EPD™

Environmental Product Declaration

Global GreenTag EPD Program:

Compliant to EN15804+A2 2019

Autex Industries Pty Ltd

Autex Acoustics® Panels and Tiles

702 to 718 Rosebank Road, Avondale, Auckland, New Zealand

Autex Acoustics®

EPD Information

EPD Verification and LCA Details			
EPD Scope	Cradle to Grave	**Range Name**	Autex Acoustics® Panels and Tiles
Issue Date	24th January 2022	**Valid Until**	24th January 2027

Product Names	EPD Numbers
Workstation	ATX AP01 2023EP
Quietspace	ATX AP02 2023EP
Cube™	ATX AP03 2023EP
3D Ceiling Tiles	ATX AP04 2023EP
3D Tiles	ATX AP05 2023EP

Product Images

Demonstration of Verification

Standard EN 15804 serves as the core Product Category Rules (PCR).

Independent external verification of the declaration and data is according to ISO 14025:2010

☑ External 3rd Party Verifier[a]	Mathilde Vlieg, Malaika LCT	22 09 2024
☑ Internal LCA Reviewer	Shloka Ashar Sustainability Consultant	20 09 2024
☑ Internal EPD Reviewer	David Baggs, Global GreenTag Pty Ltd	30/11/2024

a: Optional for business-to-business communication; mandatory for business-to-consumer communication (see EN ISO 14025:2010, 9.4)

The EPD is property of declared manufacturer. Different program EPDs may not be comparable as e.g., Australian transport is often more than elsewhere. Comparability is further dependent on the product category rules used and the source of the data. Further explanatory information is found at info@globalgreentag.com or contact: certification1@globalgreentag.com.

This EPD discloses potential environmental outcomes compliant with EN 15804:2012+A2:2019 for business-to-business communication. LCIA results are relative expressions that do not predict impacts on category endpoints, exceeding of thresholds, safety margins or risks.

EPD Program Operator	LCA and EPD Producer	Declaration Owner
Global GreenTag Pty Ltd PO Box 311 Cannon Hill, QLD 4170 Phone: +61 (0)7 33 999 686 http://www.globalgreentag.com	The Evah Institute Division of Ecquate Pty Ltd PO Box 123 Thirroul NSW Phone: +61 (0)7 5545 0998 http://www.evah.com.au/	Autex Industries Ltd 702 Rosebank Road, Avondale, Auckland, New Zealand Phone: +64 9 828 9179 http://www.autexglobal.com

Product Information

Manufacturing Site	702-718 Rosebank Road, Avondale, Auckland, New Zealand
Site Representation and Geography	New Zealand, Australasia, Pacific Rim and the World
Product Specifications	Autex Acoustics® Workstation, Quietspace and Cube™ panels comprise thermally bonded high-density polyester fibre; Autex Acoustics® 3D ceiling tile is thermally bonded felted polyester fibre and 3D tile comprises thermally moulded, needle punched, felted polyester fibre.
Functional Performance in Building	Workstation Quietspace and Cube Panels and 3D Ceiling Tiles, 3D Tiles reduce and control reverberated noise and echo in building interiors. Quietspace is a ceiling panel or wallcovering. Cube is installed as a ceiling panel, wallcovering, or moulded, printed, pressed, cut and grooved to create high-performance acoustic features for interior space.
Factory warranty	10 years
Declared Unit	Autex Acoustic Panel or Tile of given Noise Reduction Coefficient (NRC)[1] kg/m^2
Functional Unit	20 year use per kilogram of Autex Acoustic Panels for given area with NRC: 0.20 from 1.68kg/m^{2}Workstation, 0.85 from 2.30 kg/m^2,Quietspace,1.15 from 1.15 kg/m^2 Cube™, 0.75 from 1.68 kg/m^2 3D Ceiling Tile or 3D Tile
Reference Service Life	RSL 20 years with 97% reuse. Higher churn must factor results B4 & 5

Functional & Technical Performance

Product	Depth	Cover	NRC	Size	Durability	Churn
Name /Unit	mm	kg/m^2		m	years	
Workstation	6	1.68	0.20	1.22*2.44	>60	40
Quietspace Panel/APA	25	2.30	0.85	1.22*2.44	>60	40
Cube	6	1.15	0.20	1.22*2.44	>60	40
3D Ceiling Tile	62 to 83	1.68	0.75	0.595[2]	>60	40
3D Tile	50 to 80	1.68	0.75	0.575[2]	>60	40

Standards	Sound absorption performance complies as determined using ISO 354 methodology. Reaction to fire performance complies with ISO 9705:1993, AS 5637.1:2015, BS EN 13501-1 and ASTM E84.
Primary Data	Data was collected in accordance with EN ISO 14044:2006, 4.3.2, from primary sources including the manufacturer, suppliers and their publications on standards locations, logistics, technology, market share, management system and commitment to improved environmental performance.
Range and variability	Significant differences of mean LCIA results are declared. They were most sensitive to PET fibre melt-spin process energy reported ranging from (1.8 to 17.6) MJ/kg, 8.3MJ/kg mean and 8.0 standard deviation. LCIA variability based on such a mean is outside acceptable confidence limits, so lower and upper median results from that range are declared for A1-A3 module results. A1-A3 module result are shown modelled on both lower median results 4.1MJ and upper median 10.4MJ melt-spin process energy. All scenarios A4 to D3 assume upper median energy.
Cut-off & Data	Criteria complies with EN 15804:2012+A2:2019
Allocation	Physical allocation by mass and/or energy flow share. No economic allocation
No Chemicals of Very High Concern	Contains no substances in the “Authorised or Candidate Lists of Substances of Very High Concern (SVHCs)” with the European Chemicals Agency

[1] NRC = Noise reduction coefficient conforming to ISO11654 standard methods

Base Material Origin and Detail

Composition by component, function, source and percentage mass share are listed below.

Base Material Chemical Analysis

Function	Component	Source	Workstation	Quietspace	Cube™	3D Tile	3D Ceiling Tile
Main fibre	80% rPET[2]	Taiwan	>50<58	>40<50	0	>50<58	>50<58
	95% rPET	Taiwan	>20<24	>8 <11	>65<80	>20<24	>20<24
Bond fibre	PETG[3]	Korea	0	>31 <40	0	0	0
	PETG	Taiwan	>28<33	>16<21	>35<43	>28<33	>28<33
Facing	Polyethylene	Australia	0	2.5 <4	0	0	0

Program Description

EPD type	Cradle to grave as defined by EN 15804
Sub PCR	Acoustic Insulation sub PCR 2021 AIN V1 https://www.globalgreentag.com/get/files/1107/2021-acoustic-insulation-pcr.pdf
System boundary	The system boundary with nature includes material and energy system input processing plus manufacture and transport to factory gate plus waste arising.
Comparability	Construction product EPDs may not be comparable if not EN15804 compliant
Scope	Compliance demands declaring cradle to gate plus options with modules A1 to A5, B1 to B7, C1 to C4 and D1 to D3. Note included B1, B6 and B7 and C4 have zero flows
Product stages included	Stages are from A1 to A5 raw material acquisition, extraction, refining and processing plus scrap reuse from prior systems; electricity generated from all sources with extraction, refining & transport plus secondary fuel energy and recovery processes. A2 transport internal and to factory gate plus A3 making product packaging, inputs and flows leaving at end-of-waste boundary allocated as coproducts. Also, B1 to B7, C1 to C4 and D1 to D3.
Stages excluded	No stage was excluded, all with zero flows were modelled and results shown. Any modules not declared would not indicate zero inventory or impact result.

Information Modules System Analysis Scope and Boundaries

Information	Figure 1 depicts LCA and EPD results to be shown summed for modules A1 to D3.																		
Model	Actual					Scenarios											Potential		
Information	Building Life Cycle Assessment																Supplementary		
Stages	Product			Construct		Use							End-of-Life				Benefit & load beyond system		
						Fabric					Operation								
Modules	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D1	D2	D3
Cradle to grave operations	Resources	Transport	Manufacture	Transport	Construct	Use	Maintain	Repair	Replacement	Refurbishment	Energy use	Water use	Demolish	Transport	Process Waste	Disposal	Reuse	Recovery	Recycling

Figure 1 EPD Life Cycle Modules Cradle to Grave

[2] % Mass share of Post-Consumer Recycled Polyester

[3] Low Melt fibre of Polyethylene terephthalate glycol

System Operations, Scope and Boundaries

Figure 2 shows included processes in a cradle to grave system boundary to end of life fate to re-use, recycling or landfill grave.

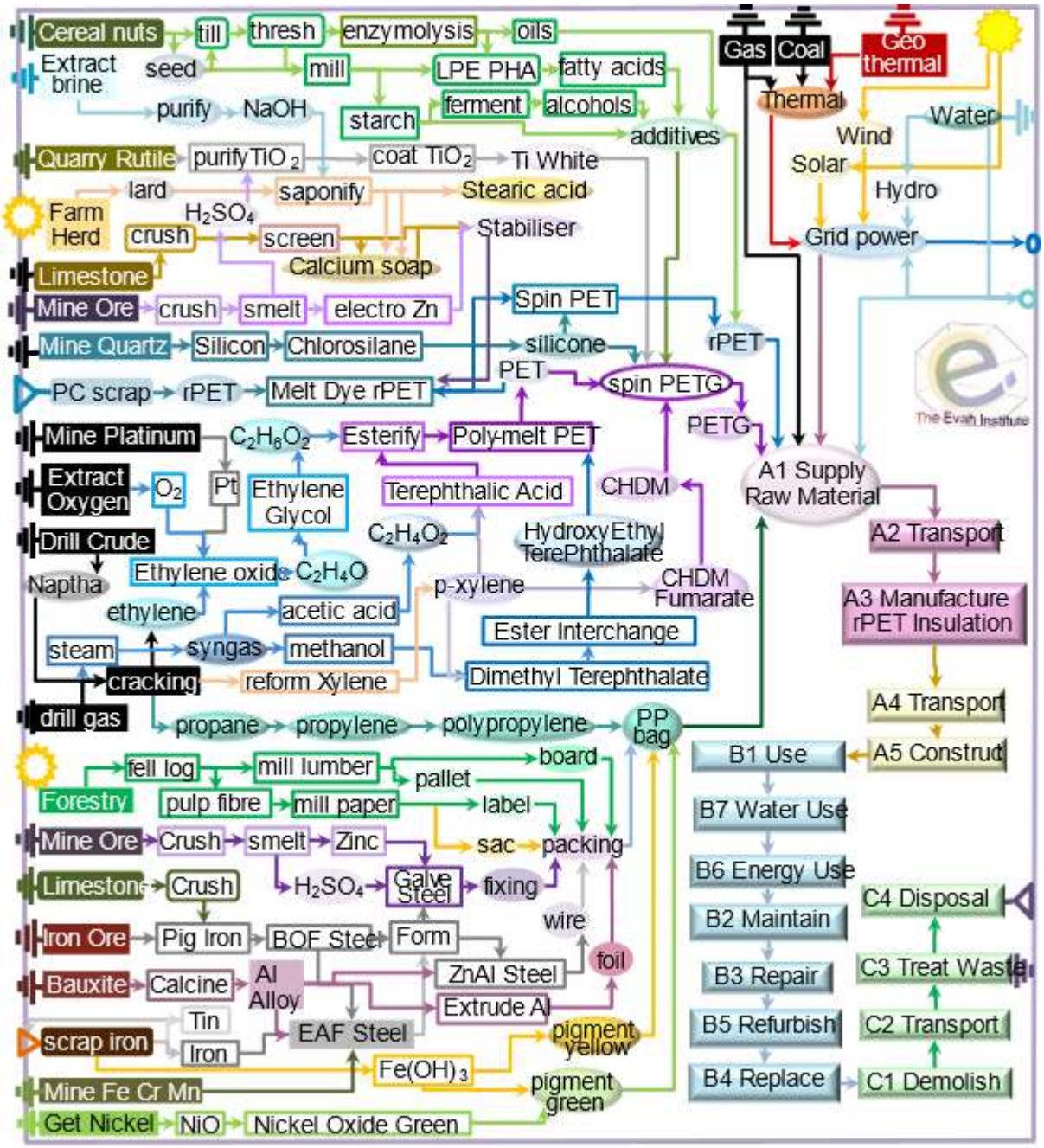


Figure 2 Product Process Flow Chart

Scenarios for Modules

Modelled 20 years with 97% reuse at 20 years and 94% at 40 years. Higher churn can be estimated by factoring results from the denoted B4 and 5, D1, D2 and D3, C1, C2 and C4 scenarios. This section defines modelling scenarios for modules A4 to C4 and beyond the system boundary to modules D1 to D3

A4 Transport to Site	Type specified	Amount	Type specified	Amount
Intercity road trucking	2t to 5t vans	220 km	85% Capacity	Full back load
Long distance road trucking	25t semi-trailer	600 km	85% Capacity	Full back load
Continental freight rail	Diesel train	600 km	85% Capacity	Full back load
Global container shipping	Factory to CBD	1,200km	85% Capacity	Full back load
Volume capacity (<1 to ≥1)	Utilisation factor	1	Uncompressed	Un-nested
A5 Installation				
Utilities used	Grid Power	0.0042MJ	Town water	Nil
Emissions	VOCs indoors	Nil	From landfill	All known
Waste on site	Scrap Trim	5%	Scrap Fate	Landfill
Collection	Council site bins	0.05 kg	Landfill route	50km no return
Pack waste collection	Council site bins	0.0004kg	To Recycler	50km no return
Pack scrap recycled	Council site bins	0.003kg	Landfill route	50km no return
Packaging Fate	Card, paper, metal	Recycle	Poly Wrap	Landfill
Packaging to Energy	Energy recovery	nil		

Building Modules B2 and B3 and C1 to C4 end-of-life scenarios follow.

B2 Maintenance	Type specified	Amount	Type specified	Amount
Maker's specified process	URL declared	Specified	Clean cycle	Annual
Vacuum cleaning energy	Annually	0.007Mjpa	Power mix	National grid
B3 Repair	Damaged	1%	Maker's process	As per website
New Product	As manufactured	1%	Freight to site	1% A5
Scrap	Fate landfill	0.025kg	Recyling	0.025kg
Energy input & source	No excess	Nil	Packaging	1% A5
B4 Replacement	1% damaged	0.01kg	Maker's process	As per website
B5 Refurbishment	Vacuum dust	surface	Cleaning Stains	Spot wash
C1 Demolition	**Type specified**	**Amount**	**Type specified**	**Amount**
Assumed PET life	100% durable	60year	Demolished	1%
Assumed Operations	Dust & churn	1% damage	Collection	100% site bins
C2 Transport	25t truck road	50km	85% capacity	No back load
C3 Waste Treatment	Cleaning dust	0.007Mjpa	Cleaning Stains	1%
C4 Disposal	Product specific	0.01kg	Collect separately	0.01kg
Typical Scenario	Landfill dirty PET	1%	All emissions	mass share

Scenarios for modules D1 Reuse, D2 Recovery and D3 Recycling are listed below.

D Beyond System Boundary

	Type specified	Amount	Type specified	Amount
D1 Reuse	Fit for purpose	97%	Reuse in place	0.97kg
D2 Recovery	Reuse on site	97%	Vacuum	0.97kg
D3 Recycle	Full Reprocess	3%	Clean fibre	0.03kg

Environmental Impact Terminology

Environmental impacts contributing to risks of social and ecological issues and collapse are tabled below with ***common names*** and remedies given for each indicator.

Global warming potential (GWP)	Greenhouse gases absorb infra-red radiation. This heat reduces thermal energy differentials, from equator to poles, forcing ocean current and wind circulation to blend and regulate climate. Weakly blended "lumpier" weather has more frequent, extreme heat wave, fire-storm, cyclone, rain-storm, flood and blizzard events. Accumulation of carbon dioxide, natural gas methane, nitrous oxides and volatile organic compounds from burning fossil fuels causes global warming. Forest and wilderness growth absorbing air-borne carbon in biomass can drawdown such accumulation. Urgent renewable energy reliance is vital in time to avoid imminent tipping points and the worsening "***climate emergency***".
Ozone depletion potential (ODP)	Stratospheric ozone loss weakens the planet's solar shield so more shorter wavelength ultraviolet (UVB) light reaching earth damages plants and increases malignant melanoma and skin cancer in humans and animals. Chlorofluorocarbons, hydrochlorofluorocarbons (HCFC), chlorobromomethane, hydrobromofluorocarbons, carbon tetrachloride, methyl chloroform, methyl bromide and halon gas cause ozone layer loss. To repair the "***ozone hole***" reliance on ozone-safe refrigerants, aerosols and solvents is essential to avoid further its depletion and enable accumulation of naturally-formed ozone.
Acidification potential (AP)	Acidification reduces soil and waterway pH, impedes nitrogen fixation vital for plant growth and inhibits natural decomposition. It increases rates and incidence of fish kills, forest loss and deterioration of buildings and materials. Chief synthetic causes of "***acid rain***" are emissions of sulphur and nitrogen oxides, hydrochloric and hydrofluoric acids and ammonia from burning fossil fuels polluting rain and snow precipitation world-wide.
Eutrophication potential (EP)	Eutrophication from excessively high macronutrient levels added to natural waters promotes excessive plant growth that severely reduces oxygen, water and habitat security for aquatic and terrestrial life across related ecosystems. Chief synthetic cause of "***algal blooms***" is nitrogen (N, NOx, NH_4) and phosphorus (P, PO_4^{3-}) in rain run-off across over-fertilised land catchments.
Photochemical ozone creation potential (POCP)	Tropospheric photochemical ozone, called "***smog***" near ground level, is created from natural and synthetic compounds in UV sunlight. Low concentration smog damages vegetation and crops. High concentration smog is hazardous to human health. Chief synthetic causes are nitrogen oxides, carbon monoxide and volatile organic compounds (VOC) pollutants. Avoiding reliance on dirtiest coal fuel and volatile chemicals has reduced smog incidence in many areas globally.
Abiotic depletion potential elemental (ADPE)	Abiotic depletion of finite mineral resources increases time, effort and money required to obtain more resources to the point of extinction of naturally viable reserves. This can limit access to available, valuable and scarce elements vital for human-life. The youth movement "***extinction rebellion***" calls on adults to secure climate, reserves and biodiversity for current and future generations.
Abiotic depletion potential fossil fuel (ADPF)	Abiotic depletion of resources by consuming finite oil, natural gas, coal and nuclear fossil fuel reserves leaves current and future generations suffering limited available, accessible, plentiful, essential valuable as well as scarce raw material, medicinal, chemical, feedstock and fuel stock. Approaching "***peak oil***" acknowledged fossil fuel reserves are finite and the need for decision-makers to act to avoid market instability, insecurity and or oil and gas wars.

Glossary of Terms, Methods and Units

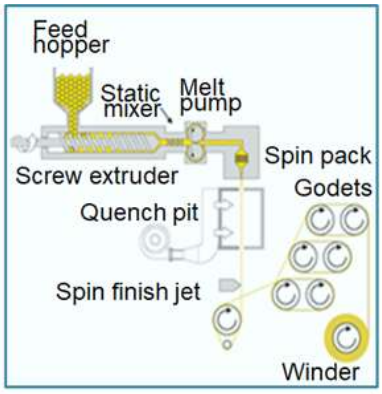
Acronyms, methods and units of impact potentials plus inventory inputs and outputs, are defined below

Impact Potentials	Acronym	Description of Methods	Units
Climate Change biogenic	GWP_{bio}	GWP biogenic [7]	kg CO_{2eq}
Climate Change land use	GWP_{luluc}	GWP land use & change [7]	kg CO_{2eq}
Climate Change fossil	GWP_{ff}	GWP fossil fuels [7]	kg CO_{2eq}
Climate Change total	GWP_{t}	Global Warming Potential [7]	kg CO_{2eq}
Stratospheric Ozone Depletion	ODP	Stratospheric Ozone Loss [8]	kg CFC_{11eq}
Photochemical Ozone Creation	POCP	Summer Smog [9]	kg NMOC $_{eq}$
Acidification Potential	AP	Accumulated Exceedance [10]	mol H^{+} $_{eq}$
Eutrophication Freshwater	EP_{fresh}	Excess nutrients freshwater [11]	kg P $_{eq}$
Eutrophication Marine	EP_{marine}	Excess marine nutrients [11]	kg N $_{eq}$
Eutrophication Terrestrial	EP_{land}	Excess Terrestrial nutrients [11]	mol N $_{eq}$
Fossil Fuel Depletion	ADP_{ff}	Abiotic Depletion fossil fuel [13]	MJ $_{ncv}$
Mineral & Metal Depletion	ADP_{min}	Abiotic Depletion minerals [12]	kg Sb $_{eq}$
Water Depletion	WDP	Water Deprivation Scarcity [14, 15]	m^3 $_{WDP\ eq}$
Fresh Water Net	FW	Lake, river, well & town water	m^3
Secondary Material	SM	Post-consumer recycled (PCR)	kg
Secondary Renewable Fuel	RSF	PCR biomass burnt	MJ $_{ncv}$
Primary Energy Renewable Material	PERM	Biomass retained material	MJ $_{ncv}$
Primary Energy Renewable Not Feedstock	PERE	biomass fuels burnt	MJ $_{ncv}$
Primary Energy Renewable Total	PERT	Biomass burnt + retained	MJ $_{ncv}$
Secondary Non-renewable Fuel	NRSF	PCR fossil-fuels burnt	MJ $_{ncv}$
Primary Energy Non-renewable Material	PENRM	Fossil feedstock retained	MJ $_{ncv}$
Primary Energy Non-renewable Not Feedstock	PENRE	fossil-fuel used or burnt	MJ $_{ncv}$
Primary Energy Non-renewable Total	PENRT	Fossil feedstock & fuel use	MJ $_{ncv}$
Hazardous Waste Disposed	HWD	Reprocessed to contain risks	kg
Non-hazardous Waste Disposed	NHWD	Municipal landfill facility waste	kg
Radioactive Waste Disposed	RWD	Mostly ex nuclear power station	kg
Components For Reuse	CRU	Product scrap for reuse as is	kg
Material For Recycling	MFR	Factory scrap to remanufacture	kg
Material For Energy Recovery	MER	Factory scrap use as fuel	kg
Exported Energy Electrical	EEE	Uncommon for building product	MJ $_{ncv}$
Exported Energy Thermal	EET	Uncommon for building product	MJ $_{ncv}$

Background Data Quality Parameters and Sensitivity

PET fibre LCA results were most sensitive to energy use in the melt-spin process. Figure 3 depicts fibre melt-spun into filament a function of polymer extrusion energy not fibre diameter. It is then cut into staple fibres (often 38 mm) or then drawn and textured to make spun yarn.

As Figure 4 depicts surveys of industry and EcoInvent V2 to 3.4 LCI by Sandin, Roos & Johansson (2019)[4] and van der Velden et al (2014)[5] reported PET fibre melt-spin energy from lowest 1.8MJ/kg to highest 17.64MJ/kg. The mean of 8.3MJ/kg had a standard deviation of 8.



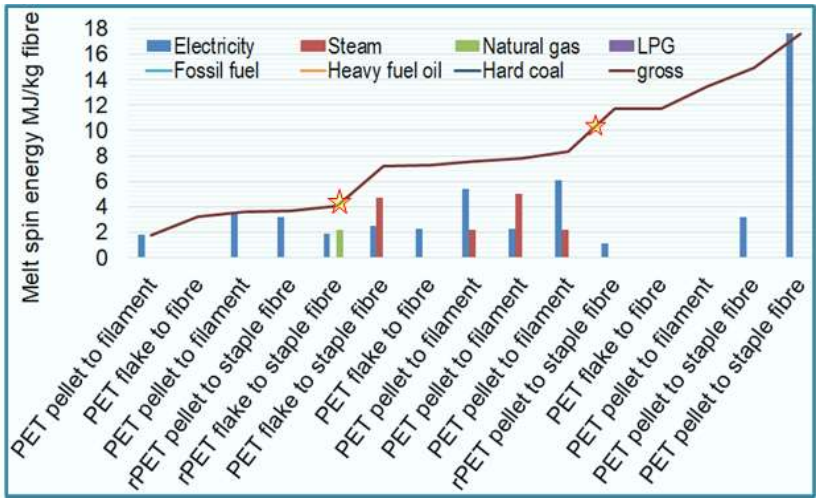


Figure 3. Melt-spin Process

Figure 4. PET Melt-spin Gross Energy & Sources

They found gross melt-spin energy ranged from 3.2 to 11.7MJ/kg PET staple fibre and 1.1 to 13.6MJ/kg partially drawn untextured filament. Table a lists survey data selected on quality and age.

Table a Pre-oriented Yarn Fibre Extrusion Melt-spin Energy MJ/kg

Process	gross	Electric	Heavy fuel oil	Natural gas	LPG	Steam	Hard coal	Fossil fuel
rPET pellet to staple fibre	3.684	3.204	0.48					
rPET flake to staple fibre	4.10	1.872		2.21	0.02			
PET flake to staple fibre	7.234	2.484				4.75		
PET pellet to filament	7.600	5.400				2.20		
PET pellet to filament	7.784	2.304	0.48			5.0		
PET pellet to filament	8.320	6.120				2.20		
rPET pellet to staple fibre	11.69	1.116					10.57	
PET pellet to staple fibre	14.90	3.2						11.7

As surveys reported such a wide hot melt-spin energy range and standard deviation that LCA results were most sensitive to, this EPD declares both lower and upper melt-spin energy. The lower melt-spin energy modelled 4.102MJ/kg fibre with 1.87MJ electricity, 2.21MJ natural gas & 0.02MJ propane. Beyond 4.1MJ/kg, upper melt-spin energy was modelled to reflect a 10.4MJ/kg median using electricity only along with that using 8.1MJ Electricity, 2.21MJ Natural gas and 0.02MJ propane. Results of these 3 modelled value sets are discussed in the Interpretation section. For clarity this EPD declares results of one lower and one upper melt-spin value only.

[4] Environmental impact of textile fibres –what we know and what we don't know, Sandin, G., Roos, S., & Johansson, M., ISBN:978-91-88695-91-8, Mistra Future Fashion report number: 2019:03 part 2.

[5] LCA benchmarking study on textiles made of cotton, polyester, nylon, acryl, or elastane. Natascha M. van der Velden & Martin K. Patel & Joost G. Vogtländer. Int J Life Cycle Assess (2014) 19:331–356, DOI 10.1007/s11367-013-0626-9

Interpretation

This EPD declares results from one lower and upper all electricity melt-spin values but this interpretation section discusses results from two upper 10.40MJ and one lower 4.102MJ value. To compare such influences, Figure 5 depicts Greenhouse Gas global warming potential (GWP) results from the three models. Compared to the lower energy model, the upper electric GWP was 2.2 to 3.0 times higher and upper gas and electric GWP was 1.9 to 2.6 times higher. Figure 6 depicts GWP of dope dyed polyester filament fibre extrusion spinning versus wet treatment and knitting fabric from 3rd party reviewed LCA of 6 polyester fabrics in 2017-18 by Roos that also used upper melt-spin energy[6].

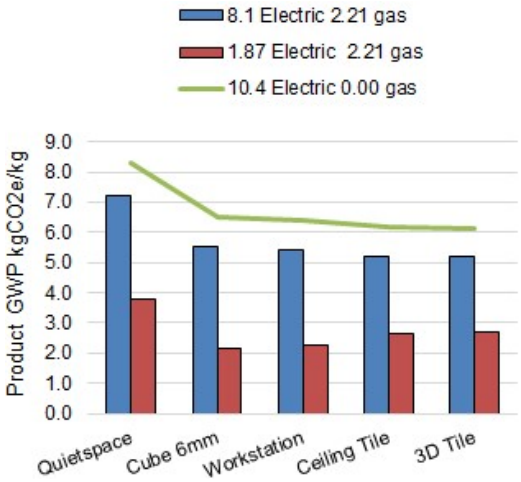


Figure 5. PET Fibre GWP kg CO_{2e}/kg

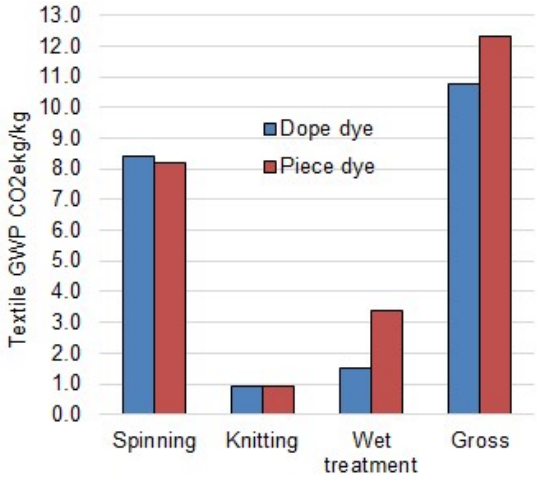


Figure 6. PET Fabric GWP kg CO_{2e}/kg

That small scale fibre production high GWP should be less with larger-scale efficiency. Nevertheless, this LCA using EcoInvent V3.4 LCI based on first-hand industry PET fibre spinning data shows GWP comparable to upper 10.4 MJ electric melt-spin results declared as Figure 7 depicts. Sandin, Roos & Johansson (2019) reported gross production energy use between 96 and 125 MJ/kg PET fibre as Figure 8 depicts well as comparable calculated GWP from 1.7 to 4.5kg CO_2 eq/ kg PET fibre too.

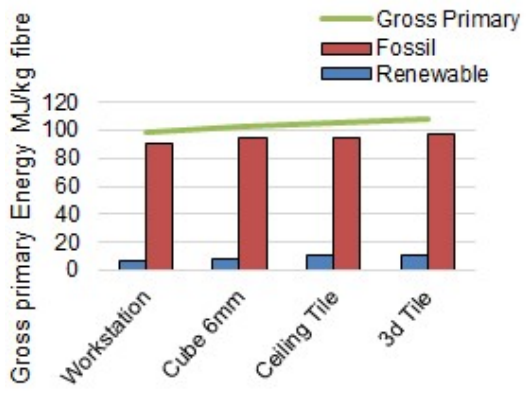


Figure7. PET Fibre MJ/kg PET Fibre

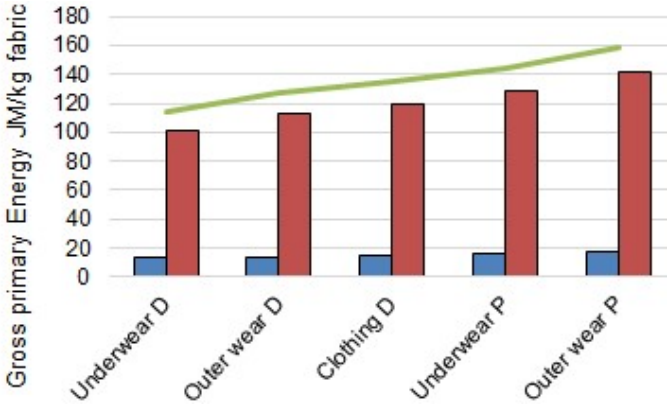


Figure 8. PET Fabric MJ/kg

Such variation in energy use and GWP result suggests that more accurate melt-spin energy definition is vital for true polyester LCA modelling to have confidence in affected EPDs. Unless based on recent post 2019 rPET staple fibre spinning-industry datasets, LCA results based on one melt-spin energy background data value are probably too uncertain to be declared representative of PET fibre. P.

[6] PET Fabric https://portal.environdec.com/api/api/v1/EPDLibrary/Files/123f5ad6-8cb9-4a8a-afad-751c6a9d6647/Data

Aditional Environmental Information on Carbon Offsets

Autex has purchased carbon certificates to offset all these products greenhouse gas global warming potential (GWP).

These certificates were 3rd party certified as compliant for this EPD.

Table 1 shows Total Greenhouse Gas with GWP Offset/kg declared product modelled on lower 4.102MJ/kg melt-spin energy. In each lower energy case, all cradle to gate product emissions were more than fully offset.

These are reported as negative emissions acting as a carbon sink.

It also shows Total Greenhouse Gas with GWP Offset/kg declared product modelled on upper 10.4MJ/kg electric melt-spin.

In each upper energy case, all product GWP emissions have been offset to cancel what their manufacture generated so they are reported as a zero emission to signify no residual Carbon dioxide equivalent gas emissions A1-A3.

Table 1 Total Greenhouse Gas with GWP Offset kg CO_{2e}/kg functional unit A1-A3

melt-spin energy modelled	Workstation	Quietspace	Cube™	3D Ceiling Tile	3D Tile
Lower 4.1MJ/kg product	-1.12	-1.84	-0.99	-0.99	-0.98
Upper 10.4MJ/kg product	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00

The GWP offset amounts are the true 3rd party certified valid GWP estimates to be assigned these products and not calculated results shown in the following section for which offsets were purchased.

For Green Building Council credits, this Additional Environmental Information reported on 3rd party certified GWP offset amounts are valid for these products not the following calculated results.

Workstation Results Cradle to Construction

Table 2a shows A1 to A3 results for lower melt-spin energy and A4, A5 for upper melt-spin energy.

Table 2a Workstation LCIA and LCI results/kg functional unit A1-A5

Burdens	A1-A3		A4	A5
Melt-spin energy modelling applied	Lower	Upper	Upper	Upper
Greenhouse Gas Biogenic	-0.36	-0.40	0	-6.2E-02
Greenhouse Gas LULUC	7.5E-10	7.5E-10	2.8E-09	1.1E-05
Greenhouse Gas Fossil	2.50	6.78	0.17	1.05
Total Greenhouse Gas	2.14	6.38	0.17	0.99
Stratospheric Ozone Depletion	1.1E-09	4.6E-09	2.9E-13	4.6E-08
Photochemical Ozone Creation	1.3E-02	1.8E-02	9.3E-04	7.0E-03
Acidification	6.5E-03	2.2E-02	9.0E-05	3.8E-03
Eutrophication Freshwater	5.89E-07	1.9E-06	2.1E-09	3.1E-07
Eutrophication Marine	1.97E-03	5.0E-03	1.7E-05	9.8E-04
Eutrophication Terrestrial	4.73E-03	1.2E-02	5.5E-05	2.3E-03
Abiotic Depletion Fossil Fuel	2.5	5.8	2.0E-01	0.93
Abiotic Depletion Minerals	3.2E-03	5.9E-03	1.1E-05	7.3E-04
Deprivation Scarcity Water	0.11	0.21	1.6E-05	1.0E-01
Net Fresh Water Use	0.28	1.1	1.0E-04	0.62
Secondary Material	0.68	0.69	4.7E-06	0.29
Secondary Renewable Fuel	1.4	2.2	0	0.16
Primary Renewable Material	4.1	6.9	3.7E-03	0.45
Primary Energy Renewable Not Material	3.6	3.5	5.1E-04	1.1
Primary Energy Renewable Total	7.6	10	4.2E-03	1.5
Secondary Non-renewable Fuel	0.25	0.26	1.1E-03	0.07
Primary Energy Non-renewable Material	33	91	0.97	4.10
Primary Non-renewable Energy Not Material	9.7	13	1.6	11
Primary Energy Non-renewable Total	42	104	2.6	15
Hazardous Waste Disposed	4.1E-03	4.5E-03	3.3E-04	8.0E-04
Non-hazardous Waste Disposed	0.49	1.6	2.9E-03	0.32
Radioactive Waste Disposed	1.1E-09	4.8E-09	1.7E-31	8.3E-16
Components For Reuse	0	0	0	0
Material For Recycling	0.12	0.17	1.0E-05	6.0E-02
Material For Energy Recovery	2.1E-04	4.5E-04	3.4E-07	1.0E-04
Exported Energy Electrical	0	0	0	0
Exported Energy Thermal	0	0	0	0

Workstation Results Building Operations and End-of-life

Table 2b lists B1 use, B2 Maintain, B3 Repair, B4 Replace, B5 Refurb B6 water use & B7 energy use, C1 Demolish, C2 Transport, C3 Process waste and C4 Disposal results all assuming upper melt spin energy.

Table 2b Workstation LCIA and LCI Results /kg Functional Unit B1 to C4

Burdens	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4
GWP $_{bio}$	0	-2.6E-04	-0.01	-0.01	-2.6E-04	0	0	-1.1E-04	0	-2.6E-04	0
GWP $_{luluc}$	0	4.1E-07	2.2E-06	2.3E-06	4.1E-07	0	0	1.7E-07	1.4E-09	4.1E-07	1.7E-10
GWP $_{ff}$	0	0.05	0.21	0.22	0.05	0	0	0.02	0.01	0.05	1.2E-03
GWP $_{t}$	0	0.05	0.20	0.20	0.05	0	0	0.02	0.01	0.05	1.2E-03
ODP	0	2.1E-15	9.2E-09	9.1E-09	2.1E-15	0	0	9.0E-16	1.1E-13	2.1E-15	1.8E-14
POCP	0	2.4E-04	1.4E-03	1.4E-03	2.4E-04	0	0	1.0E-04	6.0E-05	2.4E-04	2.8E-05
AP	0	1.1E-04	7.6E-04	8.0E-04	1.1E-04	0	0	4.6E-05	5.1E-06	1.1E-04	3.6E-06
EP $_{fresh}$	0	1.3E-11	6.2E-08	6.1E-08	1.3E-11	0	0	5.7E-12	3.1E-10	1.3E-11	5.2E-11
EP $_{marine}$	0	2.0E-05	2.0E-04	2.0E-04	2.0E-05	0	0	8.5E-06	9.5E-07	2.0E-05	6.6E-07
EP $_{land}$	0	1.5E-04	4.6E-04	5.0E-04	1.5E-04	0	0	6.2E-05	3.4E-06	1.5E-04	1.3E-06
ADP $_{ff}$	0	0.03	0.19	0.18	0.03	0	0	1.2E-02	7.5E-03	0.03	1.4E-03
ADP $_{min}$	0	2.2E-10	1.5E-04	1.5E-04	2.2E-10	0	0	9.5E-11	4.0E-06	2.2E-10	8.0E-07
WDP	0	2.8E-06	0.02	0.02	2.8E-06	0	0	1.2E-06	1.4E-06	2.8E-06	2.4E-07
FW	0	4.1E-07	2.2E-06	0.12	4.1E-07	0	0	7.4E-03	8.7E-03	4.1E-07	1.5E-03
SM	0	-2.6E-04	-0.01	0.06	-2.6E-04	0	0	2.2E-04	2.2E-06	-2.6E-04	3.0E-07
RSF	0	1.2E-03	0.03	0.03	1.2E-03	0	0	5.3E-04	2.2E-06	1.2E-03	6.8E-07
PERM	0	5.2E-08	0	0.08	5.2E-08	0	0	2.2E-08	0	5.2E-08	2.6E-04
PERE	0	0.03	0.18	0.22	0.03	0	0	1.1E-02	0	0.03	1.9E-05
PERT	0	0.03	0.18	0.31	0.03	0	0	1.1E-02	1.6E-03	0.03	2.8E-04
NRSF	0	1.6E-08	0.01	1.3E-02	1.6E-08	0	0	6.7E-09	2.1E-04	1.6E-08	7.8E-05
PENRM	0	0.01	0.82	0.83	0.01	0	0	0	0	0.01	7.2E-03
PENRE	0	0.50	2.20	2.21	0.50	0	0	0.21	0	0.50	1.2E-02
PENRT	0	0.51	3.0	3.0	0.51	0	0	0.22	3.7E-02	0.51	3.8E-03
HWD	0	8.0E-04	1.6E-04	2.0E-04	8.0E-04	0	0	1.0E-06	1.2E-05	8.0E-04	2.4E-06
NHWD	0	0.32	0.06	0.06	0.32	0	0	5.4E-05	9.7E-05	0.32	5.0E-02
RWD	0	8.3E-16	1.7E-16	1.7E-16	8.3E-16	0	0	9.2E-37	8.5E-32	8.3E-16	1.1E-32
CRU	0	0	0	0	0	0	0	0	0	0	0
MFR	0	6.0E-02	0.01	4.0E-03	6.0E-02	0	0	2.9E-04	4.6E-06	6.0E-02	1.5E-01
MER	0	1.0E-04	2.0E-05	2.0E-05	1.0E-04	0	0	2.1E-12	1.5E-07	1.0E-04	2.4E-08
EEE	0	0	0	0	0	0	0	0	0	0	0
EET	0	0	0	0	0	0	0	0	0	0	0

Workstation Results Beyond the System Boundary

Table 2c shows results for D1 Reuse, D2 Recovery to D3 Recycle.

Table 2c LCI and LCIA Results/kg functional unit D1 to D3

Results assuming upper melt-spin energy	D1	D2	D3
Climate Change biogenic	-0.17	2.0E-04	-0.04
Climate Change luluc	0.2	1.0E-11	6.8E-06
Climate Change fossil	0.98	2.5E-04	0.66
Climate Change total	0.96	4.5E-04	0.60
Stratospheric Ozone Depletion	1.3E-08	5.7E-13	2.7E-08
Photochemical Ozone Creation	3.9E-03	9.9E-07	4.2E-03
Acidification Potential	1.7E-03	4.3E-07	2.4E-03
Eutrophication Freshwater	1.3E-07	1.2E-10	1.8E-07
Eutrophication Marine	3.9E-04	7.6E-08	6.0E-04
Eutrophication Terrestrial	9.4E-04	5.2E-07	1.5E-03
Fossil Depletion	2.0E-04	1.5E-04	0.54
Mineral and Metal Depletion	0.82	5.7E-08	4.4E-04
Water Scarcity Depletion	0.05	1.8E-05	0.06
Net Fresh Water Use	0.29	1.1E-04	0.37
Secondary Material	0.37	0.10	0.17
Secondary Renewable Fuel	0.51	1.7E-04	0.10
Primary Renewable Material	0.01	2.7E-04	0.23
Primary Energy Renewable Not Feedstock	3.1	3.0E-05	0.65
Primary Energy Renewable Total	3.1	4.7E-04	0.93
Secondary Non-renewable Fuel	0.22	7.7E-06	0.04
Primary Energy Non-renewable Material	13	2.4E-03	2.49
Primary Non-renewable Energy Not Feedstock	36	3.2E-04	6.63
Primary Energy Non-renewable Total	47	2.7E-03	9.08
Hazardous Waste Disposed	7.4E-04	1.9E-07	6.0E-04
Non-hazardous Waste Disposed	0.1	1.8E-05	0.18
Radioactive Waste Disposed	2.2E-16	4.6E-21	5.0E-16
Components For Reuse	0.97	0	0.03
Material For Recycling	3.7E-03	1.5E-05	0.01
Material For Energy Recovery	6.5E-05	6.2E-09	6.1E-05
Exported Energy Electrical	0	0	0
Exported Energy Thermal	0	0	0

Quietspace Results Cradle to Construction

Table 3a A1 to A3 results assume lower melt-spin energy and A4, A5 assume upper melt spin energy use.

Table 3a Quietspace LCI and LCIA Results /kg functional unit A1-A5

Impact potential categories	A1-A3		A4	A5
Melt-spin energy modelling applied	Lower	Upper	Upper	Upper
Greenhouse Gas Biogenic	-0.72	-0.78	0	-6.2E-02
Greenhouse Gas LULUC	1.0E-09	1.0E-09	2.8E-09	1.1E-05
Greenhouse Gas Fossil	4.25	9.09	0.17	1.05
Total Greenhouse Gas	3.53	8.31	0.17	0.99
Stratospheric Ozone Depletion	1.9E-09	6.2E-09	2.9E-13	4.6E-08
Photochemical Ozone Creation	1.5E-02	2.1E-02	9.3E-04	7.0E-03
Acidification	1.2E-02	2.6E-02	9.0E-05	3.8E-03
Eutrophication Freshwater	1.3E-06	4.3E-06	2.1E-09	3.1E-07
Eutrophication Marine	2.8E-03	7.0E-03	1.7E-05	9.8E-04
Eutrophication Terrestrial	7.9E-03	2.0E-02	5.5E-05	2.3E-03
ADP Fossil Fuel	4.3	8.2	2.0E-01	0.93
ADP Mineral and Metal	4.8E-03	8.3E-03	1.1E-05	7.3E-04
Water Deprivation Scarcity	8.2E-02	0.25	1.6E-05	1.0E-01
Net fresh water	0.42	1.4	1.0E-04	0.62
Secondary material	0.50	0.50	4.7E-06	0.29
Secondary renewable fuel	2.4	3.4	0	0.16
Primary renewable energy not feedstock	5.7	9.1	3.7E-03	0.45
Primary renewable feedstock energy	6.5	6.4	5.1E-04	1.1
Primary Energy Renewable Total	12	16	4.2E-03	1.5
Secondary non-renewable fuel	0.49	0.50	1.1E-03	0.07
Primary energy non-renewable not feedstock	54	121	0.97	4.10
Primary non-renewable feedstock energy	22	25	1.6	11
Total primary non-renewable energy	76	146	2.6	15
Hazardous waste disposed	5.3E-03	6.8E-03	3.3E-04	8.0E-04
Non-hazardous waste disposed	0.73	2.1	2.9E-03	0.32
Radioactive waste disposed	1.7E-09	6.2E-09	1.7E-31	8.3E-16
Components for reuse	0	0	0	0
Material for recycling	0.20	0.24	1.0E-05	6.0E-02
Material for energy recovery	3.2E-04	6.2E-04	3.4E-07	1.0E-04
Exported electrical energy	0	0	0	0
Exported thermal energy	0	0	0	0

Quietspace Results Building Operations

Table 3b lists B1 use, B2 Maintain, B3 Repair, B4 Replace, B5 Refurb B6 water use & B7 energy use, C1 Demolish, C2 Transport, C3 Process waste and C4 Disposal results all assuming upper melt spin energy.

Table 3b Quietspace n LCIA and LCI Results /kg Functional Unit B1 to C4

Burdens	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4
GWP $_{bio}$	0	-2.6E-04	-0.01	-0.01	-2.6E-04	0	0	-1.1E-04	0	-2.6E-04	0
GWP $_{luluc}$	0	4.1E-07	2.2E-06	2.3E-06	4.1E-07	0	0	1.7E-07	1.4E-09	4.1E-07	1.7E-10
GWP $_{ff}$	0	0.05	0.21	0.22	0.05	0	0	0.02	0.01	0.05	1.2E-03
GWP $_{t}$	0	0.05	0.20	0.20	0.05	0	0	0.02	0.01	0.05	1.2E-03
ODP	0	2.1E-15	9.2E-09	9.1E-09	2.1E-15	0	0	9.0E-16	1.1E-13	2.1E-15	1.8E-14
POCP	0	2.4E-04	1.4E-03	1.4E-03	2.4E-04	0	0	1.0E-04	6.0E-05	2.4E-04	2.8E-05
AP	0	1.1E-04	7.6E-04	8.0E-04	1.1E-04	0	0	4.6E-05	5.1E-06	1.1E-04	3.6E-06
EP $_{fresh}$	0	1.3E-11	6.2E-08	6.1E-08	1.3E-11	0	0	5.7E-12	3.1E-10	1.3E-11	5.2E-11
EP $_{marine}$	0	2.0E-05	2.0E-04	2.0E-04	2.0E-05	0	0	8.5E-06	9.5E-07	2.0E-05	6.6E-07
EP $_{land}$	0	1.5E-04	4.6E-04	5.0E-04	1.5E-04	0	0	6.2E-05	3.4E-06	1.5E-04	1.3E-06
ADP $_{ff}$	0	0.03	0.19	0.18	0.03	0	0	1.2E-02	7.5E-03	0.03	1.4E-03
ADP $_{min}$	0	2.2E-10	1.5E-04	1.5E-04	2.2E-10	0	0	9.5E-11	4.0E-06	2.2E-10	8.0E-07
WDP	0	2.8E-06	0.02	0.02	2.8E-06	0	0	1.2E-06	1.4E-06	2.8E-06	2.4E-07
FW	0	4.1E-07	2.2E-06	0.12	4.1E-07	0	0	7.4E-03	8.7E-03	4.1E-07	1.5E-03
SM	0	-2.6E-04	-0.01	0.06	-2.6E-04	0	0	2.2E-04	2.2E-06	-2.6E-04	3.0E-07
RSF	0	1.2E-03	0.03	0.03	1.2E-03	0	0	5.3E-04	2.2E-06	1.2E-03	6.8E-07
PERM	0	5.2E-08	0	0.08	5.2E-08	0	0	2.2E-08	0	5.2E-08	2.6E-04
PERE	0	0.03	0.18	0.22	0.03	0	0	1.1E-02	0	0.03	1.9E-05
PERT	0	0.03	0.18	0.31	0.03	0	0	1.1E-02	1.6E-03	0.03	2.8E-04
NRSF	0	1.6E-08	0.01	1.3E-02	1.6E-08	0	0	6.7E-09	2.1E-04	1.6E-08	7.8E-05
PENRM	0	0.01	0.82	0.83	0.01	0	0	0	0	0.01	7.2E-03
PENRE	0	0.50	2.20	2.21	0.50	0	0	0.21	0	0.50	1.2E-02
PENRT	0	0.51	3.0	3.0	0.51	0	0	0.22	3.7E-02	0.51	3.8E-03
HWD	0	8.0E-04	1.6E-04	2.0E-04	8.0E-04	0	0	1.0E-06	1.2E-05	8.0E-04	2.4E-06
NHWD	0	0.32	0.06	0.06	0.32	0	0	5.4E-05	9.7E-05	0.32	5.0E-02
RWD	0	8.3E-16	1.7E-16	1.7E-16	8.3E-16	0	0	9.2E-37	8.5E-32	8.3E-16	1.1E-32
CRU	0	0	0	0	0	0	0	0	0	0	0
MFR	0	6.0E-02	0.01	4.0E-03	6.0E-02	0	0	2.9E-04	4.6E-06	6.0E-02	1.5E-01
MER	0	1.0E-04	2.0E-05	2.0E-05	1.0E-04	0	0	2.1E-12	1.5E-07	1.0E-04	2.4E-08
EEE	0	0	0	0	0	0	0	0	0	0	0
EET	0	0	0	0	0	0	0	0	0	0	0

Quietspace Results Beyond System Boundary

Table 3c shows potential results for D1 Reuse, D2 Recovery to D3 Recycle.

Table 3c Quietspace LCIA and LCI Results /kg functional unit D1 to D3

Results assuming upper melt-spin energy	D1	D2	D3
Climate Change Biogenic	-0.17	2.0E-04	-0.04
Climate Change LULUC	0.2	1.0E-11	6.8E-06
Climate Change Fossil	0.98	2.5E-04	0.66
Climate Change Total	0.96	4.5E-04	0.60
Stratospheric Ozone Depletion	1.3E-08	5.7E-13	2.7E-08
Photochemical Ozone Creation	3.9E-03	9.9E-07	4.2E-03
Acidification Potential	1.7E-03	4.3E-07	2.4E-03
Eutrophication Freshwater	1.3E-07	1.2E-10	1.8E-07
Eutrophication Marine	3.9E-04	7.6E-08	6.0E-04
Eutrophication Terrestrial	9.4E-04	5.2E-07	1.5E-03
ADP Fossil Fuel	2.0E-04	1.5E-04	0.54
ADP Mineral and Metal	0.82	5.7E-08	4.4E-04
Water Deprivation Scarcity	0.05	1.8E-05	0.06
Net Fresh Water Use	0.29	1.1E-04	0.37
Secondary Material	0.37	0.10	0.17
Secondary Renewable Fuel	0.51	1.7E-04	0.10
Primary Renewable Material	0.01	2.7E-04	0.23
Primary Energy Renewable Not Feedstock	3.1	3.0E-05	0.65
Primary Energy Renewable Total	3.1	4.7E-04	0.93
Secondary Non-renewable Fuel	0.22	7.7E-06	0.04
Primary Energy Non-renewable Material	13	2.4E-03	2.49
Primary Non-renewable Energy Not Feedstock	36	3.2E-04	6.63
Primary Energy Non-renewable Total	47	2.7E-03	9.08
Hazardous Waste Disposed	7.4E-04	1.9E-07	6.0E-04
Non-hazardous Waste Disposed	0.1	1.8E-05	0.18
Radioactive Waste Disposed	2.2E-16	4.6E-21	5.0E-16
Components For Reuse	0.97	0	0.03
Material For Recycling	3.7E-03	1.5E-05	0.01
Material For Energy Recovery	6.5E-05	6.2E-09	6.1E-05
Exported Energy Electrical	0	0	0
Exported Energy Thermal	0	0	0

Cube Results Cradle to Construction

Table 4a shows A1-A3 results/kg on lower 4.1MJ/kg melt-spin energy. A4 and A5 assume upper spin energy.

Table 4a Cube LCI and LCIA results /kg functional unit A1-A5

Impact potential categories	A1-A3		A4	A5
Melt-spin energy modelling applied	Lower	Upper	Upper	Upper
Climate Change Biogenic	-0.46	-0.51	0	-6.2E-02
Climate Change LULUC	8.1E-10	8.1E-10	2.8E-09	1.1E-05
Climate Change Fossil	2.35	7.00	0.17	1.05
Climate Change Total	1.89	6.49	0.17	0.99
Stratospheric Ozone Depletion	1.1E-09	4.9E-09	2.9E-13	4.6E-08
Photochemical Ozone Creation	8.6E-03	1.2E-02	9.3E-04	7.0E-03
Acidification	6.0E-03	2.3E-02	9.0E-05	3.8E-03
Eutrophication Freshwater	7.4E-07	2.4E-06	2.1E-09	3.1E-07
Eutrophication Marine	2.1E-03	5.2E-03	1.7E-05	9.8E-04
Eutrophication Terrestrial	5.1E-03	1.3E-02	5.5E-05	2.3E-03
ADP Fossil Fuel	2.2	5.9	2.0E-01	0.93
ADP Mineral (Elemental)	3.4E-03	6.4E-03	1.1E-05	7.3E-04
Water Deprivation Scarcity	0.12	0.22	1.6E-05	1.0E-01
Net fresh water	0.28	1.2	1.0E-04	0.62
Secondary material	0.76	0.76	4.7E-06	0.29
Secondary renewable fuel	1.7	2.6	0	0.16
Primary renewable energy not feedstock	5.0	8.0	3.7E-03	0.45
Primary renewable feedstock energy	4.7	4.7	5.1E-04	1.1
Total primary renewable energy resources	9.7	13	4.2E-03	1.5
Secondary non-renewable fuel	0.14	0.15	1.1E-03	0.07
Primary energy non-renewable not feedstock	31	94	0.97	4.10
Primary non-renewable feedstock energy	7.9	11	1.6	11
Total primary non-renewable energy	39	105	2.6	15
Hazardous waste disposed	3.9E-03	4.7E-03	3.3E-04	8.0E-04
Non-hazardous waste disposed	0.51	1.7	2.9E-03	0.32
Radioactive waste disposed	1.1E-09	5.1E-09	1.7E-31	8.3E-16
Components for reuse	0	0	0	0
Material for recycling	0.21	0.26	1.0E-05	6.0E-02
Material for energy recovery	1.2E-04	3.9E-04	3.4E-07	1.0E-04
Exported electrical energy	0	0	0	0
Exported thermal energy	0	0	0	0

Cube Results Building Operation

Table 4b lists B1 use, B2 Maintain, B3 Repair, B4 Replace, B5 Refurb B6 water use & B7 energy use, C1 Demolish, C2 Transport, C3 Process waste and C4 Disposal results all assuming upper melt spin energy.

Table 4b Cube n LCIA and LCI Results /kg Functional Unit B1 to C4

Burdens	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4
GWP $_{bio}$	0	-2.6E-04	-0.01	-0.01	-2.6E-04	0	0	-1.1E-04	0	-2.6E-04	0
GWP $_{luluc}$	0	4.1E-07	2.2E-06	2.3E-06	4.1E-07	0	0	1.7E-07	1.4E-09	4.1E-07	1.7E-10
GWP $_{ff}$	0	0.05	0.21	0.22	0.05	0	0	0.02	0.01	0.05	1.2E-03
GWP $_{t}$	0	0.05	0.20	0.20	0.05	0	0	0.02	0.01	0.05	1.2E-03
ODP	0	2.1E-15	9.2E-09	9.1E-09	2.1E-15	0	0	9.0E-16	1.1E-13	2.1E-15	1.8E-14
POCP	0	2.4E-04	1.4E-03	1.4E-03	2.4E-04	0	0	1.0E-04	6.0E-05	2.4E-04	2.8E-05
AP	0	1.1E-04	7.6E-04	8.0E-04	1.1E-04	0	0	4.6E-05	5.1E-06	1.1E-04	3.6E-06
EP $_{fresh}$	0	1.3E-11	6.2E-08	6.1E-08	1.3E-11	0	0	5.7E-12	3.1E-10	1.3E-11	5.2E-11
EP $_{marine}$	0	2.0E-05	2.0E-04	2.0E-04	2.0E-05	0	0	8.5E-06	9.5E-07	2.0E-05	6.6E-07
EP $_{land}$	0	1.5E-04	4.6E-04	5.0E-04	1.5E-04	0	0	6.2E-05	3.4E-06	1.5E-04	1.3E-06
ADP $_{ff}$	0	0.03	0.19	0.18	0.03	0	0	1.2E-02	7.5E-03	0.03	1.4E-03
ADP $_{min}$	0	2.2E-10	1.5E-04	1.5E-04	2.2E-10	0	0	9.5E-11	4.0E-06	2.2E-10	8.0E-07
WDP	0	2.8E-06	0.02	0.02	2.8E-06	0	0	1.2E-06	1.4E-06	2.8E-06	2.4E-07
FW	0	4.1E-07	2.2E-06	0.12	4.1E-07	0	0	7.4E-03	8.7E-03	4.1E-07	1.5E-03
SM	0	-2.6E-04	-0.01	0.06	-2.6E-04	0	0	2.2E-04	2.2E-06	-2.6E-04	3.0E-07
RSF	0	1.2E-03	0.03	0.03	1.2E-03	0	0	5.3E-04	2.2E-06	1.2E-03	6.8E-07
PERM	0	5.2E-08	0	0.08	5.2E-08	0	0	2.2E-08	0	5.2E-08	2.6E-04
PERE	0	0.03	0.18	0.22	0.03	0	0	1.1E-02	0	0.03	1.9E-05
PERT	0	0.03	0.18	0.31	0.03	0	0	1.1E-02	1.6E-03	0.03	2.8E-04
NRSF	0	1.6E-08	0.01	1.3E-02	1.6E-08	0	0	6.7E-09	2.1E-04	1.6E-08	7.8E-05
PENRM	0	0.01	0.82	0.83	0.01	0	0	0	0	0.01	7.2E-03
PENRE	0	0.50	2.20	2.21	0.50	0	0	0.21	0	0.50	1.2E-02
PENRT	0	0.51	3.0	3.0	0.51	0	0	0.22	3.7E-02	0.51	3.8E-03
HWD	0	8.0E-04	1.6E-04	2.0E-04	8.0E-04	0	0	1.0E-06	1.2E-05	8.0E-04	2.4E-06
NHWD	0	0.32	0.06	0.06	0.32	0	0	5.4E-05	9.7E-05	0.32	5.0E-02
RWD	0	8.3E-16	1.7E-16	1.7E-16	8.3E-16	0	0	9.2E-37	8.5E-32	8.3E-16	1.1E-32
CRU	0	0	0	0	0	0	0	0	0	0	0
MFR	0	6.0E-02	0.01	4.0E-03	6.0E-02	0	0	2.9E-04	4.6E-06	6.0E-02	1.5E-01
MER	0	1.0E-04	2.0E-05	2.0E-05	1.0E-04	0	0	2.1E-12	1.5E-07	1.0E-04	2.4E-08
EEE	0	0	0	0	0	0	0	0	0	0	0
EET	0	0	0	0	0	0	0	0	0	0	0

Cube Results Beyond System Boundary

Table 4c shows results for phases D1 Reuse, D2 Recovery to D3 Recycle.

Table 4c Cube LCIA and LCIA Results/kg Functional Unit D1 to D3

Results assuming upper melt-spin energy	D1	D2	D3
Climate Change Biogenic	-0.17	2.0E-04	-0.04
Climate Change LULUC	0.2	1.0E-11	6.8E-06
Climate Change Fossil	0.98	2.5E-04	0.66
Climate Change Total	0.96	4.5E-04	0.60
Stratospheric Ozone Depletion	1.3E-08	5.7E-13	2.7E-08
Photochemical Ozone Creation	3.9E-03	9.9E-07	4.2E-03
Acidification Potential	1.7E-03	4.3E-07	2.4E-03
Eutrophication Freshwater	1.3E-07	1.2E-10	1.8E-07
Eutrophication Marine	3.9E-04	7.6E-08	6.0E-04
Eutrophication Terrestrial	9.4E-04	5.2E-07	1.5E-03
Fossil Depletion	2.0E-04	1.5E-04	0.54
Mineral and Metal Depletion	0.82	5.7E-08	4.4E-04
Water Scarcity Depletion	0.05	1.8E-05	0.06
Net Fresh Water Use	0.29	1.1E-04	0.37
Secondary Material	0.37	0.10	0.17
Secondary Renewable Fuel	0.51	1.7E-04	0.10
Primary Renewable Material	0.01	2.7E-04	0.23
Primary Energy Renewable Not Feedstock	3.1	3.0E-05	0.65
Primary Energy Renewable Total	3.1	4.7E-04	0.93
Secondary Non-renewable Fuel	0.22	7.7E-06	0.04
Primary Energy Non-renewable Material	13	2.4E-03	2.49
Primary Non-renewable Energy Not Feedstock	36	3.2E-04	6.63
Primary Energy Non-renewable Total	47	2.7E-03	9.08
Hazardous Waste Disposed	7.4E-04	1.9E-07	6.0E-04
Non-hazardous Waste Disposed	0.1	1.8E-05	0.18
Radioactive Waste Disposed	2.2E-16	4.6E-21	5.0E-16
Components For Reuse	0	0	0
Material For Recycling	3.7E-03	1.5E-05	0.01
Material For Energy Recovery	6.5E-05	6.2E-09	6.1E-05
Exported Energy Electrical	0	0	0
Exported Energy Thermal	0	0	0

3D Ceiling Tile Results Cradle to Construction

Table 5a shows results modelled on lower melt-spin energy. A4 and A5 assume upper melt energy use.

Table 5a 3D Ceiling Tile LCI and LCIA Results /kg Functional Unit A1 to A5

Impact potential categories	A1-A3		A4	A5
Melt-spin energy modelling applied	Lower	Upper	Upper	Upper
Climate Change Biogenic	-0.97	-1.01	0	-6.2E-02
Climate Change LULUC	8.2E-10	8.2E-10	2.8E-09	1.1E-05
Climate Change Fossil	2.87	7.17	0.17	1.05
Climate Change Total	1.90	6.16	0.17	0.99
Stratospheric Ozone Depletion	1.1E-09	4.6E-09	2.9E-13	4.6E-08
Photochemical Ozone Creation	1.3E-02	1.9E-02	9.3E-04	7.0E-03
Acidification	7.3E-03	2.2E-02	9.0E-05	3.8E-03
Eutrophication Freshwater	1.4E-06	4.6E-06	2.1E-09	3.1E-07
Eutrophication Marine	2.1E-03	5.3E-03	1.7E-05	9.8E-04
Eutrophication Terrestrial	7.1E-03	1.8E-02	5.5E-05	2.3E-03
ADP Fossil Fuel	2.8	6.1	2.0E-01	0.93
ADP Mineral (Elemental)	3.8E-03	6.4E-03	1.1E-05	7.3E-04
Water Deprivation Scarcity	0.11	0.21	1.6E-05	1.0E-01
Net fresh water	0.29	1.1	1.0E-04	0.62
Secondary material	0.69	0.69	4.7E-06	0.29
Secondary renewable fuel	5.1	5.3	0	0.16
Primary renewable energy not feedstock	7.8	11	3.7E-03	0.45
Primary renewable feedstock energy	12	12	5.1E-04	1.1
Total primary renewable energy resources	20	23	4.2E-03	1.5
Secondary non-renewable fuel	0.25	0.26	1.1E-03	0.07
Primary energy non-renewable not feedstock	36	95	0.97	4.10
Primary non-renewable feedstock energy	11	13	1.6	11
Total primary non-renewable energy	47	109	2.6	15
Hazardous waste disposed	4.3E-03	4.8E-03	3.3E-04	8.0E-04
Non-hazardous waste disposed	0.47	1.6	2.9E-03	0.32
Radioactive waste disposed	1.1E-09	4.8E-09	1.7E-31	8.3E-16
Components for reuse	0.E+00	0.0E+00	0	0
Material for recycling	0.24	0.28	1.0E-05	6.0E-02
Material for energy recovery	2.1E-04	4.6E-04	3.4E-07	1.0E-04
Exported electrical energy	0	0	0	0
Exported thermal energy	0	0	0	0

3D Ceiling Tile Building Module Results

Table 5b lists B1 use, B2 Maintain, B3 Repair, B4 Replace, B5 Refurb B6 water use & B7 energy use, C1 Demolish, C2 Transport, C3 Process waste and C4 Disposal results all assuming upper melt spin energy.

Table 5b Ceiling Tile LCIA and LCI Results /kg Functional Unit B1 to C4

Burdens	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4
GWP $_{bio}$	0	-2.6E-04	-0.01	-0.01	-2.6E-04	0	0	-1.1E-04	0	-2.6E-04	0
GWP $_{luluc}$	0	4.1E-07	2.2E-06	2.3E-06	4.1E-07	0	0	1.7E-07	1.4E-09	4.1E-07	1.7E-10
GWP $_{ff}$	0	0.05	0.21	0.22	0.05	0	0	0.02	0.01	0.05	1.2E-03
GWP $_{t}$	0	0.05	0.20	0.20	0.05	0	0	0.02	0.01	0.05	1.2E-03
ODP	0	2.1E-15	9.2E-09	9.1E-09	2.1E-15	0	0	9.0E-16	1.1E-13	2.1E-15	1.8E-14
POCP	0	2.4E-04	1.4E-03	1.4E-03	2.4E-04	0	0	1.0E-04	6.0E-05	2.4E-04	2.8E-05
AP	0	1.1E-04	7.6E-04	8.0E-04	1.1E-04	0	0	4.6E-05	5.1E-06	1.1E-04	3.6E-06
EP $_{fresh}$	0	1.3E-11	6.2E-08	6.1E-08	1.3E-11	0	0	5.7E-12	3.1E-10	1.3E-11	5.2E-11
EP $_{marine}$	0	2.0E-05	2.0E-04	2.0E-04	2.0E-05	0	0	8.5E-06	9.5E-07	2.0E-05	6.6E-07
EP $_{land}$	0	1.5E-04	4.6E-04	5.0E-04	1.5E-04	0	0	6.2E-05	3.4E-06	1.5E-04	1.3E-06
ADP $_{ff}$	0	0.03	0.19	0.18	0.03	0	0	1.2E-02	7.5E-03	0.03	1.4E-03
ADP $_{min}$	0	2.2E-10	1.5E-04	1.5E-04	2.2E-10	0	0	9.5E-11	4.0E-06	2.2E-10	8.0E-07
WDP	0	2.8E-06	0.02	0.02	2.8E-06	0	0	1.2E-06	1.4E-06	2.8E-06	2.4E-07
FW	0	4.1E-07	2.2E-06	0.12	4.1E-07	0	0	7.4E-03	8.7E-03	4.1E-07	1.5E-03
SM	0	-2.6E-04	-0.01	0.06	-2.6E-04	0	0	2.2E-04	2.2E-06	-2.6E-04	3.0E-07
RSF	0	1.2E-03	0.03	0.03	1.2E-03	0	0	5.3E-04	2.2E-06	1.2E-03	6.8E-07
PERM	0	5.2E-08	0	0.08	5.2E-08	0	0	2.2E-08	0	5.2E-08	2.6E-04
PERE	0	0.03	0.18	0.22	0.03	0	0	1.1E-02	0	0.03	1.9E-05
PERT	0	0.03	0.18	0.31	0.03	0	0	1.1E-02	1.6E-03	0.03	2.8E-04
NRSF	0	1.6E-08	0.01	1.3E-02	1.6E-08	0	0	6.7E-09	2.1E-04	1.6E-08	7.8E-05
PENRM	0	0.01	0.82	0.83	0.01	0	0	0	0	0.01	7.2E-03
PENRE	0	0.50	2.20	2.21	0.50	0	0	0.21	0	0.50	1.2E-02
PENRT	0	0.51	3.0	3.0	0.51	0	0	0.22	3.7E-02	0.51	3.8E-03
HWD	0	8.0E-04	1.6E-04	2.0E-04	8.0E-04	0	0	1.0E-06	1.2E-05	8.0E-04	2.4E-06
NHWD	0	0.32	0.06	0.06	0.32	0	0	5.4E-05	9.7E-05	0.32	5.0E-02
RWD	0	8.3E-16	1.7E-16	1.7E-16	8.3E-16	0	0	9.2E-37	8.5E-32	8.3E-16	1.1E-32
CRU	0	0	0	0	0	0	0	0	0	0	0
MFR	0	6.0E-02	0.01	4.0E-03	6.0E-02	0	0	2.9E-04	4.6E-06	6.0E-02	1.5E-01
MER	0	1.0E-04	2.0E-05	2.0E-05	1.0E-04	0	0	2.1E-12	1.5E-07	1.0E-04	2.4E-08
EEE	0	0	0	0	0	0	0	0	0	0	0
EET	0	0	0	0	0	0	0	0	0	0	0

3D Ceiling Tile Results Beyond System Boundary

Table 5c shows results for D1 Reuse, D2 Recovery to D3 Recycle.

Table 5c 3D Ceiling Tile LCIA and LCI Results /kg Functional Unit D1 to D3

Results assuming upper melt-spin energy	D1	D2	D3
Climate Change Biogenic	-0.17	2.0E-04	-0.04
Climate Change LULUC	0.2	1.0E-11	6.8E-06
Climate Change Fossil	0.98	2.5E-04	0.66
Climate Change Total	0.96	4.5E-04	0.60
Stratospheric Ozone Depletion	1.3E-08	5.7E-13	2.7E-08
Photochemical Ozone Creation	3.9E-03	9.9E-07	4.2E-03
Acidification Potential	1.7E-03	4.3E-07	2.4E-03
Eutrophication Freshwater	1.3E-07	1.2E-10	1.8E-07
Eutrophication Marine	3.9E-04	7.6E-08	6.0E-04
Eutrophication Terrestrial	9.4E-04	5.2E-07	1.5E-03
Fossil Depletion	2.0E-04	1.5E-04	0.54
Mineral and Metal Depletion	0.82	5.7E-08	4.4E-04
Water Scarcity Depletion	0.05	1.8E-05	0.06
Net Fresh Water Use	0.29	1.1E-04	0.37
Secondary Material	0.37	0.10	0.17
Secondary Renewable Fuel	0.51	1.7E-04	0.10
Primary Renewable Material	0.01	2.7E-04	0.23
Primary Energy Renewable Not Feedstock	3.1	3.0E-05	0.65
Primary Energy Renewable Total	3.1	4.7E-04	0.93
Secondary Non-renewable Fuel	0.22	7.7E-06	0.04
Primary Energy Non-renewable Material	13	2.4E-03	2.49
Primary Non-renewable Energy Not Feedstock	36	3.2E-04	6.63
Primary Energy Non-renewable Total	47	2.7E-03	9.08
Hazardous Waste Disposed	7.4E-04	1.9E-07	6.0E-04
Non-hazardous Waste Disposed	0.1	1.8E-05	0.18
Radioactive Waste Disposed	2.2E-16	4.6E-21	5.0E-16
Components For Reuse	0	0	0
Material For Recycling	3.7E-03	1.5E-05	0.01
Material For Energy Recovery	6.5E-05	6.2E-09	6.1E-05
Exported Energy Electrical	0	0	0
Exported Energy Thermal	0	0	0

3D Tile Results Cradle to Gate

Table 6a shows results modelled on lower melt-spin energy and A4 and A5 results on melt-spin energy.

Table 6a 3D Tile LCI and LCIA Results /kg Functional Unit A1 to A5

Impact potential categories	A1-A3		A4	A5
Melt-spin energy modelling applied	Lower	Upper	Upper	Upper
Climate Change Biogenic	-1.11	-1.16	0	-6.2E-02
Climate Change LULUC	8.4E-10	8.4E-10	2.8E-09	1.1E-05
Climate Change Fossil	2.98	7.29	0.17	1.05
Climate Change Total	1.87	6.14	0.17	0.99
Stratospheric Ozone Depletion	1.1E-09	4.6E-09	2.9E-13	4.6E-08
Photochemical Ozone Creation	1.4E-02	1.9E-02	9.3E-04	7.0E-03
Acidification	7.6E-03	2.2E-02	9.0E-05	3.8E-03
Eutrophication Freshwater	1.6E-06	5.1E-06	2.1E-09	3.1E-07
Eutrophication Marine	2.1E-03	5.3E-03	1.7E-05	9.8E-04
Eutrophication Terrestrial	7.5E-03	1.9E-02	5.5E-05	2.3E-03
ADP Fossil Fuel	2.8	6.2	2.0E-01	0.93
ADP Mineral and Metal	3.9E-03	6.6E-03	1.1E-05	7.3E-04
Water Deprivation Scarcity	0.11	0.21	1.6E-05	1.0E-01
Net fresh water	0.30	1.1	1.0E-04	0.62
Secondary material	0.69	0.69	4.7E-06	0.29
Secondary renewable fuel	5.1	5.9	0	0.16
Primary renewable energy not feedstock	8.4	11	3.7E-03	0.45
Primary renewable feedstock energy	14	14	5.1E-04	1.1
Total primary renewable energy resources	22	25	4.2E-03	1.5
Secondary non-renewable fuel	0.25	0.26	1.1E-03	0.07
Primary energy non-renewable not feedstock	38	97	0.97	4.10
Primary non-renewable feedstock energy	11	14	1.6	11
Total primary non-renewable energy	48	110	2.6	15
Hazardous waste disposed	4.4E-03	4.9E-03	3.3E-04	8.0E-04
Non-hazardous waste disposed	0.50	1.6	2.9E-03	0.32
Radioactive waste disposed	1.1E-09	4.8E-09	1.7E-31	8.3E-16
Components for reuse	0.E+00	0.0E+00	0	0
Material for recycling	0.23	0.27	1.0E-05	6.0E-02
Material for energy recovery	2.1E-04	4.6E-04	3.4E-07	1.0E-04
Exported electrical energy	0	0	0	0
Exported thermal energy	0	0	0	0

3D Tile Results Building Operations

Table 6b lists B1 use, B2 Maintain, B3 Repair, B4 Replace, B5 Refurb B6 water use & B7 energy use, C1 Demolish, C2 Transport, C3 Process waste and C4 Disposal results all assuming upper melt spin energy.

Table 6b 3D Tile LCIA and LCI Results /kg Functional Unit B1 to C4

Burdens	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4
GWP $_{bio}$	0	-2.6E-04	-0.01	-0.01	-2.6E-04	0	0	-1.1E-04	0	-2.6E-04	0
GWP $_{luluc}$	0	4.1E-07	2.2E-06	2.3E-06	4.1E-07	0	0	1.7E-07	1.4E-09	4.1E-07	1.7E-10
GWP $_{ff}$	0	0.05	0.21	0.22	0.05	0	0	0.02	0.01	0.05	1.2E-03
GWP $_{t}$	0	0.05	0.20	0.20	0.05	0	0	0.02	0.01	0.05	1.2E-03
ODP	0	2.1E-15	9.2E-09	9.1E-09	2.1E-15	0	0	9.0E-16	1.1E-13	2.1E-15	1.8E-14
POCP	0	2.4E-04	1.4E-03	1.4E-03	2.4E-04	0	0	1.0E-04	6.0E-05	2.4E-04	2.8E-05
AP	0	1.1E-04	7.6E-04	8.0E-04	1.1E-04	0	0	4.6E-05	5.1E-06	1.1E-04	3.6E-06
EP $_{fresh}$	0	1.3E-11	6.2E-08	6.1E-08	1.3E-11	0	0	5.7E-12	3.1E-10	1.3E-11	5.2E-11
EP $_{marine}$	0	2.0E-05	2.0E-04	2.0E-04	2.0E-05	0	0	8.5E-06	9.5E-07	2.0E-05	6.6E-07
EP $_{land}$	0	1.5E-04	4.6E-04	5.0E-04	1.5E-04	0	0	6.2E-05	3.4E-06	1.5E-04	1.3E-06
ADP $_{ff}$	0	0.03	0.19	0.18	0.03	0	0	1.2E-02	7.5E-03	0.03	1.4E-03
ADP $_{min}$	0	2.2E-10	1.5E-04	1.5E-04	2.2E-10	0	0	9.5E-11	4.0E-06	2.2E-10	8.0E-07
WDP	0	2.8E-06	0.02	0.02	2.8E-06	0	0	1.2E-06	1.4E-06	2.8E-06	2.4E-07
FW	0	4.1E-07	2.2E-06	0.12	4.1E-07	0	0	7.4E-03	8.7E-03	4.1E-07	1.5E-03
SM	0	-2.6E-04	-0.01	0.06	-2.6E-04	0	0	2.2E-04	2.2E-06	-2.6E-04	3.0E-07
RSF	0	1.2E-03	0.03	0.03	1.2E-03	0	0	5.3E-04	2.2E-06	1.2E-03	6.8E-07
PERM	0	5.2E-08	0	0.08	5.2E-08	0	0	2.2E-08	0	5.2E-08	2.6E-04
PERE	0	0.03	0.18	0.22	0.03	0	0	1.1E-02	0	0.03	1.9E-05
PERT	0	0.03	0.18	0.31	0.03	0	0	1.1E-02	1.6E-03	0.03	2.8E-04
NRSF	0	1.6E-08	0.01	1.3E-02	1.6E-08	0	0	6.7E-09	2.1E-04	1.6E-08	7.8E-05
PENRM	0	0.01	0.82	0.83	0.01	0	0	0	0	0.01	7.2E-03
PENRE	0	0.50	2.20	2.21	0.50	0	0	0.21	0	0.50	1.2E-02
PENRT	0	0.51	3.0	3.0	0.51	0	0	0.22	3.7E-02	0.51	3.8E-03
HWD	0	8.0E-04	1.6E-04	2.0E-04	8.0E-04	0	0	1.0E-06	1.2E-05	8.0E-04	2.4E-06
NHWD	0	0.32	0.06	0.06	0.32	0	0	5.4E-05	9.7E-05	0.32	5.0E-02
RWD	0	8.3E-16	1.7E-16	1.7E-16	8.3E-16	0	0	9.2E-37	8.5E-32	8.3E-16	1.1E-32
CRU	0	0	0	0	0	0	0	0	0	0	0
MFR	0	6.0E-02	0.01	4.0E-03	6.0E-02	0	0	2.9E-04	4.6E-06	6.0E-02	1.5E-01
MER	0	1.0E-04	2.0E-05	2.0E-05	1.0E-04	0	0	2.1E-12	1.5E-07	1.0E-04	2.4E-08
EEE	0	0	0	0	0	0	0	0	0	0	0
EET	0	0	0	0	0	0	0	0	0	0	0

3D Tile Beyond System Boundary Module Results D1 to D3

Table 6c shows results for D1 Reuse, D2 Recovery to D3 Recycle.

Table 6c 3D Tile LCIA and LCI Results/kg Functional Unit D1 to D3

Results assuming upper melt-spin energy	D1	D2	D3
Climate Change Biogenic	-0.17	2.0E-04	-0.04
Climate Change LULUC	0.2	1.0E-11	6.8E-06
Climate Change Fossil	0.98	2.5E-04	0.66
Climate Change Total	0.96	4.5E-04	0.60
Stratospheric Ozone Depletion	1.3E-08	5.7E-13	2.7E-08
Photochemical Ozone Creation	3.9E-03	9.9E-07	4.2E-03
Acidification Potential	1.7E-03	4.3E-07	2.4E-03
Eutrophication Freshwater	1.3E-07	1.2E-10	1.8E-07
Eutrophication Marine	3.9E-04	7.6E-08	6.0E-04
Eutrophication Terrestrial	9.4E-04	5.2E-07	1.5E-03
Fossil Depletion	2.0E-04	1.5E-04	0.54
Mineral and Metal Depletion	0.82	5.7E-08	4.4E-04
Water Scarcity Depletion	0.05	1.8E-05	0.06
Net Fresh Water Use	0.29	1.1E-04	0.37
Secondary Material	0.37	0.10	0.17
Secondary Renewable Fuel	0.51	1.7E-04	0.10
Primary Renewable Material	0.01	2.7E-04	0.23
Primary Energy Renewable Not Feedstock	3.1	3.0E-05	0.65
Primary Energy Renewable Total	3.1	4.7E-04	0.93
Secondary Non-renewable Fuel	0.22	7.7E-06	0.04
Primary Energy Non-renewable Material	13	2.4E-03	2.49
Primary Non-renewable Energy Not Feedstock	36	3.2E-04	6.63
Primary Energy Non-renewable Total	47	2.7E-03	9.08
Hazardous Waste Disposed	7.4E-04	1.9E-07	6.0E-04
Non-hazardous Waste Disposed	0.1	1.8E-05	0.18
Radioactive Waste Disposed	2.2E-16	4.6E-21	5.0E-16
Components For Reuse	0	0	0
Material For Recycling	3.7E-03	1.5E-05	0.01
Material For Energy Recovery	6.5E-05	6.2E-09	6.1E-05
Exported Energy Electrical	0	0	0
Exported Energy Thermal	0	0	0

References for this EPD

CML LCA methodology, Institute of Environmental Sciences (CML), Faculty of Science, University of Leiden, Netherlands

GreenTag™ 2021 EPD Program and Product Category Rules https://www.globalgreentag.com/epd-program/

International Energy Agency, Energy Statistics 2020 http://www.iea.org

ISO 14015:2001 EMS: Environmental assessment of sites & organizations (EASO)

ISO 14020:2000 Environmental labels & declarations — General principles

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, London, BSI, 2006.

ISO 14044:2006 EM: LCA: Requirement & guideline LCI; LCIA Interpretation, London, BSI, 2006.

ISO 15392:2008 Sustainability in building construction General principles

ISO 15686-1:2011 Buildings & constructed assets - Service life planning - Part 1: General principles and framework

ISO 15686-2:2012 Buildings and constructed assets — Service life planning — Part 2: Service life prediction procedures

ISO 15686-8:2008 Buildings and constructed assets — Service-life planning — Part 8: Reference service life and service-life estimation

EN 15804:2012+A2:2019 Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products

ISO 21929-1:2011 Sustainability in building construction — Sustainability indicators — Part 1: Framework for the development of indicators and a core set of indicators for buildings

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 of the environmental performance of construction works — Part 1: Buildings

ISO/TR 21932:2013 Sustainability in buildings and civil engineering works — A review of terminology