Insulated Roof & Wall Panels

EPD Roof Panels

Environmental Product Declaration
Insulated Roof Panels
Based on cradle to grave Life Cycle Assessment

Kingspan®
Insulated Panels

PE INTERNATIONAL
EXPERTS IN SUSTAINABILITY

PE NWE

External Critical Review : Life Cycle Assessment and Environmental Product Declaration of Insulated Panel Products for Kingspan Insulated Panels Pty Ltd February 2012

Edge Environment Pty Ltd have appointed PE International's UK office to conduct a critical review of an LCA study, "Life Cycle Assessment and Environmental Product Declaration of Insulated Panel Products", conducted for Kingspan Insulated Panels Pty Ltd to assess Kingspan's insulated panel products for roof, wall and controlled environment applications produced in Australia.
The review was performed from December 2011 to February 2012 based on the report received from Edge Environment on 23rd December 2011 and revised reports received on 20 January 2012, 6 February 2012 and 17 February 2012.
The study has been reviewed against ISO 14044:2006, and in our view, it complies with all relevant requirements, defined by the use of "shall" within the Standard.
The study has also been reviewed against the Building Products Innovation Council (BPIC) *Methodology Guidelines for the Materials and Building Products Life Cycle Inventory Database*. In our view the study meets the requirements regarding system boundary, allocation, data requirements and impact assessment set out in the Methodology.
BPIC has also provided a protocol for the correct use of Australian Life Cycle Inventory Data, *Protocol for the Correct Use of Australian Life Cycle Inventory Data for Building and Construction Materials and Products.* This provides 15 core requirements which must be met for the study to be compliant with the BP Protocol. In our view, the study is compliant with the Protocol.
Overall, this LCA study appears to have been executed thoroughly. The report is well written and the goals of the study are clearly presented. Data sources are well documented and their selection appropriate. The conclusions appear to be robust.

We confirm that the LCA study is compliant with the international standards for Life Cycle Assessment (ISO 14040:2006 and ISO 14044:2006) and in our view meets the requirements of the BP LCI Methodology and Protocol.

Critical Review undertaken for Edge Environment Pty Ltd on behalf of Mark Tatam, Kingspan Insulated Panels Pty Ltd.
Completed by Jane Anderson, Principal Consultant and Peter Shonfield, Technical Director of PE INTERNATIONAL

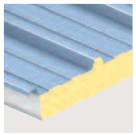
PE INTERNATIONAL, 85 Tottenham Court Road, London W1T 4TQ UK Tel: +44 20 7268 3029

Approved Environmental Profile: Australia

Insulated Roof Panels

Characterised, Normalised and Weighted Data for:
1 square metre of Installed Roofing: Kingspan Insulated Panels Trapezoidal (KS1000 RW) Panel with 60mm polyisocyanurate insulation core. External facing zinc / aluminium pre-painted coated steel. Internal facing zinc / aluminium pre-painted coated steel.

COMPLIANT WITH ISO 14040 / ISO 14044 AND BP LCI METHODOLOGY



Quality of data for certified material:

Source of Data	Kingspan Company Records, 2010
Data Analysis	Edge Environment
3rd Party Critical Review	PE INTERNATIONAL
Geography	Australia and New Zealand
Representativeness	1 site representing 100% of Kingspan Australian product manufactured in St. Mary's, Sydney.

LCA Methodology

This is a Kingspan ISO14021 Type II self-declaration summary, independently assessed by Edge Environment, and peer reviewed by PE INTERNATIONAL, in compliance with ISO 14040 / 14044 and making use of the BP LCI methodology. It is compatible with the requirements of an ISO14025 Type III product declaration.

Life Cycle Impact Data

Cradle to grave over a 40 year life, excluding the significant energy saving benefits accrued from thermal insulation performance over the lifetime of the building (full environmental product declaration available from Kingspan on request).

Reference : KS-RWaust1-2010

Impact Category	Characterised Units	Characterised Performance	Normalised Performance (dimensionless)	Weighted Performance (dimensionless)
Global warming	kg CO_2 eq	60.3	0.22%	0.046
Eutrophication	kg PO_4 eq	0.11	0.60%	0.018
Acidification	kg SO_2 eq	0.82	0.74%	0.030
Photochemical smog	kg NMVOC eq	0.24	0.33%	0.010
Ozone depletion	kg CFC-11 eq	$2.9x10^{-6}$	0.16%	0.0064
Ionizing radiation	kg U 235eq	1.5	0.12%	0.0023
Respiratory effects	kg PM2.5 eq	0.12	0.25%	0.0076
Eco-toxicity				
Marine aquatic	PDF	$3.9x10^{-9}$	0.22%	0.027
Terrestrial	PDF	$1.9x10^{-12}$	0.09%	0.0051
Abiotic resource depletion				
Non-renewable fuels	kg oil eq	21.4	0.14%	0.0041
Water use	kL H_2O	1.3	0.14%	0.0086
Total (Au Ecopoints)	(Au Ecopoints - 100 Ecopoints is equivalent to the annual,impact of one Australian citizen)			**0.167**
	The following impacts have been excluded from the above table: human toxicity, freshwater aquatic eco-toxicity, mineral resource depletion, and land occupation and transformation as combined they make up less than 1.3% of the overall impact.			

This certificate remains the property of Kingspan Insulated Panels, is issued subject to Kingspan terms and conditions, and is maintained and held in force through annual review and verification where applicable, and until such times as the product environment assessment data changes.

Date approved:
19th February 2012

Signed

Kingspan Insulated Panels

M. G. Tatam

Signed on behalf of
Kingspan Insulated Panels
Dr. M.G. Tatam, Technical Manager

edge environment

N Howard.

Signed on behalf of
Edge Environment
Nigel Howard, Managing Director

PE INTERNATIONAL
EXPERTS IN SUSTAINABILITY

Jane Anderson

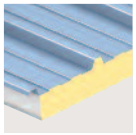
Signed on behalf of
PE INTERNATIONAL
Jane Anderson, Principal Consultant

Approved Environmental Profile: New Zealand

Insulated Roof Panels

Characterised, Normalised and Weighted Data for:
1 square metre of Installed Roofing: Kingspan Insulated Panels Trapezoidal (KS1000 RW) Panel with 60mm polyisocyanurate insulation core. External facing zinc / aluminium pre-painted coated steel. Internal facing zinc / aluminium pre-painted coated steel.

COMPLIANT WITH ISO 14040 / ISO 14044 AND BP LCI METHODOLOGY



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Photochemical smog	kg NMVOC eq	0.24	1.10%	0.050
Ozone depletion	kg CFC-11 eq	$2.9x10^{-6}$	0.05%	0.0043
Ionizing radiation	kg U 235eq	1.5	0.12%	0.0000
Respiratory effects	kg PM2.5 eq	0.12	1.66%	0.0296
Eco-toxicity				
Marine aquatic	PDF	$3.8x10^{-9}$	0.31%	0.028
Terrestrial	PDF	$1.9x10^{-12}$	0.07%	0.0031
Abiotic resource depletion				
Non-renewable fuels	kg oil eq	21.0	1.07%	0.0972
Water use	kL H_2O	1.3	0.24%	0.0080
Total (NZ Ecopoints)	(NZ Ecopoints - 100 Ecopoints is equivalent to the annual,impact of one New Zealand citizen)			**0.496**
	The following impacts have been excluded from the above table: human toxicity, freshwater aquatic eco-toxicity, mineral resource depletion, and land occupation and transformation as combined they make up less than 1.3% of the overall impact.			

This certificate remains the property of Kingspan Insulated Panels, is issued subject to Kingspan terms and conditions, and is maintained and held in force through annual review and verification where applicable, and until such times as the product environment assessment data changes.

Date approved:
19th February 2012

Signed

Signed on behalf of
Kingspan Insulated Panels
Dr. M.G. Tatam, Technical Manager

Signed on behalf of
Edge Environment
Nigel Howard, Managing Director

Signed on behalf of
PE INTERNATIONAL
Jane Anderson, Principal Consultant

The difference between the Australian and New Zealand Ecopoint score is predominantly a reflection of the lower overall environmental impact of an NZ citizen.

Environmental Product Declaration

Kingspan Products Manufactured in Australia

Environmental Product Declaration for Kingspan Insulated Roof Panels Manufactured in Australia

The Kingspan Trapezoidal roof panel system (KS1000 RW) is suitable for roof applications in a wide range of developments such as commercial, retail and industrial, government and others.

The Trapezoidal roof panel is a 'through fixed roof' system which can be used for building applications with roof slopes of 4° or more after deflection. It provides a complete roof system, combining an exterior protective steel sheet, a high performance insulant, and a decorative internal liner, all in one product.

All Kingspan products are backed by a comprehensive warranty package of up to 25 years with a life expectancy in excess of 40 years. This provides assurance for all the key performance areas of an insulated roof system. The panels are designed for excellent air tightness performance, which will optimize energy performance over the operating life of buildings.

This product declaration is based on the report *'Life Cycle Assessment and Environmental Product Declaration of Insulated Panel Products'* by Edge Environment Pty Ltd and peer reviewed by Jane Anderson (PE INTERNATIONAL). The declaration is for a typical 1m^2 of installed roof panel (Trapezoidal KS1000 RW, 60mm thick, R3.36) assessed from cradle to grave over a product life of 40 years in Australia and New Zealand. The panel service life is assumed to include one repaint of the external facing panel side. Figures 3, 4 and 5 show the continuous manufacturing process and two versions of the system diagram and assessment boundary.

Kingspan hereby declares that 1m^2 of Trapezoidal roof panel system (KS1000 RW, 60mm thick, R3.36) achieves the following environmental performance for the functional unit declared above, in accordance with the BP LCI methodologies and protocols, in accordance with ISO14040/4 and aligned with the objectives for type III product declarations stated in ISO 14025:2006(E). This Kingspan declaration is an interim measure until the time applicable product criteria reports become available for Kingspan's Australasian market.

The results in this declaration are representative for Kingspan Insulated Panels Pty Ltd production at 38-52 Dunheved Circuit, St Marys, NSW 2760.

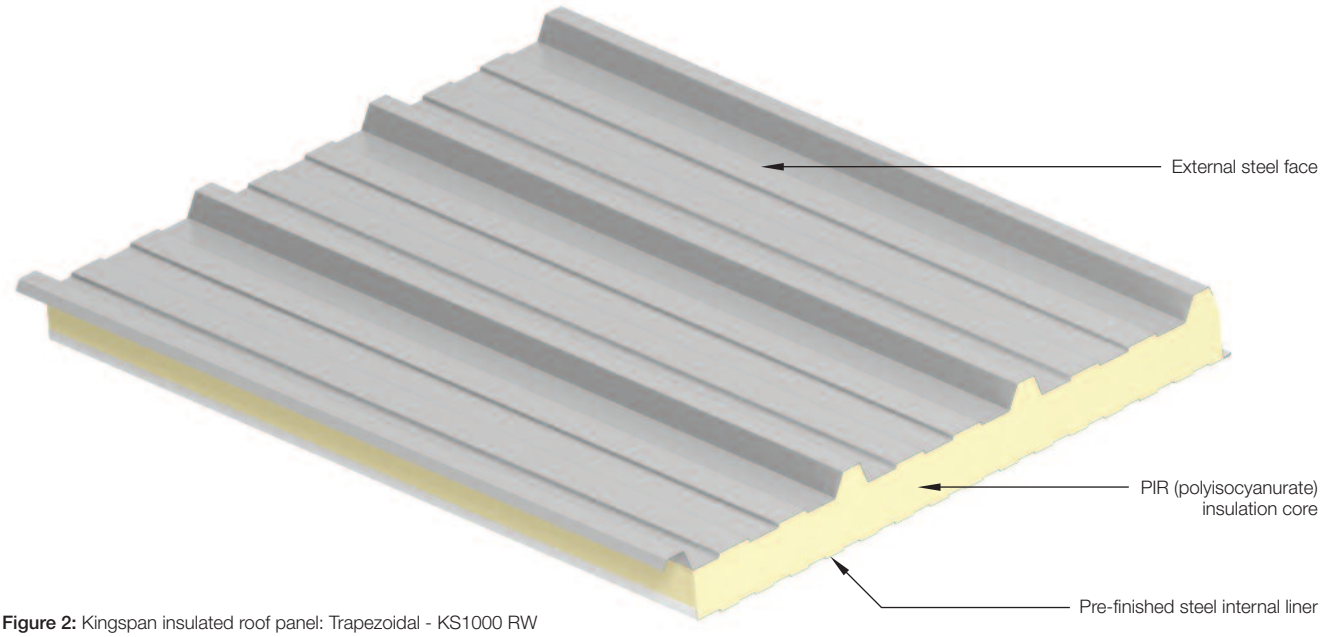

Figure 2: Kingspan insulated roof panel: Trapezoidal - KS1000 RW

Kingspan Insulated Panels

Manufacturing Process

Insulated Metal Panels – Continuous Production Line (CPL)

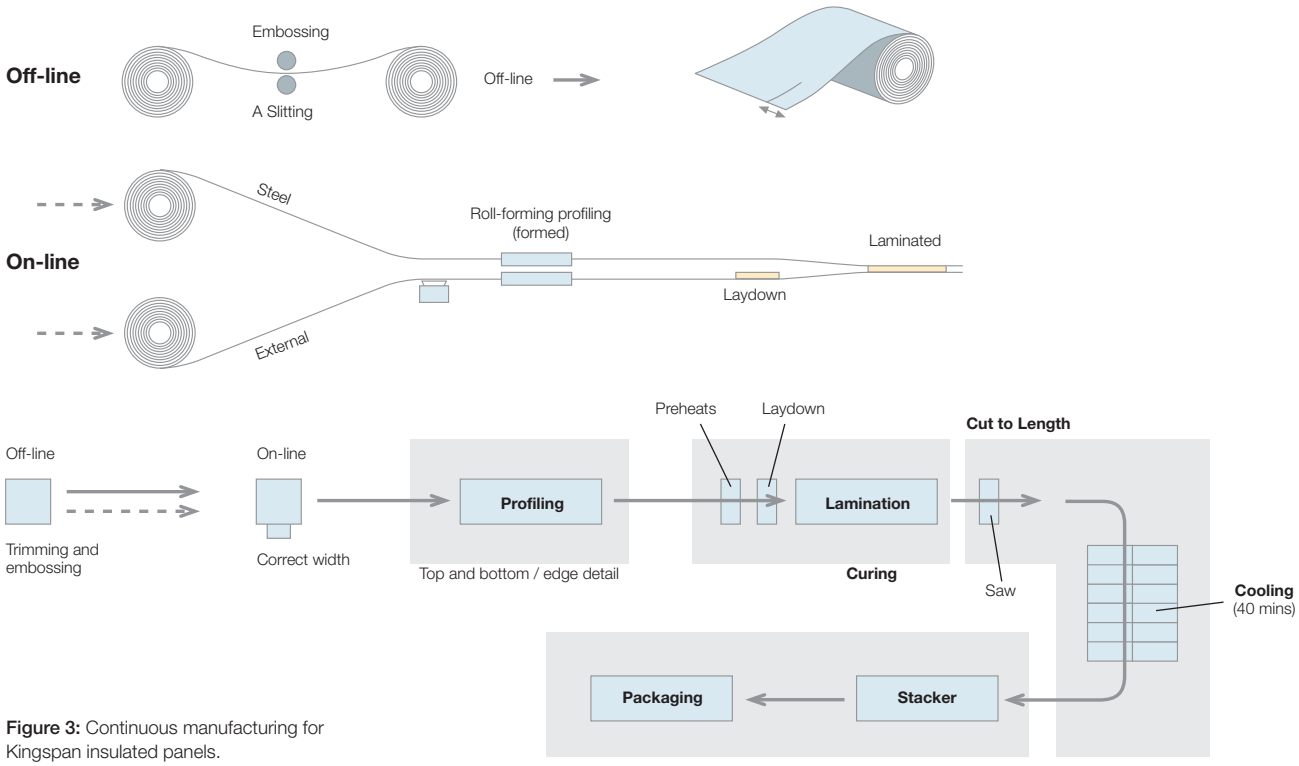

Figure 3: Continuous manufacturing for Kingspan insulated panels.

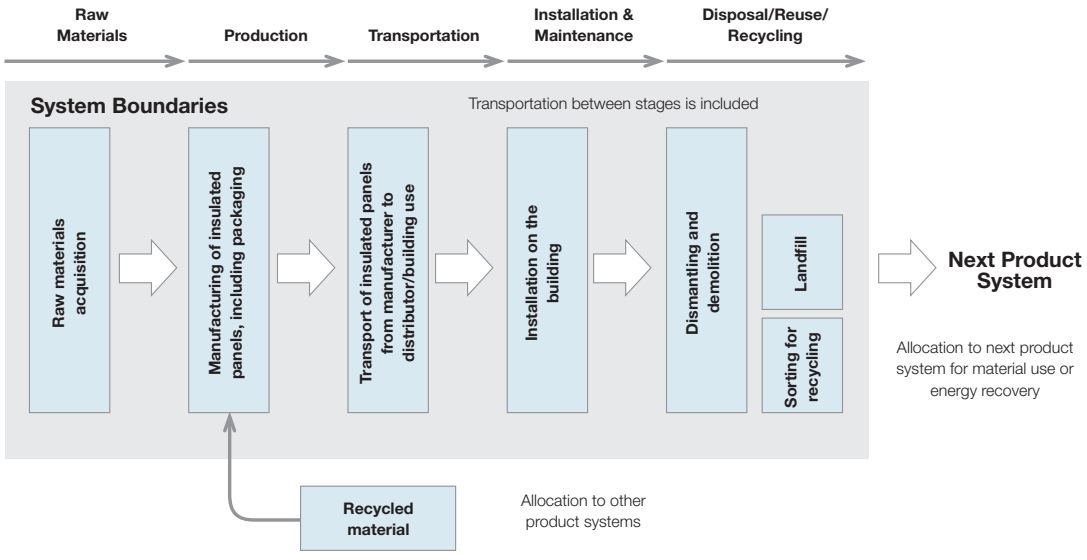

Figure 4: Kingspan insulated panel system diagram (simplified).

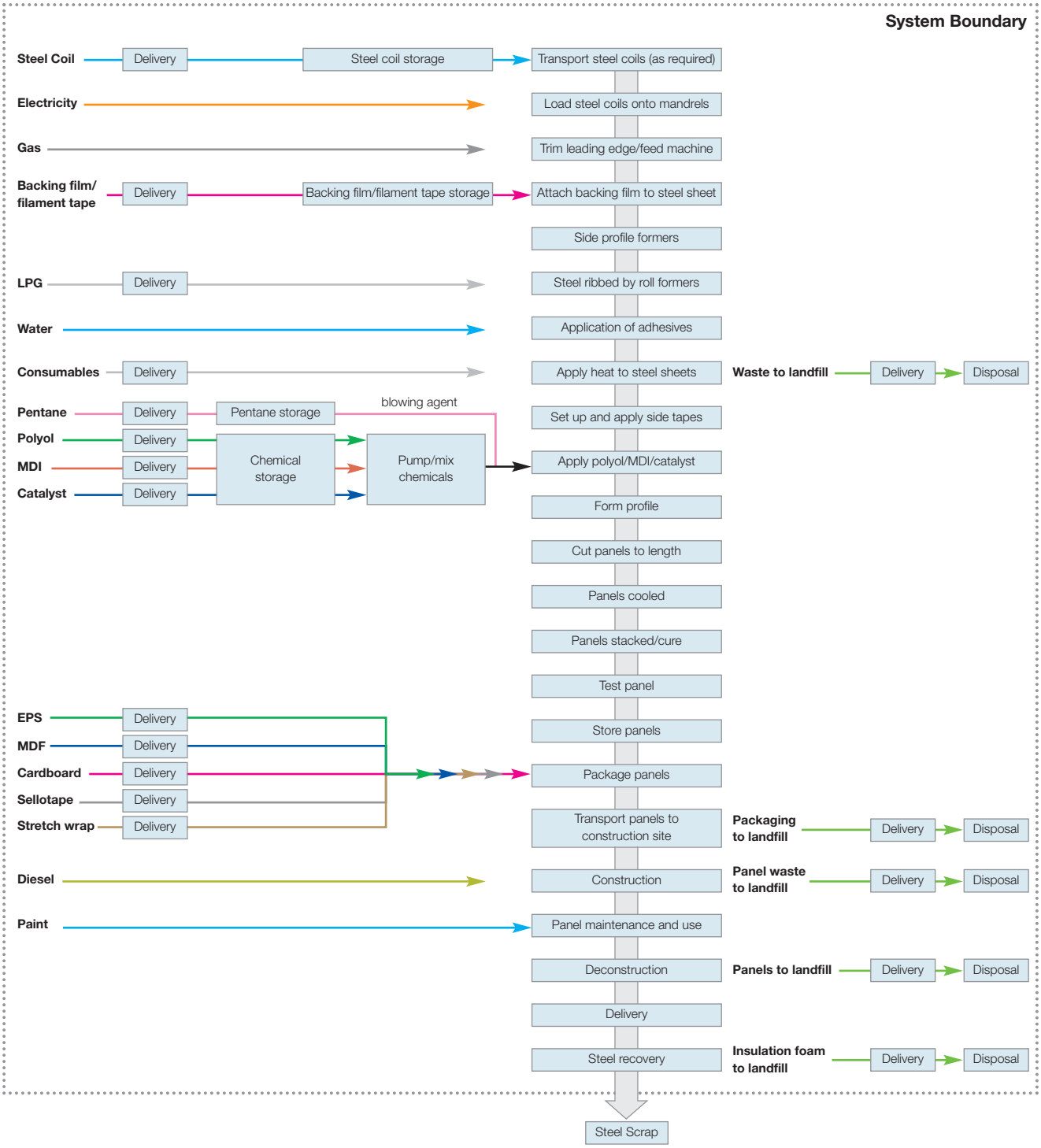

Figure 5: Kingspan insulated panel system diagram (comprehensive).

Environmental Product Declaration

Key Contributing Data

Panel Production and Packaging

The inventory data collected from Kingspan for its production of each panel type, for the year 2010, is summarised in the following table.

The panels are produced from:

- galvanised and painted steel sheet coils produced in Electric Arc Furnace (EAF) in South Korea;
- backing film/filament tape made of HDPE attached to the steel sheet;
- insulation foam formed from chemicals sourced from China (MDI, polyol and catalysts) and South Korea (pentane); and
- typical packaging made up from EPS, MDF, cardboard, stretch wrap and small amounts of sellotape (assumed negligible).

Parameter	Quantity	Unit
Steel Sheets		
Steel Coil	7.74	kg
Zinc coating	0.51	kg
Polyester Paint 25um (incl. primer)	0.62	kg
Backing Film / Filament tape	0.094	kg
Insulation Foam		
PIR Insulation foam	2.64	kg
Packaging		
EPS	0.32	kg
MDF	0.00027	m^3
Cardboard	0.068	kg
Stretch wrap	0.033	kg
Manufacturing		
Electricity	1.96	kWh
Natural Gas	2.42	MJ
Water	2.22	L
Waste	1.04	kg

Table 1: Key contributing data for production of 1m^2 Trapezoidal roof panel system (KS1000 RW, 60mm thick, R3.36, 10.6kg/m^2 - excluding packaging).

Transport

Panel distribution by truck, rail and sea freight from Kingspan's gate was calculated based on national annual sales volumes by state and conservative average transport distance assumptions. For New Zealand distribution the assessment includes sea freight in containers to Auckland, Wellington and Christchurch and an additional 200km added for regional road distribution.

Installation and Deconstruction

Diesel fuel consumption for machinery used during construction and deconstruction has been included in the assessment.

Construction waste from damaged panels has been accounted for by assuming 1% wastage i.e. the production of 1.01m^2 of panels produced and delivered to site for each square metre of panel installed in the building. This is likely a conservative estimate for the average Kingspan panel construction project.

Maintenance

The exterior facing (top) panel side is assumed to be re-painted once over the 40-year life of the panel.

Disposal / Reuse / Recycling

Kingspan have limited empirical evidence of what the end of life fate is for their panels. Based on anecdotal evidence the panels are either deconstructed and transported for reuse in a second building, or diverted for material recovery. With the large degree of uncertainty of the panels' end of life fate, the cradle to grave environmental profile was calculated based on the most conservative scenarios where the majority of used panels are deconstructed and transported to material recovery facilities, where the steel is recovered and returned into the recycling stream, and the insulation foam is diverted to landfill. Approximately 6% of the panels are assumed to be disposed in landfill with no immediate material recovery.

Project Otago Plaza Gymnasium
Location Dunedin, Otago
Product Trapezoidal – KS1000 RW

Appendix A

LCA Results

Australia

Impact Category	Characterised Units	Characterised Performance	Normalised Performance (dimensionless)	Weighted Performance (dimensionless)
Global warming	kg CO_2 eq	60.3	0.22%	0.046
Eutrophication	kg PO_4 eq	0.11	0.60%	0.018
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Eco-toxicity				
Marine aquatic	PDF	$3.9x10^{-9}$	0.22%	0.027
Terrestrial	PDF	$1.9x10^{-12}$	0.09%	0.0051
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	The following impacts have been excluded from the above table: human toxicity, freshwater aquatic eco-toxicity, mineral resource depletion, and land occupation and transformation as combined they make up less than 1.3% of the overall impact.			

Table 2: 1m² Trapezoidal roof panel life cycle impact assessment results, cradle to grave for use in Australia.

New Zealand

Impact Category	Characterised Units	Characterised Performance	Normalised Performance (dimensionless)	Weighted Performance (dimensionless)
Global warming	kg CO_2 eq	59.2	0.37%	0.061
Eutrophication	kg PO_4 eq	0.11	1.23%	0.044
Acidification	kg SO_2 eq	0.82	2.79%	0.144
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Table 3: 1m² Trapezoidal roof panel life cycle impact assessment results, cradle to grave for use in New Zealand.

The difference between the Australian and New Zealand Ecopoint score is predominantly a reflection of the lower overall environmental impact of an NZ citizen.

Appendix B

BRE Green Guide Rating

Commercial cradle to grave diagrams

Roof Specification*

High Performing Specifications **Poor Performing Specifications**

Best Performing Roof Specifications

Kingspan KS1000 RW
ECOsafe 0.42 Ecopoints

Worst Performing Roof Specifications

Wall Specification†

High Performing Specifications **Poor Performing Specifications**

Best Performing Wall Specifications

Kingspan KS1000 RW
ECOsafe 0.47 Ecopoints

KS600/900/1000 AWP
ECOsafe 0.53 Ecopoints

Worst Performing Wall Specifications

* *Low Pitched Roof: KS1000 RW Panel with EcoSafe insulation core manufactured at Holywell, UK. Supported on cold rolled steel purlins and structural sections. Steel facings; generic organic coatings. Insulation 120mm core thickness.*

† *External Wall: KS1000 RW Panel with EcoSafe insulation core manufactured at Holywell, UK, vertically laid. Supported on cold rolled steel rails. Steel facings; generic organic coatings. Insulation 70mm core thickness. KS600/900/1000 AWP Panel with EcoSafe insulation core manufactured at Holywell horizontally laid. Supported on cold rolled steel rails and structural frame. Steel facings; generic organic coatings. Insulation 80mm core thickness.*

Figure 6: Commercial cradle to grave diagrams for UK products in relation to 'The Green Guide to Specification' show Kingspan products in the highest performing category.

In the absence of a national framework for the definition and maintenance of standards for Environmental Product Declarations and Ecolabels in Australia and New Zealand for the purposes of context setting Figure 2 illustrates how Kingspan panels rate in the UK within the Building Research Establishment (BRE) 'Green Guide to Specification'. Kingspan panel systems achieve the highest possible A+ Classification.

The BRE Environmental Profiling process generates an Ecopoint score which is a method of presenting environmental data which cuts through the confusion of claims and counterclaims about the performance of building materials. These Ecopoint scores relate to the installed system and are used in the Green Guide to Specification to classify the system in rating bands of A+, A, B, C, D & E. These ratings provide designers with reliable and comparable environmental information about competing building materials, and give suppliers the opportunity to present credible environmental information about their products.

The benefits of BRE's Environmental Profiling Certification include independent, verified and audited performance according to an internationally recognised methodology; provision of data for achieving additional credits in BREEAM schemes; ability to input data for Envest 2 (design tool for optimising building environmental impact and whole life costs); and identification of areas for further improvement.

Kingspan Insulated Panels