructed assets: Sustainability in building construction: Terminology;
- /TS 21929-1 Sustainability in building construction: Sustainability indicators Part 1 Framework;
- 21930 Sustainability in building construction: Environmental declaration of building products;
- /TS 21931-1 Sustainability in building construction: Framework for methods of assessment for environmental performance of construction works: Part 1: Buildings.

6. Scope

These principles and framework are according to ISO 21930 for product category rules and reference service life in buildings. They form a basis for programs leading to type III product EPDs conforming to ISO 14025. They contain specifications and requirements that complement ISO 14025 and provide a framework for PCR compliance as defined in ISO 14025 for type III EPDs and encompass the requirements of EN 15804.

7. Goal

The intended goal is a guideline for developing EPDs for interior and exterior building product applications. Users will be specifiers, manufacturers and other interested parties. It is valid for all such products and related components according to standards and technical approvals herein.

8. Definitions

Applicable terms in ISO 21932, 6707-1, 14001, 14025, 14040, 14050 and EN 15804 are:

- a) Complementary ancillary products: One that enables product functionality e.g. fasteners.
- b) Products, goods or service: Parts, assembly or elements used in building or works life cycle.
- c) Characterisation factors: To convert LCI result to a common impact, damage or benefit unit.
- d) Declared unit: Reference where building-level function and life cycle scenario is unknown.
- e) Functional unit: A reference unit to quantify system performance for an LCA in an EPD.
- f) Gate: Dispatch point prior to freight to subsequent process, distributor, factory or site.
- g) Module of information: Partial LCI and unit process set used in an EPD of limited phases.
- h) Non-renewable resource: One that is finite in amount and exhaustible at current use rates.
- i) Product category rules review process: When a third party verifies PCRs.
- j) Product category group: A product class deemed to perform equivalent functions.
- k) PCRs: Documented sets of conditions and guidelines covering type III EPDs.
- l) Reference service life: Performance period applicable to functional and declared units.
- m) Renewable resource: Biotic ones replenishable with good stewardship e.g. forests and fauna.
- n) Secondary fuel: Fuel derived from primary feedstock or fuel e.g. diesel.
- o) Third party: Person or body recognised as independent but knowledgeable about concerns.
- p) Life cycle assessment (LCA): Model system life flows and environmental impact [ISO 14040].
- q) Type III EPD: ISO 14040 & 14044 compliant declaration of parameters, LCA and LCIA results.
- r) Waste substance: Scrap to be disposed of not sold as defined by the 1989 Basel Convention.

- s) *Système international (SI)* units: Accepted metrics convention e.g. energy in MegaJoule (MJ)

9. Identifications in Declaration

EPDs shall clearly show the company and organisation's legal name and production sites. Corporate governance information shall be declared on quality, environmental management and stewardship according to ISO14001, EMAS, The Natural Step and other systems.

Product descriptions shall enable users to identify it unambiguously. Characterisation includes:

- Identification by brand, trade and technical name plus style or colourways;
- Specification of type and or unique production code;
- A true image or technical drawing of the product;
- Main technical data and properties according to key national standards to be specified;
- Flow diagram of the main production processes according to the declaration's scope.

10. Substances for Declaration

The finished product's main material components including packaging shall be declared. Substances officially classified according to national and international regulation as hazardous shall be stated, declared by weight %, CAS Number and Risk Phrases notifying health hazards. According to jurisdiction, chemical declaration requirements such as the UN GHS shall apply.

11. Commercial in Confidence

Confidential product-specific data restricted because of competitive forces, intellectual property rights or similar legal restrictions are not publicly declared. Where information of content could affect patent or company secrets, a well defined list of their functions, Hazard Statement Categorisation and weight % is sufficient.

12. Product Group Definition

For each EPD the product group is separately specified according to unique functionality considering functional or declared unit in Part 1 of this PCR. Performance outcomes for those products to meet International and Australian Standards must also be stipulated in that Part 1.

13. General

These EPDs are based on LCI, LCA and additional environmental information for planning and assessment purposes. In addition to ISO 21930:2007(E) specifications and requirements the principles and procedures in ISO 14020, ISO 14025 and ISO 15392 shall apply.

14. Objectives

The overall goal of EPDs is uptake of lower environmental impact supply through communicating true, verifiable and accurate information to stimulate market-driven, continuous improvement. This document aims to ensure transparency across all applicable methods to develop a consistent and robust set of PCR's that account for all environmental impacts and benefits.

15. Stakeholders

The PCR shall include an open, participatory consultation process developed with interested parties including material suppliers, manufacturers, trade associations, purchasers, users, consumers, non-governmental organisations, public agencies plus independent parties and certification bodies. Reasonable efforts to achieve a consensus throughout shall be documented.

16. Responsibilities

Program operators shall ensure consultation in program operation plus credibility and transparency in outcomes. The manufacturer that owns the data takes liability and responsibility for the EPD and no one else is authorised to declare the product EPD. The development of these EPDs is voluntary and based on the Type III EPD program.

The manufacturer or agent, with legal responsibility for product branding, quality and compliance to occupant health, safety and environmental performance standards, owns the data and takes liability and responsibility for the EPD. No one else is authorised to declare the EPD without the Manufacturer’s written permission.

17. Communications

Product information is intended for business-to-business communication to provide measurable and verifiable input for assessment of overall building environmental performance. However, for business-to-consumer communication to market and users, EPDs shall follow ISO 14025:2006 Clause 9 provisions. Users setting up type III EPD programs are both information providers and users.

18. Methodology

This PCR framework accords with ISO 14025:2006 to provide guidance, rules and needs governing EPD preparation based on LCA and LCI conducted according to ISO 14040 and 14044.

19. Part Use of Average Data

This PCR permits an EPD partly-based on average data where omissions of significant environmental aspects or phases shall be documented and justified as in ISO 14001 and 14004. Where information is lacking this too shall be declared along with the means to deal with such gaps.

20. Phases for Inclusion

All significant environmental aspects shall be considered with cradle to grave information divided as:

- Production from raw material supply, transport, manufacture and all inputs from the cradle;
- Design and construction from transport to site and installation/construction;
- In-use including maintenance replacement, refurbishment and all transport plus
- Disposition including deconstruction, reuse, demolition, recycling disposal and all transport.

21. Information Module Phases

By declaring combined life-cycle impacts the EPD shall provide information for assessing environmental performance. Figure 1 shows cradle to grave phases including production, installation, use and maintenance, replacement, deconstruction and disposition. Declarations covering all stages cradle-to-grave are subdivided into modules A, B, C and D.

Phase A-C	A Produce			A Construct		B Use Built Fabric Operate					C End of life				D Beyond					
Stages	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Modules	Acquire Resources &refine material			Deliver, Unpack & dispatch/packing		Product Use					Operating Energy		Deconstruct & Sort				Potential Recovery			
Operations	Dispatch, Transport, Ship & deliver			Prep, Build, Install, Scrap & Dispatch		Clean & Maintain					Operating Water		Transport to Depot				Potential Reuse			
Scope	Fabricate, Finish & Pack product					Repair Product							Process Scrap				Potential Recycle			
						Replace Product							Disposal in Landfill				Potential Upcycled			
						Refurbish Product														
C ₂ Gate	Mandatory 1,2,3			Usual 4,5		Usual 6 to 10					Optional		Usual 13-16				Optional 17-20			
C ₂ Gate +	Mandatory 1,2,3			Mandatory 4,5		Mandatory 6 to 10					Mandatory		Mandatory 13-16				Optional 17-20			
C ₂ Grave	Mandatory 1,2,3																			

Figure 1 Information Modules

Results may be declared as one or aggregated in modules of Production A1-3, Construction A4-5; Use B6-12 and note if 11-12 are zero; End-of-life C13-16. Benefits and loads beyond are optional.

As some information may be unknown and multi functionality can obscure exact use and disposal, where justified declarations may cover fewer phases e.g. cradle to gate based on information modules. This shall be stated and expressed per declared unit.

22. Additional Environmental Information

Additional information shall also be provided on:

- Issues of biodiversity, human and environmental toxicity and geography at any phase;
- Data significant for building product performance;
- Organisational management systems and where such certification can be viewed;
- Related programs and where such advice and verification can be viewed;
- Activity participation as in recycling or recovery programs and where details can be obtained;
- LCA-derived result not typically communicated in EPD formats;
- Instructions and limits for efficient use;
- Human health plus ecosystem hazards and risk assessment considering:
- Significant absent or present material as described in SO 14021:1999, 5.4 and 5.7r;
- Management of waste preferable options and
- Potential improvements and recovery at disposition i.e. recycled content or recycling rates.

23. Responsibility and Harmonisation

The Evah Institute is responsible for this PCR and consultation with interested parties to enable effective consideration of manufacturers' information on e.g. state-of-the-art, demolition and recycling. It identifies rules to harmonise LCA goal, scope and data aggregation with additional environmental information. It determines phases for inclusion, parameters to be covered and how they shall be collated and reported. Rules as in ISO 14025:2006, 6.7.1 shall address:

- a) Instructions for producing LCA and LCI data plus additional environmental information;
- b) Instructions on the content and format of the declaration;
- c) Product category definition and description such as function, technical performance and use;
- d) Phases covered or identification of missing phases where it is not cradle to grave;
- e) Period of validity is 3 years, PCR start date, file name and revision number.
- f) LCA goal and scope definition in accordance with ISO 14040 and ISO 14044, including:
 - Use of SI units along with functional and declared units plus the system boundary;
 - Description of data, source, date, quality, input and output inclusion and exclusion criteria and
 - Uncertainty in cover, precision, completeness, representation, consistency and reproducibility.
- g) Inventory analysis according to ISO 14044, including methods for:
 - Data collection and calculation procedures;
 - Allocation of material and energy flows and releases and
 - Actual end-of-life recycling rate as well as recycled content.
- h) Outcome category selection and citing of calculation rules applied;
- i) Predetermined parameters for reporting LCA results as LCI data and LCIA category indicators;
- j) Declaration of specific substances affecting human or environment health at each phase, and
- k) Need to include hazard and risk information/methods according to ISO 14025:2006, 7.2.3.
- l) Inclusion of all packaging and declaration of fate scenario selected.

24. Product Categorisation

At the highest level, all building products belong to the same category but subcategories are defined for classes with comparable specification where the same functional or declared unit applies. During consultation, The Evah Institute shall ensure that product categories are transparently defined and any definition of category should be valid over a reasonable period.

25. Functional and Declared Units

Quantitative normalisation is provided by the functional unit to compare equivalent function and by the declared unit to compare equivalent specification. These are detailed in Part 1 and below.

The functional unit is the reference for summing inputs, outputs, impacts and benefits per stage defined by ISO 14044:2006, 4.2.3.2 and normalises performance in an EPD. It is defined by element performance at reference conditions defined by ISO 14025:2006, 6.7 and relates service and technical life for integrating building performance. Shorter than service life, replacement cycles for overall performance are governed as in ISO 15686-1.

For part of a life cycle, the declared unit is based on durability for measured conditions of strength, wear, temperature and humidity. It relates typical functions and categories defined in ISO 14025:2006, 6.7. A declared unit is, e.g. flooring cradle to gate without cleaning.

26. Phases in System Boundaries

Systems shall be modelled to describe all inputs and outputs crossing its boundaries. System boundaries and all transport modes, capacity, distances and back/loads shall be documented in EPD project reports according to phase or stage. EPDs shall state if based on a full life cycle or which phases and transports are included or excluded. Production and construction shall be declared separately from in-use and disposition phase results. Construction and disposition phases shall be described in detail based on typical scenarios. Installation impacts from energy and material used shall be identified in the project report.

If data is unavailable, this shall be stated. Maintenance, replacement and refurbishment activities with impacts in use, operation or maintenance shall be identified. Reuse and recycling shall be treated in accordance with provisions of ISO 14044:2006, 4.3.4.3.

When assessing environmental performance technical information on energy and water savings etc. in-use is taken into account as in ISO/TS 21931-1. The PCR system boundaries encompass the following phase operations as depicted in Figure 2.

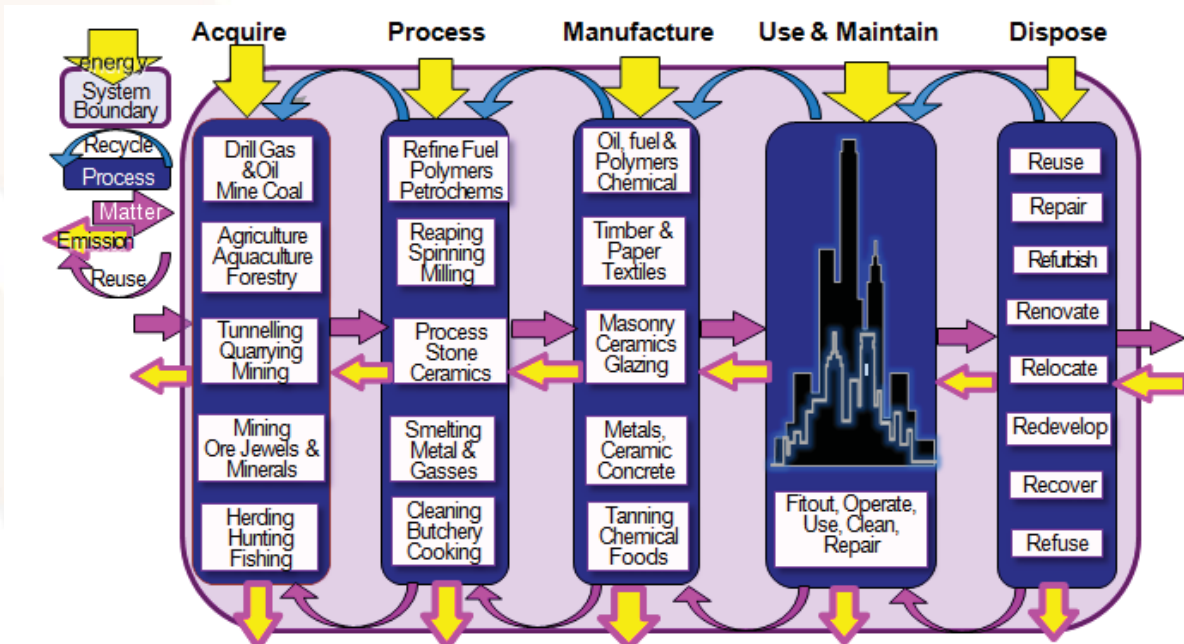


Figure 2 City Operation System Boundaries and Cradle to Grave Phases

A Production

- Raw material acquisition, processing and transport to manufacturer;
- Recycled and reused material acquisition and processing and transport to manufacturer, and

- Manufacture, fabrication, finishing, packaging and loading ready for dispatch.

B. Construction

- Transport of product from manufacturer to distributor and then to site;
- Unloading, unpacking and disposition of packaging to a fate scenario, and
- Installation on the site and testing of successful commissioning.

C. In-use or Operations

Product comparison shall be carried out only at building level with in-use phase scenario relating:

- Reference service life of 60 years;
- Product replacement number declared accordingly;
- Service life for other relevant applications defined;
- Maintenance for normal service life per manufacturers guidelines;
- Performance considering ISO 23045: Assessing Energy Efficiency of New Buildings;
- Product exposed considering ICS 91.140.30: Ventilation and air-conditioning systems;
- Emission of dust, Volatile Organic Compounds, Formaldehyde, toxic or notifiable compounds;
- Release to ground or water declared in accordance with national standards and practice, and
- Comparability in accordance with requirements of ISO 14025:2006, Clause 4 and 5.6.

D. Disposition

The disposition phase is treated as a scenario considering dismantling, demolition; transport from site to recycling, reuse and landfill. If transport is included in phases other than indicated, or if no transport information exists and assumptions are made, this shall be noted.

27. Data Descriptions

Table 1 lists sources that shall be used for generic data in jurisdictional markets. Use of specific or average flow-based data shall be documented and applied to background:

- Raw material acquisition and production denoted as specific or average and if so which;
- Product manufacture denoted as specific or average and if so what that relates to;
- Electricity mix based on National sources or averaged values if lacking site data.
- Hazardous waste in EU may be shown according to EU Directive 91/689/EEC & 75/442/EEC.

28. Data Collection

Data shall be flow-based and representative of temporal, geographical and technological needs with:

- Inputs and outputs of energy in MegaJoules and mass in tonne, kilogram, gram or milligram.
- Manufacturing annual values updated from previous years and background data ≤10year old;
- Geography of production sites in the calculation with representativeness of data documented;
- Data to represent technology in use and if unknown surrogates used must be documented;
- All data cited as to database and year of publication, and
- Transport mode, distance and load and thermal energy production documented.

29. Metadata

Data quality is characterised quantitatively, qualitatively and by collection and integration method. Transparency in verification requires that all data sources shall be documented in the project report. This shall document how data quality was formulated and relate its accuracy, precision and representativeness considering reliability of source, completeness across sites, duration in years, temporal age, geography reflected technology modelled and sample size. Data quality requirements shall be treated according to the provisions of ISO 14025 and ISO 14044:2006,

4.2.3.6. For an EPD based on average data its representativeness shall be justified. For environmental aspects of a product EPD any uses of generic data shall be justified.

30. Calculations

Flows used as input/ unit shall include amount of related accessories and auxiliary material.

Table 1 Example Databases

Local & Global Scope	Core Databases and LCI Dataset Reports	Published
Power Supply Fuel Mix	International Energy Agency www.iea.org/	2011-2017
EU Fuel & Petrochemicals	Plastic Manufacturers Europe www.plasticseurope.org/	1999-2017
Minerals Company sites	Corporate & Mineral Resources www.minerals.usgs.gov	2012-2017
Regional Databases	The Evah Institute http://www.evah.com.au/tools.html	2008-2017
Global Market Share	Industry & Company Research www.ibisworld.com/	2013-2017
Commodities & Trade	Corporate & Trade Resources www.minerals.usgs.gov	2012-2017
Industry Sectors	Boustead 6 www.boustead-consulting.co.uk/	2010-2013
EU & Global Polymers	PlasticsEurope http://www.plasticseurope.org/	1999-2017
Global Agriculture	Key Evah Institute Projects http://www.evah.com.au	2012-2017
Global Aluminium	European Aluminium Association http://www.eaa.org/	2005-2017
Global Biochemicals	Key Evah Institute Projects http://www.evah.com.au	2010-2017
Global Copper	ICA www.copperinfo.com/environment/index.html	2005-2017
Global Fertilisers	Key Evah Institute Projects http://www.evah.com.au	1995-2017
Global Pigment & Dye	Key Evah Institute Projects http://www.evah.com.au	1995-2017
Global Steel	International Iron & Steel Institute http://worldsteel.org	2005-2017
American Forest Product	Consortium Renewable Industrial Material www.corrim.org/	1999-2017
Global Forests & Paper Mills	Evah Institute Projects http://www.evah.com.au	2008-2017
US Polymers	Franklin Associates LCI Reports www.fal.com	1999-2017
US Fuel & Petrochemical	Franklin Associates LCI Reports www.fal.com	1999-2017
USA PC Recycled Feed	Franklin Associates LCI Reports www.fal.com	2012-2017
Building Supply Ecolabel	GlobalGreenTag™ www.globalgreentag.com or equal	2010-2017
Building Supply Generic	The Evah Institute www.evah.com.au/tools.html	2010-2017
Personal Care Ecolabel	GlobalGreenTag™ www.globalgreentag.com or equal	2012-2017
Personal Care Generic	The Evah Institute www.evah.com.au/tools.html	2012-2017
Supply Chain Geography	Google Maps, Local & Boustead Look Up Tables	2000-2017
Regional Fuel Mix Power	Clean Energy Council www.cleanenergycouncil.org.au	2012-2017
Australian Market Share	Industry & Company Research www.ibisworld.com/	2012-2017
Australian Sectors	Evah Institute Clients www.evah.com.au/clients.html	2000-2017
Australian Copper supply	All Suppliers Evah Institute http://www.evah.com.au	1995-2017
Australian SPVC supply	All Suppliers Evah Institute www.evah.com.au or equal	2010-2017
Australian Steel supply	Key Evah Institute Projects http://www.evah.com.au	1995-2017
Australian Wood Product	Australian Forest & Wood Product www.fwpa.com.au	2005-2017
Australian Forests & Mills	Major Evah Institute Projects http://www.evah.com.au	2005-2017
Australian Aluminium	Key Evah Institute Projects www.evah.com.au or equal	2000-2017
Australian Generic Supply	AusLCI http://alcas.asn.au/AusLCI/ or equal	2011-2017
Background Generic Swiss	EcolInvent 2.2 and 3 http://www.ecoinvent.org/	2000-2015

31. Inclusion

All hazardous and toxic substances shall be included in LCI with no cut-off. Surrogates shall be used to fill data gaps ≤1% mass or energy or impact share and justified in sensitivity analysis.

32. Exclusions

Operations that altogether do not contribute $\geq 0.1\%$ of gross mass, energy or impact may be omitted. Such cut-off rules shall be stated, defined for minimum influence on result obtained for relevant flows and justified by sensitivity analysis and based on relevance defined in ISO 14044.

33. Allocations

Data calculation in LCI employing allocation across multiple product systems shall comply with ISO 14044. Flows and emissions shall be partitioned amongst co-products and phases according to embodied mass, energy or stoichiometry and procedures clearly stated. Allocation associated with transport shall be based on volume/mass and where product volume restricts cargo load factor this in transport. As a last resort economic allocation may be applied provided the monetisation shall be proven to be $\leq \pm 10\%$ pro rata in 3 years prior and procedures clearly stated for verification.

34. Characterisation factors

Factors used to calculate environmental impacts shall be from Table 2 or documented in the project report as well as the EPD for verification, third party audit and stakeholder information.

35. Reporting

EPD documentation involves manufacturers providing data to practitioners for LCA and EPD development, auditing and verification. Together an LCA summary and addendums become the report to meet needs of EPD contents as in Section 8 Definitions and conform to ISO 14044:2006, Clause 6 3rd party report requirements and show LCA results included characterise according to the following as listed in Table 2 for verification.

36. Project Documentation

Under confidentiality deeds project reports shall be made available to the certifier and verifier to ensure it meets ISO 14025:2006, 7.2.2, 7.2.3 and 7.2.4 provisions. LCA data shall be included on:

- a) Unit process, input and output data used in LCI calculations;
- b) Key measurements, calculations, estimates, correspondence and references used in the LCA;
- c) References to literature and databases from which data was extracted;
- d) Data used to carry out the sensitivity analyses to satisfy ISO 14044:2006, 4.5.3.3;
- e) Substantiation of percentages or figures used for calculating end of life scenario;
- f) Information on calculation of averages across different locations to obtain generic data;
- g) Criteria to determine system boundaries and substantiation of information module consistency;
- h) Documentation that substantiates the chosen product life-cycle phases;
- i) Substantiation of 3 year history of stable market pricing underlying all economic allocation used:

It shall also include additional environmental information on all:

- a) Specifications or data sheets used to create the manufacturer's product;
- b) Data showing information is complete with reference to standards or quality regulations;
- c) Documentation that the product can fulfill the intended use;
- d) Documentation that chosen processes and scenarios satisfy ISO 21930:2007;
- e) Substantiation of additional environmental information to satisfy ISO 14025:2006, 7.2.4;
- f) Standard Operating Procedures for data collection, questionnaires, instructions, Deeds etc, and
- g) Documentation used to substantiate any other key assumptions and choices.

37. Confidentiality

Considering protection of intellectual property rights, binding or legal restrictions and competitive advantage most product-specific data is confidential. The EPD is not required to publicly release confidential data. To obscure underlying sensitive information data can be presented aggregated

over phases. Commercial data provided for assessment and independent verification shall be kept commercial-in-confidence through confidentiality deeds according with ISO 14025:2006, 8.3.

38. EPD Contents

All EPDs shall follow the required PCR format and include all identified parameters. The manufacturer is responsible for providing all key product information.

Table 2 Characterisation Factors

Inventory	Acronym	Units
Net Fresh Water Use	FW	m ³
Renewable Energy Use	RE	MJ
Total Renewables Use	GRE	MJ
Fossil Energy Use	FE	MJ
Finite Material Use	FR	MJ
Gross Fossil Fuel Use	GFF	MJ
Recycled Material Use	RRM	kg
Recovered Renewable Fuel	RRF	MJ
Recovered Fossil Fuel Use	RFF	MJ
Scrap For Reuse Recycling	SRR	kg
Feedstock For Energy Recovery	FER	kg
Non-Hazardous Waste	W	kg
Hazardous Waste	HW	kg
Total Radioactive Waste	RWD	kg
Potential Impact Categories ¹	Acronym	Negative Unit
Climate change	GWP	kg CO ₂ e _{100year} ²
Formation tropospheric ozone (photochemical oxidants)	TPO	kg NMVOC
Photochemical Ozone Creation	POCP	kg C ₂ H ₄ e
Depletion Stratospheric atmospheric ozone	ODP	kg CFC11 _e
Depletion of Fossil Resources: fuel, metal	ADPF	kg MJ _{surplus}
Depletion of Other Resources: water, renewable	ADPE	m ³
Acidification emissions to freshwater, marine or land	AP	kg (P,N, SO ₂) _e
Eutrophication of terrestrial, marine & freshwater	EP	kg PO ₄ _e
Ecotoxicity Damage: land, marine & freshwater Ecosystem	TXES	kg 1,4-DBe
Ecotoxicity Human Health Damages	TXHH	kg 1,4-DBe
Loss of Species, Biodiversity, Ecosystem or Habitat	EQL	kg 1,4-DBe
Land transformation of site, urban, agricultural and natural	LT	m ² a
Potential Benefit Categories ³	Acronym	Positive Unit
Supply Viability via Energy Recovery	SEER	GJ _{surplus}
Supply Viability via Water Recovery	SEWR	MI _{Reuse}
Supply Viability via Fuel Recovery	SEFR	GJ _{surplus}
Supply Viability via Mineral Recovery	SEMR	GJ _{surplus}
Supply Viability via Resource Recovery	SERR	MJ _{surplus}
Hale Human Health via Wellness	HHW	HALY
Hale Human Health via Dust Avoidance	HHHD	kg PM ₁₀
Hale Human Health via Healthy Airshed	HHHA	g 1,4DBe

1 EcoIndicator 99 or RECIPE or AUSLCI version of comparable national ecopoints

2 Where e stands for equivalent and here is to the 2013 IPCC factors

3 Evah 2020 Life Cycle benefit Assessment method <http://www.evah.com.au/elcap.html>

Hale Human Health via Safe Organics in Air	HHSA	g NMVOC
Hale Human Health via Ozone Layer Repair	HHRO	g R11 _e
Ecosystem Recovery via Climate Brake	ERCB	kt CO ₂ e ₂₀
Ecosystem Recovery via Water Clarification	ERWC	T PO ₄ _e
Ecosystem Recovery via Ecotoxicity Avoided	EREA	t1,4DB _e
Ecosystem Recovery via Restored Fraction	ERAR	PRF*m ² *yr
Ecosystem Recovery via Habitat Recovery	ARHR	PRF*m ² *yr

39. Declaration of Mandatory and Optional Inclusions

The product system studied shall contain a:

- Diagram of system boundaries including phases in the LCA subdivided into production, construction, use/operation and maintenance plus disposition and parts thereof;
- Description of the nature of processes and ancillary/complementary items required for product installation and replacements and maintenance according to PCR criteria.

Replacement, maintenance, necessary process and ancillary products shall be included or exclusions defined to show they conform to section 6.13 Calculation Rules. The comparison shall include whole building performance in accordance with ISO/TS 21931-1 and other normative references so the EPD may not be used to compare products.

40. Declaration of Parameters

The following results for all phases should be differentiated in result tables and charts:

Use of Resources

The EPD shall list resources relied upon differentiated into use of:

- Water from freshwater, ground, marine and surface sources.
- Renewable material differentiated as hydro, wind, solar, biomass and other sources;
- Renewable primary energy differentiated as hydro, wind, solar, biomass and other key source;
- Finite primary material, feedstock and fuel resources listed by type;
- Finite primary fuels listed as fossil oil; natural gas; coal, Uranium and other feedstock.
- Secondary material and fuel resources compliant to ISO 14021:1999, 7.8.1.1.

Emissions to Air, Land and Water

In accordance with national standards and practice the EPD shall declare all of the most significant releases to land, ground and surface water, and emissions to air outdoors and indoors.

Indoor Environmental Quality

For evaluation on human health and comfort in the building the EPD shall declare significant information on human health and comfort due to chemical, biological and physical emissions.

Waste Disposition

Waste generated during the product life cycle shall be classed as hazardous or non-hazardous waste, expressed in percentages or as mass per functional or declared unit.

41. Results and Environmental Impacts

Results, impacts and potential damages are differentiated into Greenhouse gas emissions including:

- Gross global warming potential in kg CO_{2e},
- Climate Change Damages and
- Emission of ozone-depleting gases including:
- Formation of tropospheric ozone (photochemical oxidants)
- Depletion of the stratospheric ozone layer

- Gross Ozone Depleting Potential in kg CFC_{11e}

They show potential biodiversity and or ecosystem impacts including:

- Environmental and Human health related toxicity
- Acidification and eutrophication of water sources
- Acidification of land, as well as
- Depletion of resources, fuel, land and range of habitat.

42. Declaration of Additional Environmental Information

The EPD shall include other information where relevant on environmental:

- Geographical aspects relating to any phase e.g. potential versus actual site impact;
- Data significant for product performance;
- Management systems and where organisational certification can be viewed;
- Programs that are applicable and where certification can be viewed;
- Activity participation as in recycling or recovery programs and where details can be obtained;
- Results derived from the LCA but not typically communicated in such formats;
- Instructions and limits for efficient use; and human health hazards and risk assessment;
- Significant material absent/present in certain areas per ISO 14021:1999, 5.4 and 5.7r;
- Management of preferable disposition options to avoid waste;
- Impact potential for incidents including in the:
- Disposition in deconstruction, reuse, demolition, recycling and disposal;
- Energy, water, acoustic and other improvements;
- feedstock energy content energy recovery in re-use or recycling, and
- Recycled content or recycling rates as described in ISO 14021:1999, 7.8.1.1.

43. Verification Demonstration

The EPD shall contain a completed demonstration of verification as outline e.g. in Table 3. The PCR review was conducted and is according to ISO 21930.

Table 3 Demonstration of Verification

Verification	Name	Affiliation	email address
PCR Review Chair	Murray Jones	Ecquate Pty Ltd	murrayjones@internode.on.net
Product Research	Nana Bortsie-Aryee	Global GreenTag	certification@globalgreentag.com
LCI Developer	Mathilde Vlieg	Vlieg LCA	mathildevlieg@gmail.com
LCIA Analyst	Omar Biaz	Global GreenTag	certification4@globalgreentag.com
EPD Developer	Judy Luo	Global GreenTag	certification2@globalgreentag.com
Internal LCA Audit	Shloka Ashar	Global GreenTag	certification1@globalgreentag.com
3rd Party Review	Delwyn Jones	The Evah Institute	delwyn@evah.com.au
Internal EPD Audit	David Baggs	Global GreenTag	david.baggs@globalgreentag.com

44. Verification

The review and verification procedure requires that ISO 14025:2006 Clause 8 provisions shall apply:

- PCR review per clause
- 8.1 Declaration of General Information and
- 8.4 Declaration of Parameters.

- 8.5 Additional Environmental Information
- Independent verification per section 8.2 Verification Demonstration.

The independent verifier shall generate a verification report stipulating the conclusion of the verification process, while adhering to the obligations of ISO 14025:2006, 8.3, covering rules for data confidentiality. This report shall be available to any person upon request. The competence of the:

- Third party PCR review panel shall be according to provisions in ISO 14025:2006, 8.2.3 and
- Independent EPD verifier shall be according to provisions given in ISO 14025:2006, 8.2.2.

Appendix A Normative References

- ISO 6707-1:2004 Building and civil engineering: Vocabulary Part 1: General terms
- 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 14050:2009 Environmental management: Vocabulary
- 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 Sustainability in building construction: Environmental declaration of building products
- ISO 21931-1:2010 Sustainability in building construction Framework for methods of assessment for environmental performance of construction works Part 1: Buildings
- ISO 21932:2013 Sustainability in buildings and civil engineering works -- A review of terminology
- EN 15804: 2012: Sustainability of construction works, Environmental product declarations, European Committee for Standardisation (CEN)
- EN 15643-1: 2011: Sustainability of construction works - Sustainability assessment of buildings – Part 1 general framework, CEN
- EN 15643-2: 2011: Sustainability of construction works - Sustainability assessment of buildings – Part 2 framework for assessment of environmental performance, CEN
- EN15978 - 2011: Sustainability of construction works - Assessment of environmental performance of buildings - Calculation method, European Committee for Standardisation, CEN
- CEN/TR 15941 - 2010: Sustainability of construction works – Environmental Product Declarations-Methodology for the selection of generic data, CEN
- CEN/TR 15942 - 2014: Sustainability of construction works - Environmental Product Declarations-Communication formats: business to business, CEN

Appendix B General References

- 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 (2014) LCI Model 3 database <http://www.ecoinvent.ch/> Ecoinvent, Switzerland
- Evah (2015) LCA Tools, Databases & Methodology at <http://www.evah.com.au/tools.html>
- Franklin Associates (2014) US LCI Database <http://www.fal.com/index.html> Eastern Research Group US
- GreenTag™ Certification (2015)
http://www2.ecospecifier.org/services_offered/greentag_certification
- GreenTag™ (2015) 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
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<http://www.iea.org/countries/membercountries/>
- Plastics Europe (2014) Portal <http://www.plasticseurope.org/plastics-sustainability/eco-profiles.aspx>
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- 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 (2014) Persistent Organic Pollutants <http://www.chem.unep.ch/pops/> The UN
- USLCI (2014) Life-Cycle Inventory Database <https://www.lcacommons.gov/nrel/search>, USA
- U.S. Geological Survey National Minerals <http://minerals.usgs.gov/minerals/pubs/country/> USA
- US EPA (2014) Database of Sources of Environmental Releases of Dioxin like Compounds in U.S
<http://cfpub.epa.gov/ncea/cfm/recorddisplay.cfm?deid=20797> p 1-38, 6-9, USA.

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