ORTECH | INDUSTRIES
ESTABLISHED 1985 PTY LTD

AUSTRALASIA EPD®

ECO PLATFORM EPD VERIFIED

DURRA PANEL®

Environmental Product Declaration

In accordance with ISO 14025:2006 and EN 15804:2012+A2:2019/AC:2021 for Durra Panel

Programme	The International EPD® System www.environdec.com	**EPD Registration Number**	S-P-10940
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An EPD should provide current information and may be updated if conditions change.
The stated validity is therefore subject to the continued registration and publication at www.environdec.com

Programme Information

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Product category rules (PCR)	PCR 2019:14 Construction Products version 1.3.3 (valid until 2024-12-20)
PCR review conducted by	The Technical Committee of the International EPD® System Chair: Claudia A. Peña Contact: info@environdec.com

Independent third-party verification of the declaration and data, according to ISO 14025:2006

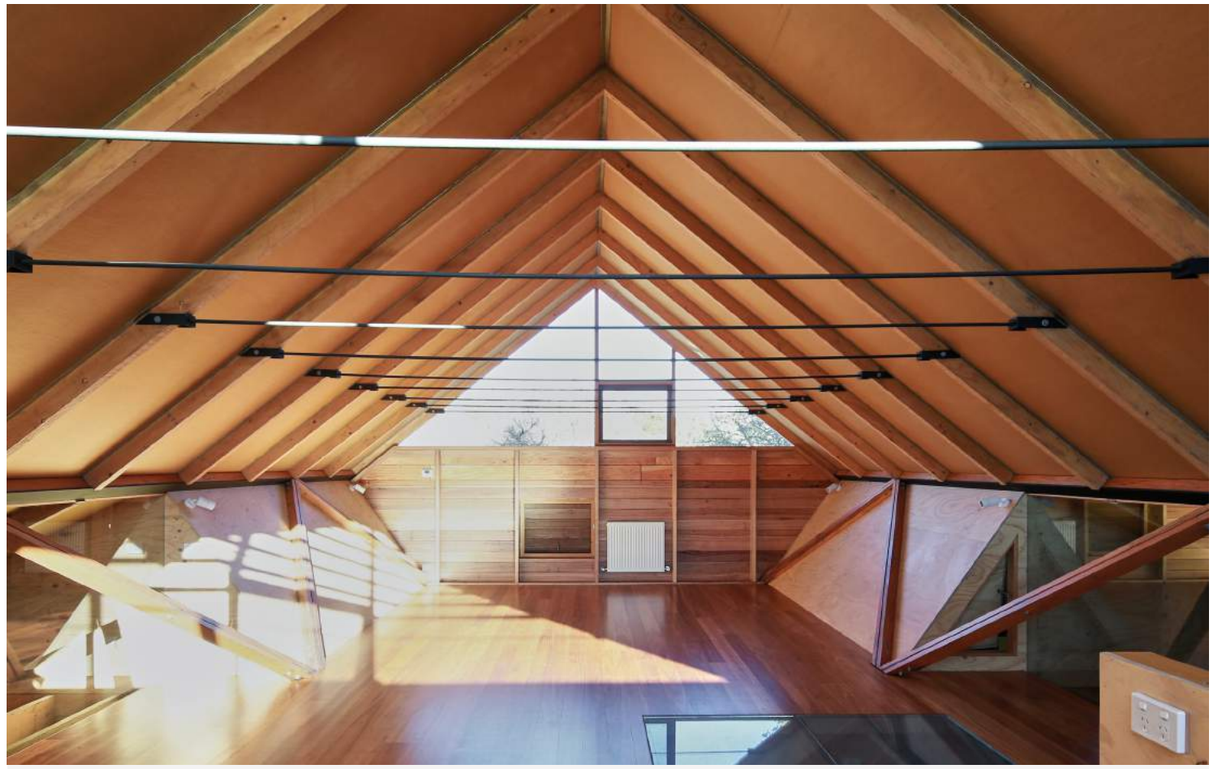
☐ EPD process certification ☒ EPD verification

Procedure for follow-up of data during EPD validity involves third party verifier

☐ Yes ☒ No

The EPD owner has the sole ownership, liability, and responsibility for the EPD.

EPDs within the same product category but registered in different EPD programmes, or not compliant with EN 15804, may not be comparable. For two EPDs to be comparable, they must be based on the same PCR (including the same version number) or be based on fully-aligned PCRs or versions of PCRs; cover products with identical functions, technical performances and use (e.g. identical declared/functional units); have equivalent system boundaries and descriptions of data; apply equivalent data quality requirements, methods of data collection, and allocation methods; apply identical cut-off rules and impact assessment methods (including the same version of characterisation factors); have equivalent content declarations; and be valid at the time of comparison. For further information about comparability, see EN 15804 and ISO 14025 .



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Life Cycle Assessment (LCA) is a methodology for assessing the full ‘cradle-to-grave’ environmental benefits of products and processes by assessing environmental flows (i.e. impacts) at each stage of the life cycle.

This LCA is undertaken in compliance with ISO 14025, European standard EN 15804:2012+A2:2019 + AC:2021, PCR 2019:14 Construction Products V1.3.3, and in line with the requirements of the General Program Instructions of the International EPD® programme V4.0 as well as instructions of the Australasian EPD Programme V4.1.

Company

Ortech Industries Pty Ltd

Ortech Industries Pty Ltd is a pioneering Australian-owned company that has been at the forefront of sustainable building materials since it was established in 1985.

Ortech specialises in the manufacturing of Durra Panel, a truly sustainable and long life building material, that has been in continuous production in Australia for over 70 years in Bendigo, Victoria, Australia.

The Durra Panel manufacturing facility is located at 91 Allingham Street, Golden Square, VIC 3555, Australia.

Product

Durra Panel

UN CPC 314 Boards and panels

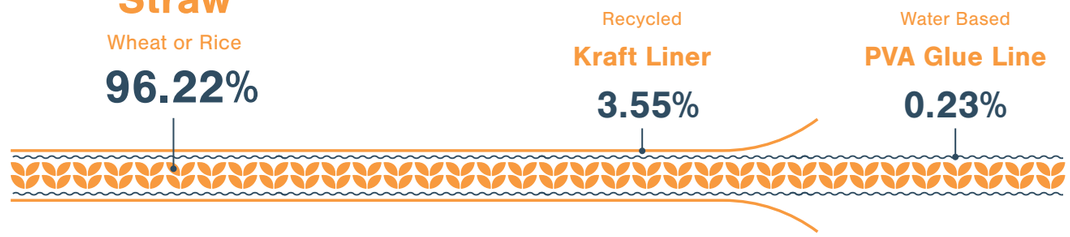
Durra Panel is a wall and ceiling panel that combines the desirable properties of low embodied energy, carbon capture and storage, long life, strength, impact resistance, thermal and acoustic insulation together with a high degree of fire resistance.

Durra Panel

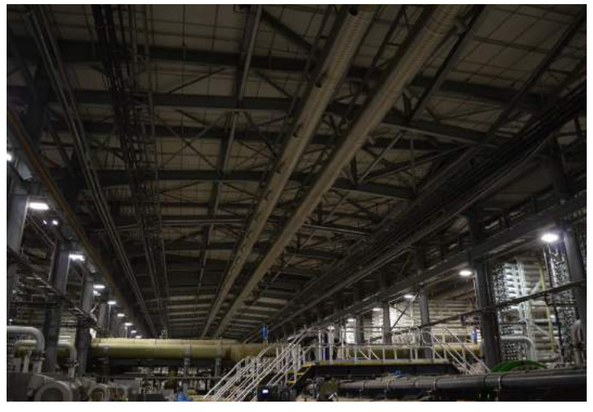
Durra Panel is a wall and ceiling panel that contains an engineered biomass core made entirely out of reclaimed straw.

Durra Panel is manufactured using an innovative engineered process which converts wasted agricultural by-products into a strong and durable construction material. The dry extrusion process combines heat and pressure, causing the straw fibres to release a natural polymer called lignin that self binds the panel core. There are no binding agents or chemical additives. A recycled kraft liner is then laminated to the panel core to complete the process.

Durra Panel Composition



Durra Panel can be used on its own as a wall and ceiling lining or be combined with Durra Steel Sections to form a wide range of panelised roof, ceiling and wall systems with an extensive track record over 70 years for use in commercial, industrial and residential projects. Durra Panel has been successfully used in project applications such as airports, stadiums, schools, industrial facilities and homes.



Sustainability

With a 100% straw core, Durra Panel offers a superior environmental performance compared to other rigid board construction products.

Durra Panel is Australian made, utilising straw stubble, a greatly wasted resource that is a by-product of annual wheat / rice harvesting and is in plentiful supply around the world.

The unique core extrusion process requires no water, gas, glues or chemical binders and produces zero toxic waste.

Durra Panel is a durable and long life material, storing carbon in buildings for over 70 years.

At the end of its useful life, Durra Panel is 100% biodegradable and can be composted, mimicking the natural carbon cycle.

A circular economy

100% biodegradable and compostable
Returned to the soil at the end of its useful life

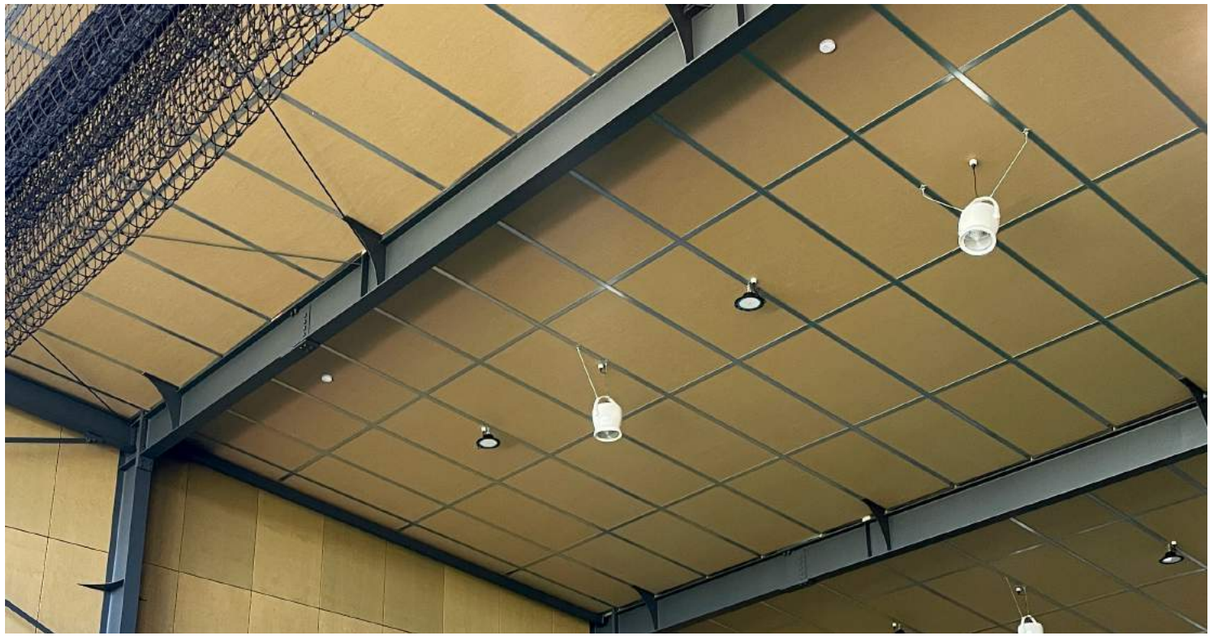
Panels are demountable and reusable
Durable and modular for simple relocation

Made from straw stubble
A waste by-product from harvesting

Naturally self binding
No glues or resins used in the panel core

Low embodied energy
Manufacturing produces no toxic waste

99.9% VOC free
Creating healthy indoor air quality



The compressed straw panel core naturally provides built in benefits

Acoustic

Durra Panel combines sound absorption and sound isolation in the one product, with the ability to create a wide range of high performance acoustic systems.

Fire Resistant

The natural carbonising action of the straw within the panel when exposed to flame effectively resists fire penetration.

Durable

Durra Panel is effective at resisting knocks and blows and has a low maintenance finish that is ideal for industrial and aggressive environments.

Thermal

The dense Durra Panel core acts as a natural thermal barrier between internal and external environments.

Ordering Durra Panel

Durra Panel is produced at a standard width of 1.187 metres to fit within a 1.2 metre grid. Panel lengths are variable and are made to order to suit project needs (minimum length - 1.2 metres / suggested maximum length - 3.6 metres).

Product Specification

Declared Unit

One square metre (m²)

This EPD provides data for one square metre (mass equivalent 18.5 kg) of Durra Panel.

Weight	18.5 kg / m² (nom)
Panel Thickness	50 mm
Strength (Point Load)	5.8 kN
Impact Resistance	High
R Value (Thermal Resistance)	0.62 m² W/k
K Value (Thermal Conductivity)	0.081 W / Mk
Specific Heat Capacity	1 050 J / kgK
Compressive Strength	442.38 kPa
Compressive Modulus	36.01 MPa
Embodied Energy	12.6 MJ / m²
VOC Emission Rate	<0.05 mg / m² / hr (7 days)

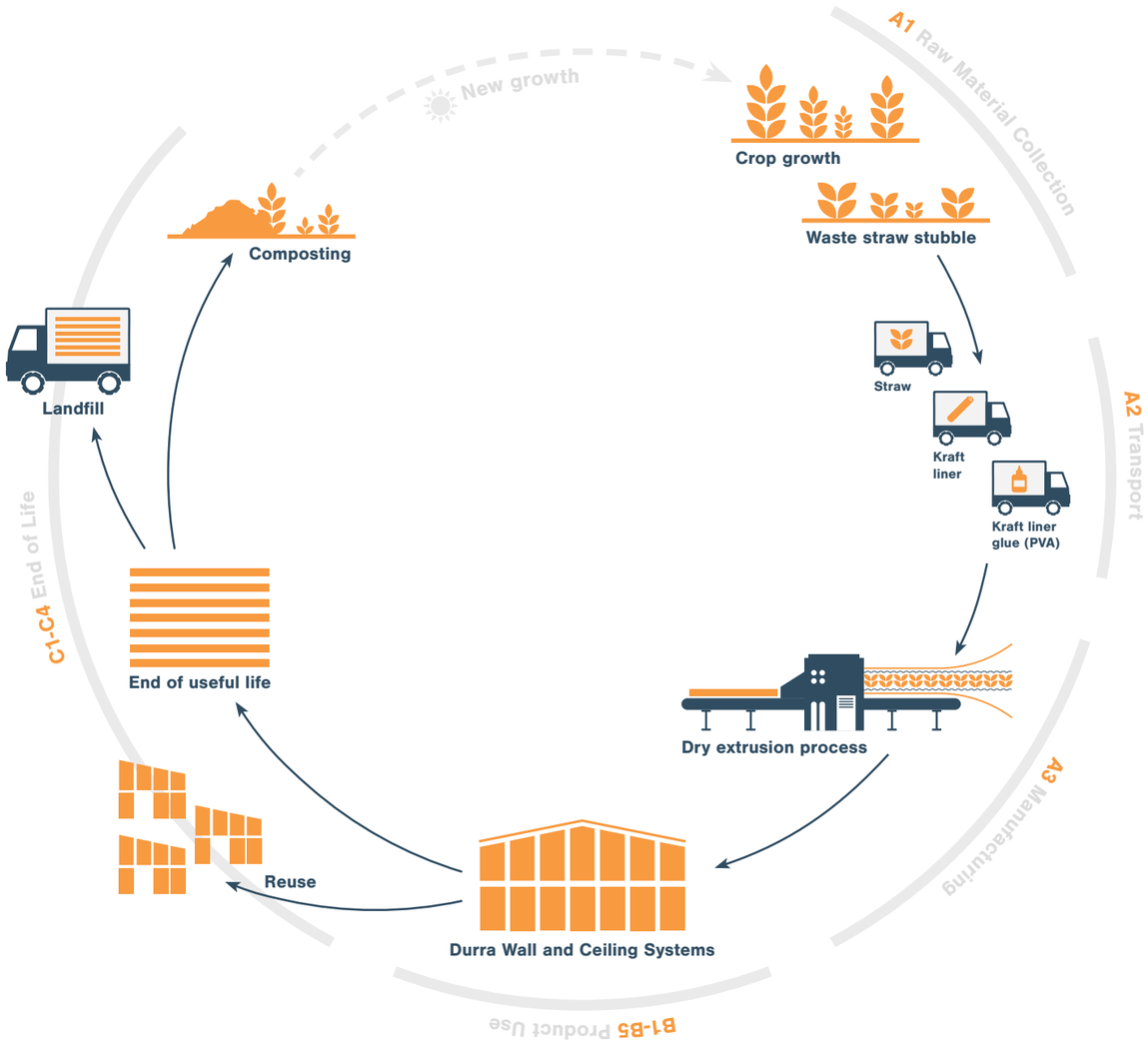
Content Declaration

Product Component	Weight, kg	Post-Consumer Recycled, weight %	Biogenic, Weight %, kg C/m²
Straw	16.7	0%	100%, 6.2
Kraft Paper Liner	0.844	98-100%	100%, 0.33
Water Based PVA Glue	0.453	0%	0
Aluminium Tape	0.0971	0%	0
Paper Tape	0.00352	0%	97%, 0.0013
Panel Side Tape	0.000273	0%	0
Packaging Material	**Weight, kg**	**Weight % (versus the product)**	**Biogenic Carbon, kg C/m²**
Hand Pallet Wrap	0.011	<1%	0
Steel Strapping Rope	0.046	<1%	0
Metal Seals	0.0008	<1%	0
LDPE Film	0.046	<1%	0
Coloured Tape	0.00048	<1%	0
Cardboard Corners	0.059	<1%	0.025

Durra Panel does not contain substances in the Candidate List of Substances of Very High Concern in the European Chemicals Agency in concentrations >0.1% of the weight of the product.

Product Lifecycle

A Circular Economy



Modules B1-B5 are out of scope

Scope of Declaration

System Boundaries

The system boundary describes the process steps included in the LCA. This LCA will cover cradle-to-gate plus end-of-life stages (modules A1-A3, A5, C1-C4, D). Use of results from modules A1-A3 without considering results of module C is discouraged. Modules A4, B1-B7 are also excluded from this study as these modules are best modelled at the final construction/building project level.

See below the system boundary table according to EN 15804+A2 life cycle stages.

	Product Stage			Construction Process Stage		Use Stage							End of Life Stage				Resource Recovery Stage
	Raw Material Supply	Transport	Manufacturing	Transport	Construction Installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational Energy Use	Operational Water Use	De-construction Demolition	Transport	Waste Processing	Disposal	Reuse - Recovery - Recycling Potential
Module	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Modules Declared	X	X	X	ND	X	ND	ND	ND	ND	ND	ND	ND	X	X	X	X	X
Geography	AU/ GLO	AU/ GLO	AU	-	AU	-	-	-	-	-	-	-	AU	AU	AU	AU	AU
Specific Data Used	>90%	>90%	>90%	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Variation Products	0%	0%	0%	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Variation Sites	0%	0%	0%	-	-	-	-	-	-	-	-	-	-	-	-	-	-

X module declared in this study **ND** module not declared in this study

Geographical Scope: Australia

Calculation Approach

In this LCA, the environmental impacts are calculated using a square metre of Durra Panel as a reference unit. EN 15804 divides the life cycle into different stages. The scope of this LCA is ‘cradle to gate, modules C1-C4, and module D’, including stages A1-A3, A5, C1-C4, and D. Due to the multi-functional use of the panel, modules A4 and B1-B7 are not declared as these modules are best modelled at the construction/building project level. All activities are therefore to be modelled from the production of raw materials to the end of the manufacturing stage, then from the demolition at its end of life to the composting/disposal of the product as well as any reuse-recovery-recycling potential. Impacts from the transport to construction site and the end of the use stage (A4 and B1-B7) are not included as these are dependent on the specific application of the panels. Durra Panel is produced at one production site in Bendigo, Victoria, hence no averaging of products is required.

Methodology

Manufacturing (Module A1-A3)

A1 **Raw Material Supply**	Production/extraction of raw materials used to manufacture the panel and packaging, for example: growing wheat crops for straw.
A2 **Transport**	Transport of each raw material to the Durra Panel factory.
A3 **Manufacturing**	Electricity (residual grid mix) and other fuel/inputs of production, transport, and manufacturing. Waste generated from the manufacturing process include straw, straw chaff and kraft paper liner, which remain within the system boundary and are disposed of on site.
A5 **Construction Installation**	It is assumed the packaging for the panel reaches its end of life during this module. All packaging components are assumed to be sent to landfill at the construction site. This module is included to balance the biogenic carbon stored in the relevant packaging components.

End of Life (Module C1-C4)

C1 **De-construction Demolition**	Demolition of the construction at the end of life of the panel.
C2 **Transport**	Transport of the end-of-life panel to either landfill or a composting centre is modelled in this module. An assumed transport distance of 50km was used for both of these scenarios.
C3 **Waste Processing**	This module specifies the composting of the panel at its end of life. This process takes into account biogenic CO_2 and CH_4 emissions, N_2O emissions, water, electricity, and diesel usage. Some panels for large projects have stipulations in the contracts to be composted after use. It is unknown what occurs to panels that are not contracted to be composted, however we have conservatively assumed here that all remaining panels are sent to landfill.
C4 **Disposal**	Rest-of-World Ecoinvent sanitary landfill waste treatment processes were used/modified to model Durra Panel's performance in landfill. An artificial release of the biogenic carbon stored within the relevant component was added to the model (so that total biogenic carbon over the product's lifecycle is neutral).

Resource Recovery (Module D)

D **Reuse - Recovery - Recycling - Potential**	This module demonstrates the benefit / impact of composting the panel at its end of life. Module D is declared as 0 for all indicators. This is a conservative assumption as composting is likely to have some positive benefits rather than a negative influence.

Assumptions

Allocation Procedures

Straw stubble is a by-product of growing wheat or rice crops. As such, it is not possible to divide the cropping process between grain and straw. To represent the environmental effects of producing straw, an allocation was therefore required, to partition the environmental flows between the production of grain and straw.

One of the key processes requiring allocation in the LCA was the straw. As EN 15804 postulates, the allocation of these products was based on economic values, as the difference in revenue from the co-products relevant to this LCA (wheat grain and straw) is high.

Background Data

Primary data for the LCA was collected and provided by Ortech industries for the year 1 January 2022 – 31 December 2022.

SimaPro® LCA software v9.5 was used for the LCA modelling. All global background data are taken from Ecoinvent v3.9.1 allocation recycling cut-off model (Weidema, Bauer et al. 2021). Background data for Australian material inputs, energy use, waste treatment and trucks are all sourced from the AusLCI database v1.42 (ALCAS 2023) which are then updated to Ecoinvent 3.9.1 for consistency with other data. Additional EN 15804:2012+A4:2019+AC:2021 indicators for resource use, waste categories, and output flows were manually added in relevant processes using data from the allocation recycling cut-off, EN 15804 Ecoinvent database. Background data is less than 10 years old or have been updated within this timeframe.

Cut-off criteria

The cut-off threshold for the LCA study was flows contributing less than 1% for any impact category included in the LCA. No flows were deliberately excluded due to this threshold, however particularly minor inputs expected to be well below this threshold were not considered. Infrastructure, production equipment, and personnel related activities are non-attributable and excluded from the system boundary. Packaging is included.

Generic Data Quality

Plausibility of the data for Durra Panel was checked by comparing the results to similar products. Due to a lack of EPDs on straw panels, an EPD for straw (as an insulation material) was compared to the results of Durra Panel, which is driven primarily by the straw content. When the results of the straw EPD are proportioned to the straw content in Durra Panel, the GWPT results are similar. The results for the straw insulation EPD were calculated and verified according to the same standards used here.

Environmental Impact Indicators

Mandatory Potential Environmental Impact Indicators

Global Warming Potential (GWP) — kg CO_2 eq.

GWPF (fossil) / GWPB (biogenic) / GWPL (land use) / GWPT (total)

This is governed by the increased concentration of gases in the atmosphere that trap heat and lead to increasing global temperatures, principally carbon dioxide, methane and nitrous oxide.

Ozone Depletion Potential (ODP) — kg CFC 11 eq.

This calculates the destructive effects in the stratospheric ozone layer over a time horizon of 100 years.

Acidification Potential (AP) — mol H^+ eq.

This assesses the change in critical load exceedance of the sensitive area in terrestrial and main freshwater ecosystems, to which acidifying substances deposit.

Eutrophication Potential – Freshwater (EPF) — kg P eq.

Expresses the degree to which the emitted nutrients reach the freshwater end compartment.

Eutrophication Potential – Marine (EPM) — kg N eq.

Expresses the degree to which the emitted nutrients reach the marine end compartment.

Eutrophication Potential – Terrestrial (EPT) — mol N eq.

This expresses the degree to which nutrients reach sensitive terrestrial environments, resulting in changes in species composition, such as increased invasive species, reed growth, and dieback in tree species.

Photochemical Ozone Creation Potential (POCP) — kg MNVOC eq.

This measures harmful air pollutant creation by primary pollutants such as nitrous oxides and volatile organic compounds when they interact under the influence of the sun and form chemicals toxic to humans and ecosystems, including ozone.

Abiotic Depletion Potential – Minerals & Metals (ADPE) — kg Sb eq.

This measures the depletion of minerals based on the concentration of currently economic reserves and rate of de-accumulation.

Abiotic Depletion Potential – Fossil Fuels (ADPF) — MJ NCV

This measures the depletion of fossil fuels based on energy content.

Water Deprivation Potential (WDP) — m^3 H2O eq.

This quantifies the relative available water remaining per area once the demand of humans and aquatic systems has been met.

Additional Mandatory and Voluntary Indicators

Global Warming Potential – excluding biogenic uptake, emissions, and storage (GWP-GHG)	**kg CO_2 eq.**
Particulate Matter Emissions (PM)	**Disease incidence**
Ionising Radiation – Human Health (IRP)	**kBq U-235-eq.**
Eco-Toxicity – Freshwater (ETPF)	**CTUe**
Human Toxicity – Cancer (HTPC)	**CTUh**
Human Toxicity – Non-Cancer (HTPNC)	**CTUh**
Land Use Related Impacts / Soil Quality (SQP)	**Dimensionless**

Use of Resources, Waste Production and Output Flows

Resource Use	
Primary Energy Resources – Renewable – Use as Energy Carrier (PERE)	**MJ**
Primary Energy Resources – Renewable – Used as Raw Materials (PERM)	**MJ**
Primary Energy Resources – Renewable – Total (PERT)	**MJ**
Primary Energy Resources – Non-renewable – Use as Energy Carrier (PENRE)	**MJ**
Primary Energy Resources – Non-renewable – Used as Raw Materials (PENRM)	**MJ**
Primary Energy Resources – Non-renewable – Total (PENRT)	**MJ**
Use of Secondary Materials (SM)	**kg**
Use of Renewable Secondary Fuels (RSF)	**MJ**
Use of Non-Renewable Secondary Fuels (NRSF)	**MJ**
Net Use of Fresh Water (FW)	**m^3**
Waste Production	
Hazardous Waste Disposed (HWD)	**kg**
Non-Hazardous Waste Disposed (NHWD)	**kg**
Radioactive Waste Disposed (RWD)	**kg**
Output Flows	
Components for Reuse (CRU)	**kg**
Material for Recycling (MFR)	**kg**
Materials for Energy Recovery (MER)	**kg**
Exported Energy – Electrical and Thermal (EE)	**MJ**

Results

Results stated apply to one square metre (1m²) of Durra Panel.

The estimated impact results are only relative statements, which do not indicate the endpoints of the impact categories, exceeding threshold values, safety margins and/or risks.

Core Environmental Impact Indicator Results (A1-A3)

Mandatory potential environmental impact indicator results for A1-A3 according to EN 15804:2012+A2:2019.

Indicator	Unit	Result
GWPT	kg CO_2 eq.	-1.93E+01
GWPF	kg CO_2 eq.	5.73E+00
GWPB	kg CO_2 eq.	-2.50E+01
GWPL	kg CO_2 eq.	1.12E-02
ODP	kg CFC 11 eq.	3.22E-07
AP	mol H^+ eq.	7.05E-02
EPF	kg P eq.	9.06E-04
EPM	kg N eq.	1.96E-02
EPT	mol N eq.	2.51E-01
POCP	kg MNVOC eq.	2.17E-02
ADPE*	kg Sb eq.	3.22E-05
ADPF*	MJ (NCV)	7.37E+01
WDP*	m^3	1.41E+00

Additional Environmental Impact Indicator Results (A1-A3)

Additional potential environmental impact indicators according to EN 15804:2012+A2:2019 results (A1-A3).

Indicator	Unit	Result
GWP-GHG	kg CO_2 eq.	4.41E+00
PM	Disease incidence	6.03E-07
IRP**	kBq U-235 eq.	1.23E-01
ETPF*	CTUe	6.30E+01
HTPC*	CTUh	1.98E-09
HTPNC*	CTUh	6.38E-08
SQP*	Dimensionless	8.27E+02

Energy source for electricity in module A3 is the residual mix of Victoria, Australia. This mix only contains non-renewable energy generators. GWP-GHG = 1.12 kg CO_2 eq./kWh.

Resource Use Indicators, Waste, and Output Flows (A1-A3)

Resource use and other inventory flow indicator results for A1-A3.

Indicator	Unit	Result
Resource Use		
PERE	MJ NCV	-2.52E+02
PERM	MJ NCV	2.76E+02
PERT	MJ NCV	2.42E+01
PENRE	MJ NCV	6.32E+01
PENRM	MJ NCV	1.57E+01
PENRT	MJ NCV	7.90E+01
SM	kg	9.58E-01
RSF	MJ NCV	7.65E-02
NRSF	MJ NCV	0.00E+00
FW	m^3	5.14E-02
Waste Flows		
HWD	kg	8.54E-02
NHWD	kg	3.98E+00
RWD	kg	3.68E-05
Output Flows		
CRU	kg	0.00E+00
MFR	kg	9.40E-04
MER	kg	3.96E-05
EE	MJ	4.28E-02

Core Environmental Impact Indicator Results (A5, C1-C4, D)

Mandatory potential environmental impact indicator results for C1-C4, and D according to EN 15804:2012+A2:2019.

Impact category	Unit	Module A5 Construction installation	Module C1 Deconstruction demolition	Module C2 Transport	Module C3 Waste processing	Module C4 Disposal	Module D Reuse, recovery, recycle potential
GWPT	kg CO_2 eq.	3.22E-01	9.57E-02	1.70E-01	1.08E+01	1.44E+01	0.00E+00
GWPF	kg CO_2 eq.	2.96E-03	9.56E-02	1.70E-01	2.98E-01	1.44E-01	0.00E+00
GWPB	kg CO_2 eq.	3.19E-01	2.49E-05	1.06E-04	1.05E+01	1.43E+01	0.00E+00
GWPL	kg CO_2 eq.	1.55E-06	1.06E-05	7.43E-05	1.75E-07	1.01E-04	0.00E+00
ODP	kg CFC 11 eq.	5.09E-11	1.48E-09	2.43E-09	9.30E-09	3.08E-09	0.00E+00
AP	mol H^+ eq.	2.32E-05	8.65E-04	1.20E-03	2.26E-04	1.01E-03	0.00E+00
EPF	kg P eq.	1.79E-06	2.87E-06	1.08E-05	1.23E-06	3.72E-05	0.00E+00
EPM	kg N eq.	1.48E-04	4.01E-04	3.99E-04	4.09E-05	5.07E-03	0.00E+00
EPT	mol N eq.	7.03E-05	4.36E-03	4.30E-03	4.47E-04	3.83E-03	0.00E+00
POCP	kg MNVOC eq.	9.69E-05	1.29E-03	1.51E-03	1.19E-04	3.18E-03	0.00E+00
ADPE*	kg Sb eq.	7.52E-09	3.26E-08	4.25E-07	3.50E-08	3.02E-07	0.00E+00
ADPF*	MJ (NCV)	5.05E-02	1.22E+00	2.31E+00	1.06E+00	2.88E+00	0.00E+00
WDP*	m^3	1.89E-03	3.19E-03	1.06E-02	5.80E-02	1.22E-01	0.00E+00

Additional Mandatory Impact Category Results (A5, C1-C4, D)

Additional potential environmental impact indicators according to EN 15804:2012+A2:2019 results (C1-C4, D).

Impact category	Unit	Module A5 Construction installation	Module C1 Deconstruction demolition	Module C2 Transport	Module C3 Waste processing	Module C4 Disposal	Module D Reuse, recovery, recycle potential
GWP-GHG	kg CO_2 eq.	2.74E-01	9.56E-02	1.70E-01	2.98E-01	7.06E+00	0.00E+00
PM	Disease incidence	3.18E-10	2.41E-08	1.10E-08	1.54E-09	2.02E-08	0.00E+00
IRP**	kBq U-235 eq.	5.57E-05	5.80E-04	2.01E-03	2.53E-05	3.92E-03	0.00E+00
ETPF*	CTUe	4.72E-01	5.13E-01	1.08E+00	4.61E-01	5.44E+00	0.00E+00
HTPC*	CTUh	1.14E-12	1.57E-11	2.88E-11	1.28E-11	4.57E-11	0.00E+00
HTPNC*	CTUh	4.14E-10	4.64E-10	4.78E-10	4.73E-10	1.08E-08	0.00E+00
SQP*	Dimensionless	9.65E-02	8.17E-02	1.79E+00	1.86E-01	6.36E+00	0.00E+00

Resource Use (A5, C1-C4, D)

Resource use indicator results for C1-C4, and D.

Impact category	Unit	Module A5 Construction installation	Module C1 Deconstruction demolition	Module C2 Transport	Module C3 Waste processing	Module C4 Disposal	Module D Reuse, recovery, recycle potential
PERE	MJ NCV	-8.34E-01	6.95E-03	3.04E-02	2.09E-02	-1.50E+02	0.00E+00
PERM	MJ NCV	8.36E-01	0.00E+00	0.00E+00	0.00E+00	1.50E+02	0.00E+00
PERT	MJ NCV	2.08E-03	6.95E-03	3.04E-02	2.09E-02	6.59E-02	0.00E+00
PENRE	MJ NCV	5.08E-02	1.23E+00	2.40E+00	3.09E-01	2.90E+00	0.00E+00
PENRM	MJ NCV	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PENRT	MJ NCV	5.08E-02	1.23E+00	2.40E+00	3.09E-01	2.90E+00	0.00E+00
SM	kg	1.76E-05	5.05E-04	1.07E-03	0.00E+00	1.09E-03	0.00E+00
RSF	MJ NCV	5.77E-07	1.33E-06	1.37E-05	0.00E+00	3.71E-05	0.00E+00
NRSF	MJ NCV	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FW	m^3	4.70E-05	6.59E-05	2.84E-04	0.00E+00	2.87E-03	0.00E+00

Waste Flows (A5, C1-C4, D)

Waste flows for C1-C4, and D.

Impact category	Unit	Module A5 Construction installation	Module C1 Deconstruction demolition	Module C2 Transport	Module C3 Waste processing	Module C4 Disposal	Module D Reuse, recovery, recycle potential
HWD	kg	6.98E-05	5.67E-04	1.83E-03	0.00E+00	2.81E-03	0.00E+00
NHWD	kg	2.52E-03	1.13E-02	5.82E-02	7.66E+00	8.88E-02	0.00E+00
RWD	kg	3.48E-08	1.34E-07	4.83E-07	0.00E+00	1.12E-06	0.00E+00

Output Flows (A5, C1-C4, D)

Output flows for C1-C4, and D.

Impact category	Unit	Module A5 Construction installation	Module C1 Deconstruction demolition	Module C2 Transport	Module C3 Waste processing	Module C4 Disposal	Module D Reuse, recovery, recycle potential
CRU	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MFR	kg	9.09E-07	3.89E-06	1.85E-05	0.00E+00	2.68E-05	0.00E+00
MER	kg	2.83E-09	1.52E-08	1.50E-07	0.00E+00	1.08E-07	0.00E+00
EE	MJ	1.65E-05	8.01E-05	5.19E-04	0.00E+00	5.78E-04	0.00E+00

EN15804+A1 Results

Environmental performance results for A1-A3 with indicators from EN 15804:2012+A1:2013.

Indicator	Unit	Result
GWP	kg CO_2 eq.	5.65E+00
ODP	kg CFC 11 eq.	2.72E-07
AP	kg SO_2 eq.	3.85E-02
EP	kg PO_4^{3-} eq.	1.58E-02
POCP	kg C_2H_4 eq.	9.05E-04
ADPE	kg Sb eq.	3.76E-05
ADPF	MJ (NCV)	8.50E+01

Environmental performance results for C1-C4, D with indicators from EN 15804:2012+A1:2013.

Impact category	Unit	Module A5 Construction installation	Module C1 Deconstruction demolition	Module C2 Transport	Module C3 Waste processing	Module C4 Disposal	Module D Reuse, recovery, recycle potential
GWP	kg CO_2 eq.	1.87E-01	9.23E-02	1.63E-01	2.97E-01	4.84E+00	0.00E+00
ODP	kg CFC 11 eq.	4.22E-11	1.21E-09	2.01E-09	7.35E-09	2.54E-09	0.00E+00
AP	kg SO_2 eq.	1.82E-05	6.10E-04	6.91E-04	1.37E-04	7.65E-04	0.00E+00
EP	kg PO_4^{3-} eq.	1.79E-04	1.46E-04	1.73E-04	2.16E-04	2.81E-02	0.00E+00
POCP	kg C_2H_4 eq.	4.51E-05	1.68E-05	4.74E-05	7.84E-06	1.17E-03	0.00E+00
ADPE	kg Sb eq.	7.52E-09	3.26E-08	4.25E-07	1.12E-08	3.03E-07	0.00E+00
ADPF	MJ (NCV)	5.26E-02	1.29E+00	2.41E+00	1.17E+00	2.98E+00	0.00E+00

** Disclaimer: The results of this environmental impact indicator shall be used with care as the uncertainties of the results are high and as there is limited experience with the indicator.*

*** Disclaimer: This impact category deals mainly with the eventual impact of low dose ionizing radiation on human health of the nuclear fuel cycle. It does not consider effects due to possible nuclear accidents, occupational exposure nor due to radioactive waste disposal in underground facilities. Potential ionizing radiation from the soil, from radon and from some construction materials is also not measured by this indicator.*

Interpretation of Results

Interpretation

From a climate change perspective, the main driver behind the results is the straw in Durra Panel, which makes up the majority of the panel by weight. Not accounting for biogenic flows of carbon, the emissions of greenhouse gas from fossil sources are distributed between the production of PVA glue (23%), straw (19%) and recycled kraft paper liner (16%), which together represent over 50% of the total.

The biogenic carbon content of the straw is greater than the sum of all greenhouse gas emissions from fossil sources, making the overall Global Warming Potential results negative for module A1-3.

This is counterbalanced at end-of-life, as the EN 15804 standard does not allow for the storage of biogenic carbon in a product. As such, the biogenic carbon in straw and other biogenic materials is modelled as being emitted during the end-of-life modules (C3-4). This flow results in an increase of 25 kg CO_2eq / m² panel.

Straw remains a key influence for indicators such as land use, terrestrial eutrophication, and use of secondary materials. For other indicators such as ozone depletion and ionising radiation, the PVA glue is the main contributor.

Carbon Accounting

As the EN 15804+A2 stipulates the biogenic carbon sequestration of the materials used in the product must be net neutral over its entire life-cycle, the carbon absorbed by the straw and paper elements must be emitted at the end of the panel's life. To emulate this, an artificial emission was added to modules C3 and C4 to balance the uptake of carbon in the raw materials at the start of the supply chain. It is likely that some of the carbon in the panel will remain stored for long period of time at the end-of-life of the product, rather than being re-emitted to the atmosphere. The GWPT value declared in this study would be higher than the real life scenario if this were the case.

End of Life

Many of the Durra Panels manufactured by Ortech are still in use and have not reached their end of life, with evidence that half a century of real-world service indicates no change to composition or degradation of the microstructure and full retainment of the functional properties of the panel. As such, the end of life trajectory of the panel is uncertain, except for the panels contracted to be composted at their end-of-life. For a conservative assumption, the study has assumed only panels contracted for composting are composted, while the rest is sent to landfill at the end of life. This may not be the case in reality, as other panels may be composted or even recycled at their end of life, which would likely reduce the end of life impacts of Durra Panel.

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