



Global GreenTagEPD Program:  
Compliant to EN15804+A2 2019



**Xypex Chemical Corporation**  
**Xypex Admix C-1000**  
13731 Mayfield Place, Richmond  
British Columbia, Canada

**XYPEX**® Concrete Waterproofing  
by Crystallization™



Xypex Admix C-1000  
EPD XYP08 2023EP

**Mandatory Disclosures**

<b>EPD type</b>	Cradle to grave A1 to C4 + D	<b>EPD Numbers</b>	XYP08 2023EP
<b>Issue Date</b>	28 Aug 2023	<b>Valid Until</b>	28 Aug 2028
<b>Demonstration of Verification</b>			
<b>PCR</b>	Standard EN 15804+A2 2019 serves as core Product Category Rules (PCR) [1]. Sub-PCR UCM:2023 Unreinforced Concrete Mixtures and Additives also applies [2].		
<input checked="" type="checkbox"/> <b>Internal</b>	<p><i>Delwyn Jones</i> 22 Aug 2023 LCA Developed by Delwyn Jones, The Evah Institute</p> <p><i>Direshni Naiker</i> 22.08.2023 LCA Reviewed by Direshni Naiker The Evah Institute</p> <p>EPD Reviewed by David Baggs, Global GreenTag Pty Ltd</p>		
<input checked="" type="checkbox"/> <b>External</b>	<p><i>Mathilde Vlieg</i> 22/08/2023 Third Party Verifier<sup>a</sup> Mathilde Vlieg Malaika LCT</p> <p>a. Independent external verification of the declaration and data, mandatory for business-to-consumer communication according to ISO 14025:2010 [2].</p>		
<b>Communication</b>	This EPD discloses potential environmental outcomes compliant with EN 15804 for business-to-business communication.		
<b>Comparability</b>	Construction product EPDs may not be comparable if not EN15804 compliant. Different program EPDs may not be comparable. Comparability is further dependent on the product category rules and data source used.		
<b>Reliability</b>	LCIA results are relative expressions that do not predict impacts on category endpoints, exceeding of thresholds, safety margins or risks.		
<b>Owner</b>	This EPD is the property of the declared manufacturer.		
<b>Explanations</b>	Further explanatory information is available at <a href="mailto:info@globalgreentag.com">info@globalgreentag.com</a> or by contacting <a href="mailto:certification1@globalgreentag.com">certification1@globalgreentag.com</a> [3].		

EPD Program Operator	LCA and EPD Producer	Declaration Owner
Global GreenTag Pty Ltd PO Box 311 Cannon Hill QLD 4170 Australia Phone: +61 (0)7 33 999 686 <a href="http://www.globalgreentag.com">http://www.globalgreentag.com</a>	Ecquate Pty Ltd PO Box 123 Thirroul NSW 2515 Australia Phone: +61 (0)7 5545 0998 <a href="http://www.ecquate.com">http://www.ecquate.com</a>	Xypex Chemical Corporation 13731 Mayfield Place, Richmond British Columbia Canada Phone: +1 604.273.5265 <a href="https://www.xypex.com/">https://www.xypex.com/</a>





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**Program Description**

<b>EPD type</b>	Cradle to grave A1 to C4 + D as defined by EN 15804 [1]																																							
<b>System boundary</b>	The system boundary with nature includes material and energy acquisition, processing, manufacture, transport, installation, use plus waste arising to end of life.																																							
<b>Stages included</b>	Stages A1-3 A4-5, B1-4, C1 to C2 and C4 D1 to D3																																							
<b>Stages excluded</b>	No stage was excluded but flows and results for B5-B7 and C3 were all zero.																																							
<b>Scope Depiction</b>	Figure 1 depicts all modules being declared including some with zero results. Any module not declared (MND) does not indicate a zero result.																																							
<b>Model Information</b>	Actual															Scenarios					Potential																			
<b>Stages</b>	Product															Construct					Use					End-of-Life					Benefit & load beyond system									
<b>Data Modules</b>	A1			A2			A3			A4			A5			B1		B2		B3		B4		B5		B6		B7		C1		C2		C3		C4		D1	D2	D3
<b>Unit Operations</b>	Resources	Transport	Manufacture	Transport	Construct	Use	Maintain	Repair	Replace	Refurbish	Energy use	Water use	Demolish	Transport	Process	Waste	Disposal	Reuse	Recovery	Recycling																				

Figure 1 EPD Life Cycle Modules Cradle to Grave

**Data Sources**

<b>Primary Data</b>	Data was collected from primary sources 2019 to 2022 including the manufacturer and suppliers' standards, locations, logistics, technology, market share, management system in accordance with EN ISO 14044:2006, 4.3.2, [4]. All are biochemical-physical allocated none are economically allocated.
<b>A1-A3 Stage inclusions</b>	Operations include all known raw material acquisition, refining and processing plus scrap or material reuse from prior systems; electricity generated from all sources with extraction, refining & transport plus secondary fuel energy and recovery processes. Also, transport to factory gate; manufacture of inputs, ancillary material, product, packaging, maintenance, replacement plus flows leaving at end-of-waste boundary and fate of all flows at end of life.
<b>Variability</b>	Significant differences of average LCIA results are declared.
<b>Chemicals of Concern</b>	Contains no substances in the European Chemicals Agency "Authorised or Candidate Lists of Substances of Very High Concern (SVHCs)".

**Data Quality**

Data cut-off & quality criteria complies with EN 15804 [1] The LCA used background data aged <10 years and quality parameters tabled below.

Background	Data Quality	Parameters and Uncertainty (U)			
Correlation	Metric $\sigma$	U ±0.01	U ±0.05	U ±0.10	U ±0.20
Reliability	Reporting	Site Audit	Expert verify	Region	Sector
	Sample	>66% trend	>25% trend	>10% batch	>5% batch
Completion	Including	>50%	>25%	>10%	>5%
	Cut-off	0.01%w/w	0.05%w/w	0.1%w/w	0.5%w/w
Temporal	Data Age	<3 years	≤5 years	<7.5 years	<10 years
	Duration	>3 years	<3 years	<2 years	1 year
Technology	Typology	Actual	Comparable	In Class	Convention
Geography	Focus	Process	Line	Plant	Corporate
	Range	Continent	Nation	Plant	Line
	Jurisdiction	Representation is Global. Africa, North America, Europe, Pacific Rim			



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### Product Information

At batching time the XYPEX admixture containing cement, lime, waterproofing and setting agents is added to the concrete mix. In contact with moisture in fresh concrete and cement hydration products these agents react to catalytically generate insoluble crystals. These crystals permanently seal concrete pores and capillary tracts throughout preventing liquid ingress from all directions.

<b>Brand Name &amp; Code</b>	Admix C-1000	<b>Range Names</b>	Xypex Admixture
<b>Factory warranty</b>	One year	<b>Reference Service Life</b>	60 years [5,6]
<b>Manufacturer</b>	Xypex Chemical Corporation		
<b>Manufacturer address</b>	13731 Mayfield Place, Richmond British Columbia, Canada		
<b>Site representation</b>	Canada and Americas		
<b>Function in Building</b>	Xypex products waterproof, protect and improve concrete.		
<b>Functional unit</b>	Cradle to grave concrete repair, remedial & waterproofing/kg 60years		

### Product Components

This section summarises factory components, functions, source nation and % mass share. In product content listed below the % mass has a range and confidence interval that is 90% certain to contain true population means at any time. Listing such certainty considers normal resource acquisition, supply chain, sedimentation, seasonal, manufacturing and product variation over this EPD's validity period. This also allows for intellectual property protection whilst ensuring fullest possible transparency.

Function	Component	Cradle	Amount
<b>Cement binder</b>	Portland Cement	Canada	>30 <40
<b>Aggregate</b>	Moraine sand	Canada	>25 <35
<b>Crystalline waterproofing</b>	Proprietary Base mix	Canada	>15 <25
<b>Hydration</b>	Hydrated Lime	Canada	>10 <20
<b>Set retarder</b>	Proprietary mineral	Canada	>4.0 <10
<b>Packaging</b>			
<b>Pallet wood</b>	Wood	Canada	>1.5 <2.0
<b>Pail, Straps, Wrap &amp; Tape</b>	Polymers	Canada	>0.4 <0.5
<b>Packaging</b>	Cardboard and paper	Canada	>0.2 <0.3

### Product Functional & Technical Performance Information

This section provides specifications and data to calculate results factoring different mass and periods. For normal conditions, the dosage rate is 2 to 3% by weight of cement in the mix. The recommended minimum dosage rate for regular grade Admix C-1000 is 3kg/m<sup>3</sup> and the maximum dosage is 6kg/m<sup>3</sup>. The sequence for addition will vary according to type of batch plant operation and equipment. As it is important to obtain a homogeneous blend of admixture within the concrete avoid adding dry admixture powder directly to wet mixed concrete as this could cause clumping that prevents thorough dispersion.

<b>Safety Procedures</b>	<a href="https://www.xypex.com/technical/safety-data">https://www.xypex.com/technical/safety-data</a>
<b>Specifications</b>	<a href="https://www.xypex.com/technical/specifications">https://www.xypex.com/technical/specifications</a>
<b>Practices Reference</b>	<a href="https://www.xypex.com/learning-centre/faq">https://www.xypex.com/learning-centre/faq</a>
<b>Installation Procedure</b>	<a href="https://www.xypex.com/products/installations">https://www.xypex.com/products/installations</a>



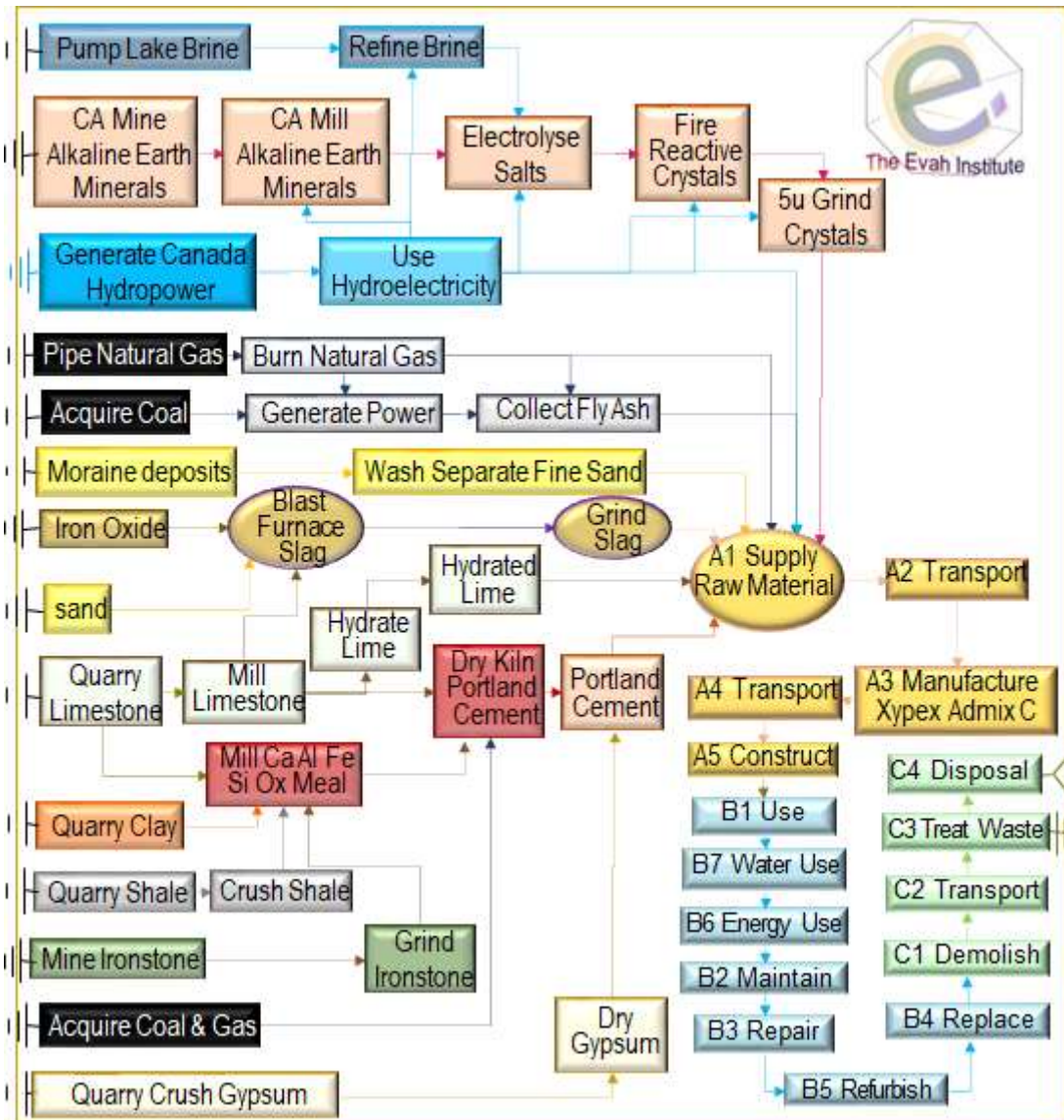
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**System Analysis Scope and Boundaries**

Stages A1 to 3 model actual operations. Stage A4 to C4 are model scenarios.

Typical scenarios are assumed to forecast unit operations as described in the next section.

Figure 2. shows included processes in a cradle to grave system boundary to end of life fates to unshown beyond the boundary reuse, recycling or landfill grave.



**Figure 2. Product Process Flow Chart Completeness**



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**Scenarios for Modules (Units/Functional Unit)**

This section defines modelling scenarios beyond actual A1 to A3 operations from stage A4 to D3.

A Construction	Type specified	Amount	Type specified	Amount
<b>A4 Transport to Site</b>	25t semi-trailer	60 km	85% Capacity	Full back load
Volume capacity (<1 to ≥1)	Utilisation factor	1	Uncompressed	Un-nested
<b>A5 Installation utilities</b>	Town water	0.53litre	Grid power	0.0002 MJ
Waste on site	Spill	0.05kg		
Scrap collection & routes	25t semi-trailer	60 km	to landfill	In LCA report

Stage B2 and B3 scenarios are listed below. Stages B1 Use of building fabric, B4 Replacement, B5 Refurbishment, B6 Building Operating Energy and B7 Building Operating Water all have zero flows.

B Building	Type specified	Amount	Type specified	Amount
<b>B2 Maintenance</b>	None typical	nil	Clean cycle	nil
<b>B3 Repair 5%</b>	As per website	Specified	Freight to site	As A5

Stage C1, C2 and C4 scenarios are listed below. Stage C3 Waste Treatment has zero flows.

C End of Life	Type specified	Amount	Type specified	Amount
<b>C1 Demolition</b>	Remove worn area	0.05kg	Collect separately	0.05kg
<b>C2 Transport</b>	25t truck road	50km	85% capacity	No back load
<b>C4 Disposal</b>	Product specific	0.05kg	Collect separately	0.05kg
Recovery system	No recycling	0.0 kg	Not for energy	0.0 kg

Stage D scenarios D1 Reuse and D2 Recovery are listed below. D3 Recycling has zero flows. Because of typical product durability no recycling was modelled. As buildings and infrastructure are demoshished, however, the product is fully recyclable.

D Beyond System Boundary	Type specified	Amount	Type specified	Amount
<b>D1 Reuse</b>	typically	95%	Patch 5%	0.05kg
<b>D2 Recovery</b>	typically	100%	Cleaning	sweep
<b>D3 Recycle</b>	At 60 years	Nil	None	0%



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**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.

<p><b>Global warming forcing Climate Change</b></p>	<p>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 “<b>climate emergency</b>”.</p>
<p><b>Ozone layer depletion</b></p>	<p>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 “<b>ozone hole</b>” reliance on ozone-safe refrigerants, aerosols and solvents is essential to avoid further its depletion and enable accumulation of naturally-formed ozone.</p>
<p><b>Acidification</b></p>	<p>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 “<b>acid rain</b>” are emissions of sulphur and nitrogen oxides, hydrochloric and hydrofluoric acids and ammonia from burning fossil fuels polluting precipitation of rain and snow world-wide.</p>
<p><b>Eutrophication of terrestrial, freshwater and marine life</b></p>	<p>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 organisms across related ecosystems. Chief synthetic cause of “<b>algal blooms</b>” is nitrogen (N, NOx, NH<sub>4</sub>) and phosphorus (P, PO<sub>4</sub><sup>3-</sup>) in rain run-off over-fertilised land catchments.</p>
<p><b>Photochemical ozone creation</b></p>	<p>Tropospheric photochemical ozone, called “<b>summer smog</b>” 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.</p>
<p><b>Depletion of minerals, metals &amp; water</b></p>	<p>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 “<b>extinction rebellion</b>” calls on adults to secure climate, reserves and biodiversity for current and future generations.</p>
<p><b>Depletion of fossil fuel reserves</b></p>	<p>Abiotic depletion of resources by consuming finite oil, natural gas, coal and yellowcake 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 “<b>peak oil</b>” 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.</p>



## 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 <sub>bio</sub>	GWP biogenic [7]	kg CO <sub>2eq</sub>
Climate Change luluc	GWP <sub>luluc</sub>	GWP land use & change [7]	kg CO <sub>2eq</sub>
Climate Change fossil	GWP <sub>ff</sub>	GWP fossil fuels [7]	kg CO <sub>2eq</sub>
Climate Change total	GWP <sub>t</sub>	Global Warming Potential [7]	kg CO <sub>2eq</sub>
Stratospheric Ozone Depletion	ODP	Stratospheric Ozone Loss [8]	kg CFC <sub>11eq</sub>
Photochemical Ozone Creation	POCP	Summer Smog [9]	kg NMOC <sub>eq</sub>
Acidification Potential	AP	Accumulated Exceedance [10]	mol H <sup>+</sup> <sub>eq</sub>
Eutrophication Freshwater	EP <sub>fresh</sub>	Excess nutrients freshwater [11]	kg P <sub>eq</sub>
Eutrophication Marine	EP <sub>marine</sub>	Excess marine nutrients [11]	kg N <sub>eq</sub>
Eutrophication Terrestrial	EP <sub>land</sub>	Excess Terrestrial nutrients [11]	mol N <sub>eq</sub>
Mineral & Metal Depletion	ADP <sub>min</sub>	Abiotic Depletion minerals [12]	kg Sb <sub>eq</sub>
Fossil Fuel Depletion	ADP <sub>ff</sub>	Abiotic Depletion fossil fuel [13]	MJ <sub>ncv</sub>
Water Depletion	WDP	Water Deprivation Scarcity [14, 15]	m <sup>3</sup> <sub>WDP eq</sub>
Fresh Water Net	FW	Lake, river, well & town water	m <sup>3</sup>
Secondary Material	SM	Post-consumer recycled (PCR)	kg
Secondary Renewable Fuel	RSF	PCR biomass burnt	MJ <sub>ncv</sub>
Primary Energy Renewable Material	PERM	Biomass retained material	MJ <sub>ncv</sub>
Primary Energy Renewable Not Feedstock	PERE	biomass fuels burnt	MJ <sub>ncv</sub>
Primary Energy Renewable Total	PERT	Biomass burnt + retained	MJ <sub>ncv</sub>
Secondary Non-renewable Fuel	NRSF	PCR fossil-fuels burnt	MJ <sub>ncv</sub>
Primary Energy Non-renewable Material	PENRM	Fossil feedstock retained	MJ <sub>ncv</sub>
Primary Energy Non-renewable Not Feedstock	PENRE	fossil-fuel used or burnt	MJ <sub>ncv</sub>
Primary Energy Non-renewable Total	PENRT	Fossil feedstock & fuel use	MJ <sub>ncv</sub>
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 stations	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 products	MJ <sub>ncv</sub>
Exported Energy Thermal	EET	Uncommon for building products	MJ <sub>ncv</sub>





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**Module A1 to D4 Results Cradle to Site**

Table 1 shows A1- A3 Acquisition, Transport and Manufacture then A4 Delivery and A5 Construct results.

**Table 1 A1 to A5 Impact & Inventory Results/Functional Unit**

Result	A1-3	A4	A5
Climate Change biogenic	-8.3E-03	-1.0E-06	-4.9E-04
Climate Change luluc	3.2E-06	1.7E-09	2.2-07
Climate Change fossil	0.99	1.9E-02	0.06
Climate Change total	0.98	1.9E-02	0.06
Stratospheric Ozone Depletion	1.5E-08	1.7E-13	1.0-09
Photochemical Ozone Creation	4.5E-03	1.2E-04	2.8-04
Acidification Potential	2.1E-03	1.2E-05	1.3-04
Eutrophication Freshwater	4.5E-08	5.6E-10	9.7-09
Eutrophication Marine	4.7E-04	2.3E-06	3.1-05
Eutrophication Terrestrial	1.2E-03	7.9E-06	7.4-05
Mineral and Metal Depletion	3.0E-04	7.2E-06	2.0-05
Fossil Depletion	0.43	2.3E-02	0.03
Water Scarcity Depletion	1.1E-02	3.0E-06	7.4-04
Net Fresh Water Use	6.7E-02	0.02	4.6-03
Secondary Material	2.2E-02	2.9E-06	1.5-03
Secondary Renewable Fuel	5.8E-02	6.7E-06	5.0-04
Primary Renewable Material	1.1E-04	2.4E-03	3.1E-03
Primary Energy Renewable Not Feedstock	1.4	2.9E-04	0.09
Primary Energy Renewable Total	1.4	2.7E-03	0.09
Secondary Non-renewable Fuel	8.1E-03	7.4E-04	4.9E-04
Primary Energy Non-renewable Material	0.98	0.11	0.06
Primary Non-renewable Energy Not Feedstock	6.62	0.19	0.42
Primary Energy Non-renewable Total	7.6	0.30	0.49
Hazardous Waste Disposed	2.7E-04	3.7E-05	1.7E-05
Non-hazardous Waste Disposed	0.1	3.1E-04	0.06
Radioactive Waste Disposed	2.8E-16	1.1E-31	1.9E-17
Components For Reuse	0	0	0
Material For Recycling	9.6E-03	6.5E-06	6.0E-03
Material For Energy Recovery	1.5E-04	2.3E-07	1.1E-05
Exported Energy Electrical	0	0	0
Exported Energy Thermal	0	0	0



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## Results Module B: Building Fabric and Operations

Table 2 shows B1 Use, B2 Maintain, B3 Repair, B4 Replace, B5 Refurbish, B6 Building energy and B7 Building water use results.

**Table 2 B1 to B7 Impact & Inventory Results/Functional Unit**

Result	B1	B2	B3	B4	B5	B6	B7
Climate Change biogenic	0	0	-4.3E-04	0	0	0	0
Climate Change luluc	0	0	1.7E-07	0	0	0	0
Climate Change fossil	0	0	5.2E-02	0	0	0	0
Climate Change total	0	0	5.1E-02	0	0	0	0
Stratospheric Ozone Depletion	0	0	8.0E-10	0	0	0	0
Photochemical Ozone Creation	0	0	2.3E-04	0	0	0	0
Acidification Potential	0	0	1.1E-04	0	0	0	0
Eutrophication Freshwater	0	0	9.8E-09	0	0	0	0
Eutrophication Marine	0	0	2.4E-05	0	0	0	0
Eutrophication Terrestrial	0	0	5.9E-05	0	0	0	0
Mineral and Metal Depletion	0	0	1.7E-05	0	0	0	0
Fossil Depletion	0	0	2.4E-02	0	0	0	0
Water Scarcity Depletion	0	0	5.8E-04	0	0	0	0
Net Fresh Water Use	0	0	3.60	0	0	0	0
Secondary Material	0	0	1.1E-03	0	0	0	0
Secondary Renewable Fuel	0	0	4.1E-04	0	0	0	0
Primary Renewable Material	0	0	2.9E-03	0	0	0	0
Primary Energy Renewable Not Feedstock	0	0	6.5E-02	0	0	0	0
Primary Energy Renewable Total	0	0	6.8E-02	0	0	0	0
Secondary Non-renewable Fuel	0	0	5.2E-04	0	0	0	0
Primary Energy Non-renewable Material	0	0	5.7E-02	0	0	0	0
Primary Non-renewable Energy Not Feedstock	0	0	0.37	0	0	0	0
Primary Energy Non-renewable Total	0	0	0.43	0	0	0	0
Hazardous Waste Disposed	0	0	1.6E-05	0	0	0	0
Non-hazardous Waste Disposed	0	0	5.5E-02	0	0	0	0
Radioactive Waste Disposed	0	0	1.5E-17	0	0	0	0
Components For Reuse	0	0	0	0	0	0	0
Material For Recycling	0	0	5.8E-03	0	0	0	0
Material For Energy Recovery	0	0	7.0E-06	0	0	0	0
Exported Energy Electrical	0	0	0	0	0	0	0
Exported Energy Thermal	0	0	0	0	0	0	0



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### Results Module C: End-of-life

Table 3 shows results for C1 demolish, C2 Transport C3 Waste Processing and C4 Disposal.

**Table 3 C1 to C4 Impact & Inventory Results/Functional Unit**

Result	C1	C2	C3	C4
Climate Change biogenic	-1.0E-05	-1.0E-05	0	-7.8E-07
Climate Change luluc	4.6E-11	1.4E-09	0	1.2E-09
Climate Change fossil	3E-06	6.0E-03	0	7.4E-03
Climate Change total	3E-06	6.0E-03	0	7.4E-03
Stratospheric Ozone Depletion	2.3E-13	1.1E-13	0	1.1E-13
Photochemical Ozone Creation	2.2E-08	6.0E-05	0	7.5E-05
Acidification Potential	1.4E-08	5.1E-06	0	2.0E-04
Eutrophication Freshwater	3.3E-13	3.1E-10	0	3.4E-10
Eutrophication Marine	4.2E-09	9.5E-07	0	1.2E-06
Eutrophication Terrestrial	7.4E-09	3.4E-06	0	4.0E-06
Mineral and Metal Depletion	3.8E-09	4.0E-06	0	4.9E-06
Fossil Depletion	2.1E-06	7.5E-03	0	9.0E-03
Water Scarcity Depletion	1.6E-07	1.4E-06	0	1.6E-06
Net Fresh Water Use	0	1.0E-2	0	9.7E-03
Secondary Material	3.4E-07	2.2E-06	0	2.1E-06
Secondary Renewable Fuel	1.1E-07	5.1E-06	0	4.7E-06
Primary Renewable Material	1.4E-07	1.6E-03	0	2.0E-04
Primary Energy Renewable Not Feedstock	1.5E-05	2.0E-04	0	2.0E-04
Primary Energy Renewable Total	1.5E-05	1.8E-03	0	1.9E-03
Secondary Non-renewable Fuel	1.4E-08	4.8E-04	0	5.1E-04
Primary Energy Non-renewable Material	2.4E-06	0.04	0	0.04
Primary Non-renewable Energy Not Feedstock	4.3E-05	0.06	0	0.08
Primary Energy Non-renewable Total	4.6E-05	0.10	0	0.12
Hazardous Waste Disposed	7.1E-10	1.2E-05	0	1.5E-05
Non-hazardous Waste Disposed	1.4E-06	9.6E-05	0	1.0
Radioactive Waste Disposed	4.4E-21	8.5E-32	0	7.5E-32
Components For Reuse	0	0	0	0
Material For Recycling	1.5E-08	4.6E-06	0	4.5E-06
Material For Energy Recovery	2.9E-10	1.5E-07	0	1.6E-07
Exported Energy Electrical	0	0	0	0
Exported Energy Thermal	0	0	0	0



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**Results Module D: Beyond System Boundaries**

Table 4 has results for benefit and loads in D1 reuse, D2 recovery and D3 recycling.

**Table 4 D1 to D3 Impact & Inventory Results/Functional Unit**

Result	D1	D2	D3
Climate Change biogenic	-2.0E-04	-1.9E-4	0
Climate Change luluc	1.7E-07	2.4E-09	0
Climate Change fossil	4.8E-02	0	0
Climate Change total	4.8E-02	0	0
Stratospheric Ozone Depletion	8.2E-10	5.9E-13	0
Photochemical Ozone Creation	2.3E-04	1.2E-06	0
Acidification Potential	1.0E-04	5.3E-07	0
Eutrophication Freshwater	2.2E-09	1.2E-10	0
Eutrophication Marine	2.4E-05	9.4E-08	0
Eutrophication Terrestrial	5.8E-05	6.9E-07	0
Mineral and Metal Depletion	1.8E-05	5.8E-08	0
Fossil Depletion	2.4E-02	1.7E-04	0
Water Scarcity Depletion	6.0E-04	1.8E-05	0
Net Fresh Water Use	3.7	0.11	0
Secondary Material	1.1E-03	1.7E-04	0
Secondary Renewable Fuel	4.0E-04	4.3E-05	0
Primary Renewable Material	4.9E-05	3.0E-05	0
Primary Energy Renewable Not Feedstock	6.9E-02	1.4E-04	0
Primary Energy Renewable Total	6.9E-02	1.7E-04	0
Secondary Non-renewable Fuel	2.9E-04	7.7E-06	0
Primary Energy Non-renewable Material	4.8E-02	0	0
Primary Non-renewable Energy Not Feedstock	0.37	3.1E-03	0
Primary Energy Non-renewable Total	0.42	3.1E-03	0
Hazardous Waste Disposed	1.4E-05	1.9E-07	0
Non-hazardous Waste Disposed	7.3E-03	2.0E-05	0
Radioactive Waste Disposed	1.6E-17	4.9E-21	0
Components For Reuse	0	0	0
Material For Recycling	1.9E-04	1.6E-05	0
Material For Energy Recovery	7.3E-06	6.5E-09	0
Exported Energy Electrical	0	0	0
Exported Energy Thermal	0	0	0



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**Interpretation Cradle to Gate A1 to A3.**

The first interpretation section discusses product results cradle to gate A1 to A3.

Like most lime and cement products derived from roasting fossil limestone, admixtures have significant Global Warming Potential (GWP). Roasting limestone meal in high temperature kilns releases chemically bound carbonates from the mineral and oxides of carbon, nitrogen and sulphur from fuel combustion to air.

Figure 3 charts proprietary base mix mass versus GWP as CO<sub>2e</sub> kg/kg admixture. Figure 4 charts cement mass versus GWP CO<sub>2e</sub> kg/kg admixture. Together they show the cement has twice the GWP sensitivity of the next component the base mix. GWP sensitivity to sand and setting agent components were lowest.

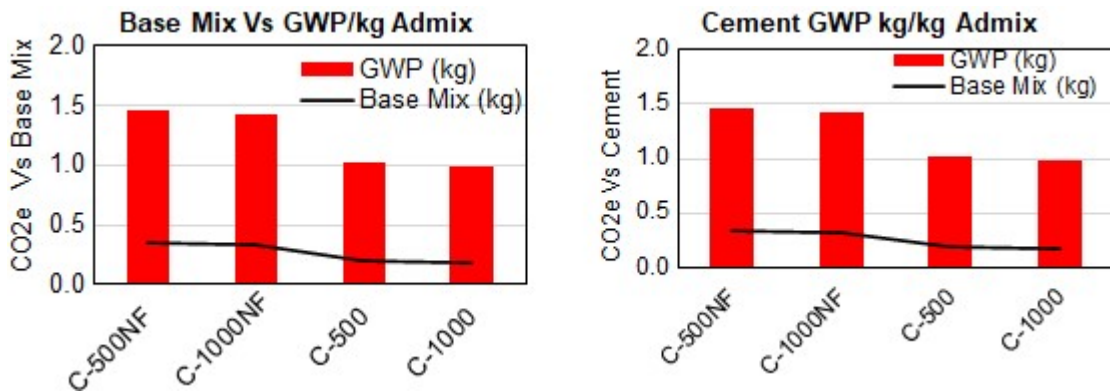


Figure 3 A1-3 Base Mix MJ Vs CO<sub>2e</sub>/kg Admix      Figure 4 A1-3 Cement Vs CO<sub>2e</sub>/kg Admix

Figure 5 charts the A1-3 abiotic depletion of access to fossil fuels (ADPff) in (MJncv) correlated to GWP CO<sub>2e</sub> kg/kg admixture. Most such fossil fuel was used in roasting limestone meal in kilns to make clinker for cement and to make lime for hydrated lime.

**Interpretation Cradle to Grave and Beyond the System Boundary A1 to D3.**

The second interpretation section discusses product results cradle to grave and beyond A1 to D3 Figure 6 shows highest GWP A1-A3 and insignificant A4 to C4 and beyond 60-years.

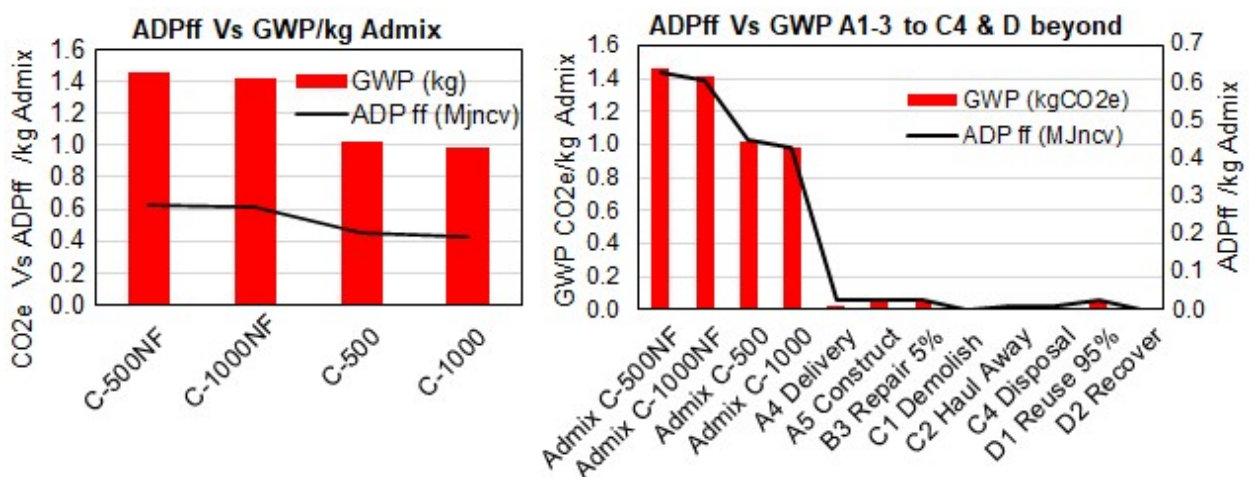


Figure 5 ADPff MJncv) Vs CO<sub>2e</sub> kg/kg A1-3

Figure 6 GWP A1 to D3/kg Functional Unit

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