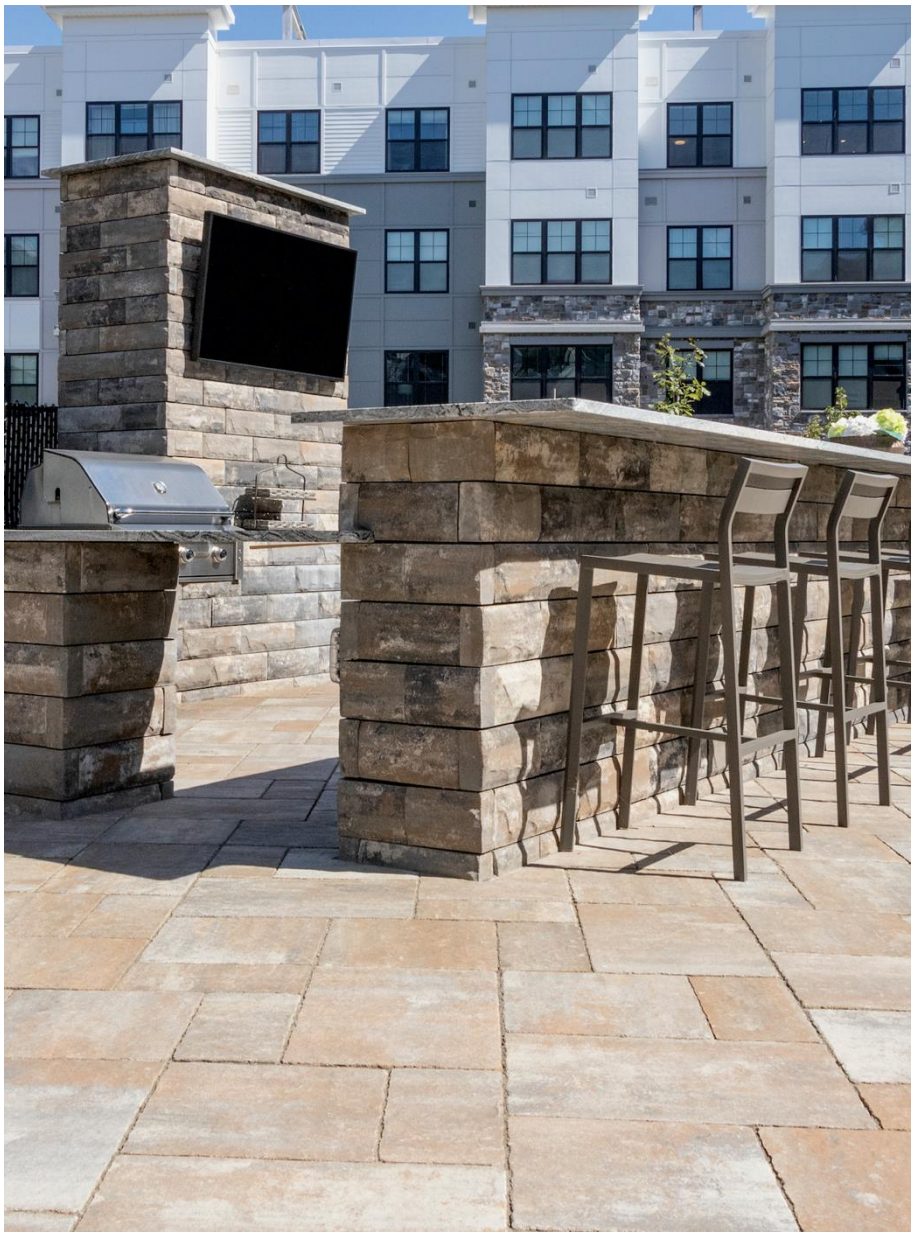
ENVIRONMENTAL PRODUCT DECLARATION

DRYCAST PAVER PRODUCT



UNILOCK®

Since 1972, when Unilock brought the first paver to North America, we have consistently strived to raise the bar. Today we offer unmatched variety of paver, slab and wall styles.

It takes more than bringing new products to market to make a great company. It also requires providing excellent support, and fostering business practices that are inclusive, equitable, sustainable and grounded in corporate integrity. As we pave the way forward, this remains at the core of our company culture.

UL CERTIFIED ENVIRONMENTAL PRODUCT DECLARATION UL.COM/EPD

Concrete interlocking paving units, slabs and segmental retaining walls units are used as hardscapes in the creation of outdoor environments, both commercially and residentially. Being very durable and resistant, these materials have a long lifecycle, low maintenance costs, contribute to Low Impact Development, carbon sequestration, LEED and Green building initiatives.

EPD PROGRAM AND PROGRAM OPERATOR NAME, ADDRESS, LOGO, AND WEBSITE	UL ENVIRONMENT 333 PFINGSTEN RD, NORTHBROOK, IL 60062	WWW.UL.COM WWW.SPOT.UL.COM
GENERAL PROGRAM INSTRUCTIONS AND VERSION NUMBER	Program Operator Rules v 2.7 2022	
MANUFACTURER NAME AND ADDRESS	Unilock Group of Companies 401 The West Mall, Ste 610 Toronto, Ontario M9C 5J5	
DECLARATION NUMBER	4790644192.101.1	
DECLARED PRODUCT & DECLARED UNIT	1 m^3 of paver product	
REFERENCE PCR AND VERSION NUMBER	Product Category Rules for Building Related Products and Services, Part A: Life Cycle Assessment Calculation Rules and Report Requirements, Edition 6 (ULE, 2022) ; and, Part B: Concrete Masonry and Segmental Concrete Paving Product EPD Requirements (ULE, 2020)	
DESCRIPTION OF PRODUCT APPLICATION/USE	Paver product / Outdoor application	
MARKETS OF APPLICABILITY	North America	
DATE OF ISSUE	July 1, 2023	
PERIOD OF VALIDITY	5 years	
EPD TYPE	Company specific	
EPD SCOPE	Cradle to gate	
YEAR(S) OF REPORTED PRIMARY DATA	2021	
LCA SOFTWARE & VERSION NUMBER	LCA FE v10	
LCI DATABASE(S) & VERSION NUMBER	LCA FE MLC database (CUP 2023.1)	
LCIA METHODOLOGY & VERSION NUMBER	IPCC AR5 (GWP) (IPCC, 2014), CML-IA v4.8, (ADPf), TRACI 2.1 (Bare, 2012)	

The sub-category PCR review was conducted by:	UL Environment PCR Review Panel epd@ul.com
This declaration was independently verified in accordance with ISO 14025: 2006. The UL Environment "Part A: Calculation Rules for the Life Cycle Assessment and Requirements on the Project Report," in conformance with ISO 21930:2017, serves as the core PCR ☐ INTERNAL ☒EXTERNAL	Cooper McCollum Cooper McCollum, UL Environment
This life cycle assessment was conducted in accordance with ISO 14044 and the reference PCR by:	Sphera
This life cycle assessment was independently verified in accordance with ISO 14044 and the reference PCR by:	Jack Geibig, Ecoform Jack Geibig

LIMITATIONS

Environmental declarations from different programs (ISO 14025) may not be comparable. EPDs are comparable only if they use the same PCR (or sub-category PCR where applicable), include all relevant information modules and are based on equivalent scenarios with respect to the context of construction works. This PCR allows EPD comparability only when the same functional requirements between products are ensured and the requirements of ISO 21930:2017 are met. However, variations and deviations are possible. Example of

variations: different LCA software and background LCI datasets may lead to different results for the life cycle stages declared.

Product Definition And General Information

Description of Organization

Since 1972, when Unilock brought the first paver to North America, we established a new industry that has come to be known as 'hardscaping'. Our founder, created our company with a vision of interconnectedness – not just in the interlocking pavers we manufacture, but in the interconnectivity of people and places. Since then, other companies have tried to follow in our path, but Unilock remains the industry leader.

We've consistently maintained our reputation with a tireless commitment to raising the bar in everything we do. Today we offer an unmatched variety of paver, slab and wall styles with unsurpassed durability that has been time tested in some of the most prestigious public spaces in North America. Our close relationships with European companies have given us access to exclusive new products and technologies and together with our own home-grown inventions, this has kept us on the leading edge.

It takes more than bringing new products to market to make a great company. It also requires providing excellent support, and fostering business practices that are inclusive, equitable, sustainable and grounded in corporate integrity. As we pave the way forward, this remains at the core of our company culture.

Product Description

Concrete interlocking paving units, slabs and segmental retaining walls units (CSI–07-76-00 / 32-14-13 / 32-32-23) are used as hardscapes in the creation of outdoor environments, both commercially and residentially. They can create plazas, parks, walkways, roadways, streetscapes, retaining walls, garden walls, outdoor islands, patios, driveways and more.

The Drycast product family includes, but is not limited to the following product lines:

ADA Paver, Anchorlock™, Artline™ , Beacon Hill™ Flagstone, Beacon Hill™ Smooth, Boulevard™, Bristol Valley®, Bronte™ Street Paver, Camelot™, DuraFlow™, DuraMat™, EcoLine®, Eco-Optiloc™, Eco-Priora™, Eco-Promenade™, Eco-Stone™, Granito™, HexPaver™ , Hollandstone™, Holland Premier™, Il Campo®, Mattoni™, Metro Slab™, Nordic Cobble, Northshore™, Optiloc™, Promenade™ Plank, Revela™, Senzo™, Series™, Skyline™, Thornbury™, Transition™, Treo®, Tribeca Cobble™, Turfstone™, Umbriano™, Westport™, Windermere®, Brussels Dimensional Stone®, Brussels Dimensional System™, Brussels Fullnose™/Fullnose Edger™, Concord™ Wall, DuraHold®, DuraHold 2®, Estate Wall™, Lineo™ Dimensional Stone, Old Quarry™, Pisa2™/PisaXL, Pisa™ Smooth, Roman Pisa™, Roman Stack™, SienaEdge™, SienaStone®, SienaSmooth®, Sonoma Stone™, Split 'nStack™, U-Cara® Multi-Face System (fascia and block), Umbriano™ Coping, Universal Base, Universal Coping.

Figure 1 Drycast pavers and retaining wall products

Product Average

This EPD covers environmental impacts for Drycast paver product for outdoor applications. Production weighted Drycast average data is used in order to do the LCA analysis in this EPD. Vertical averaging is performed where the flow of goods are captured within each facility and then an average is calculated. The results displayed are production weighted average across 13 production sites in North America. Individual plant contribution results are also presented.

Application

Paver products are used for outdoor application in commercial and residential areas.

Industry Standards

The products considered in the Drycast EPD meet or exceed the following Technical Specifications:

- ASTM C936
- ASTM C1782
- ASTM C1372
- CSA A231.1 and A231.2 available upon request
- NCMA Zone 3 Recommendation for products exposed to deicing materials

Unilock does not test or rate the declared products for extraordinary effects, i.e., performance under unforeseeable influence of fire, water or mechanical destruction.

Declaration of methodological framework

A “cradle-to-gate” life cycle assessment (LCA) was conducted for this EPD.

Delivery Status

Pavers, slabs and retaining walls are packaged in bundle form with multiple units per layer. They are shipped to site, often on skids for ease of movability. Products are installed on-site by trained landscape contractors. The size of the pavers, shapes and laying pattern are determined in conjunction with the application or use of the site, dependent on whether it is commercial or residential and pedestrian, vehicular, heavy-duty or roof deck application.

Installation of pavers, slabs and retaining walls requires the removal of native soil, a compacted base of open graded or specifically graded aggregate, topped with layer of either smaller open graded bedding material or concrete/angular sand. The hardscape materials are then laid, leveled, and cut to fit where necessary. A final compaction is done on pavers and slabs and then a joint material such as polymeric sand or concrete sand completes the lock up. For walls, hardscape blocks are stacked to the desired height and open graded or free draining aggregates are installed behind the wall and compacted in layers until the finished height is reached.

Drycast hardscape materials are extremely durable and capable of lasting fifty years.

Because of their durability, hardscape products can be reused in a new location, however they can also be used as landfill or even recycled to create an aggregate. It is possible that the product is also disposed of on construction sites.

Properties of the Product as Delivered

Table 1: Technical product specifications - Pavers

Name	Value	Unit
Compressive strength	> 8000 psi	psi
Absorption (%)	< 5 %	–
Freeze thaw durability at 28 cycles of FT	< 225	g/m²

Table 2: Technical product specifications – Slabs

Name	Value	Unit
Compressive strength	> 8000 psi	psi
Freeze thaw durability at 28 cycles of FT	< 225 g/m²	g/m²
Flexural strength	725 avg, > 650 min	psi

Table 3: Technical product specifications – Retaining Walls

Name	Value	Unit
Compressive strength – NCMA Recommendation (ASTM Std)	> 5500 psi and (> 3000 psi)	psi
Absorption (%)	< 7 %	--
Freeze thaw durability (%) 100 cycles tapwater	≤ 1.%	--

Material Composition: Base and Ancillary Material

Drycast products are primarily made from sand and sand mix (gravel, stone, asphalt base, silica quartz, silica sand etc.). Some other components such as cement, coating & sealing compounds are also used. Note that different paver products within the Drycast product line may have slightly different contributions, however, their LCIA contribution is not significant (well below 10%).

Table 2: Base and Ancillary material for Drycast pavers

Raw materials	Drycast
Admixture - Plasticiser	0.094%
Admixture - Air entrainer	0.000%
Admixture - Retarder	0.000%
Portland Cement	8.265%
Slag Cement	2.247%
Canada GU Cement	5.436%
Aggregates	37.724%
Sand & sand-mix	35.226%
Calcite & Limestone	0.574%
Copper nickel slag	0.001%
Paint & coating	0.144%
Fly Ash	0.000%
Granite	0.894%
Magnesium oxide	0.008%
Sealer	0.000%
Gravel	9.386%

Manufacturing

The manufacturing sites are distributed all over North America: Ayr, Georgetown, Gormley & Pickering in Ontario (Canada); Aurora (1 + 2), Marengo, IL; Elkhorn, WI; Brighton, MI; Rittman, OH; Brewster (1 + 2), NY; Uxbridge, MA. All Unilock products are inspected on site for quality assurance.

The manufacturing process comprises the steps shown in Figure 2.

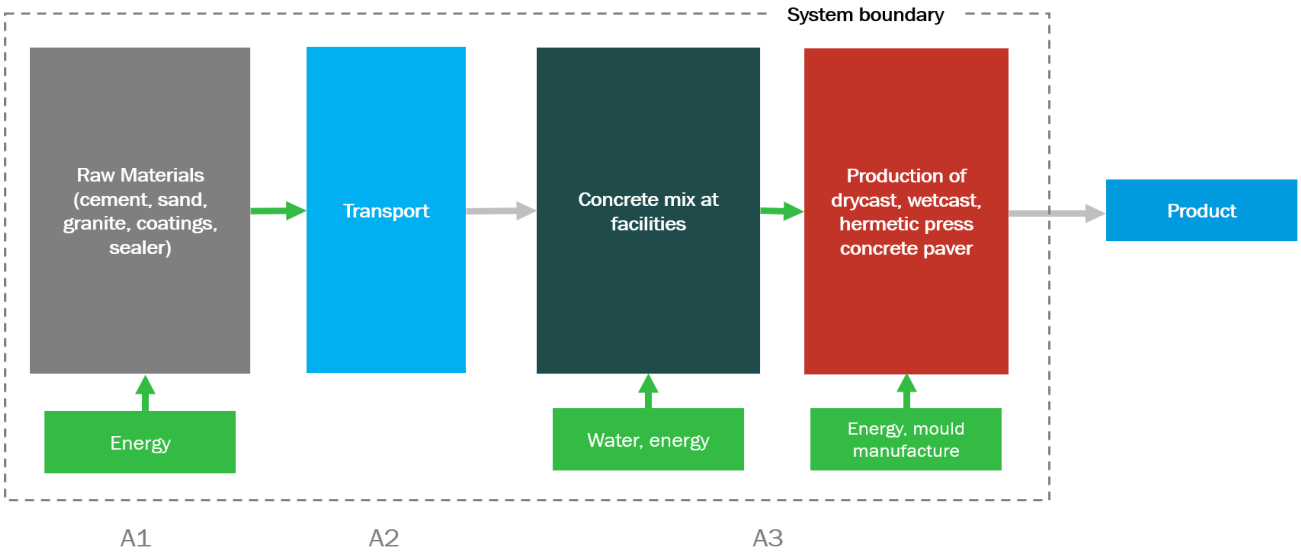


Figure 2: Process flow diagram for Drycast paver product manufacturing

Raw materials (aggregates, sand, cement, admixtures, dyes) are purchased and transported to our manufacturing locations where they are received and stored. A specific ratio of course and fine aggregates are combined with cement and other supplementary cementitious materials (SCM), admixtures and colorants and put in the mixer. A relatively small quantity of water is added in order to achieve a dry mix and mixed together.

The ingredients fill the mold on the press and are vibrated and compacted to the shape and surface texture in the mold. Each layer is demolded and sent to the kiln to harden.

Once sufficiently cured, the layers are brought together to form a bundle where they are packaged and strapped. If additional post treating (blasting, texturing or sealing) is required it will be sent to the process and re-bundled for sale. They are transported to the yard for additional curing before being sold.

Packaging

Corrugated cardboard, plastic films, foam, wooden pallets, and cables are used for packaging and shipping.

Transportation

Inbound transportation mode is primary via ship and truck.

Transportation distances and modes of transport are included for the transport of the raw materials, operating materials, and auxiliary materials to the production facility. Per the PCR guidance, assuming the trucks return empty, distances for short hauls were multiplied by 2.

Transport to the customer or construction site is outside the scope of this EPD.

Product Processing/Installation

Outside of the scope of this EPD (installation stage excluded).

Use

Outside of the scope of this EPD (use stage excluded).

Reference Service Life, Condition of Use

Outside of the scope of this EPD (use stage excluded).

Recycling and Disposal

Product reuse, recycling, and incineration for energy recovery is outside the scope of this EPD.

Environment and Health

Product manufacturing: Plant emissions to air/soil/water are monitored (if applicable) and comply with local laws.

Product use: Unilock products are not expected to create exposure conditions that exceed safe thresholds for health impacts to humans or flora/fauna under normal operating conditions. Use stage is outside of the scope of this EPD.

Life Cycle Assessment Background Information

A "cradle-to-gate" analysis using life cycle assessment (LCA) techniques was conducted for this EPD. The analysis was done according to the product category rule (PCR) for Concrete Masonry Unit by ULE and LCA principles, requirements and guidelines laid out in the ISO 14040/14044 standards. This analysis follows an attributional LCA approach. While the intent of the PCR is to increase comparability, there may still be differences among EPDs that comply with the same PCR (e.g., due to differences in system boundaries, background data, etc.).

Declared Unit

The declared unit for this EPD is 1 m^3 of Drycast paver product.

Table 3: Declared unit

Name	Value	Unit
Declared unit	1	m^3
Conversion factor to kg	2.4E+03	kg/m^3

Slabs thickness is typically greater than 1.2" (30mm) and pavers are greater than 2 3/8" (60mm) and can be produced in thicknesses up to 6" (150mm).

System Boundaries

Per the PCR, this "cradle-to-gate" analysis provides information on the Product Stage of the paver product life cycle, comprising modules A1–A3.

DESCRIPTION OF THE SYSTEM BOUNDARY (X = INCLUDED IN LCA; MND = MODULE NOT DECLARED)																
PRODUCT STAGE			CONSTRUCTION PROCESS STAGE		USE STAGE							END OF LIFE STAGE				BENEFITS AND LOADS BEYOND THE SYSTEM BOUNDARIES
Raw material supply	Transport	Manufacturing	Transport	Construction- installation process	Use	Maintenance	Repair	Replacement1	Refurbishment1	Operational energy use	Operational water use	De-construction demolition	Transport	Waste processing	Disposal	Reuse- Recovery- Recycling- potential
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
X	X	X	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND

* X = module included, MND = module not declared

Time coverage: Primary data were collected on production within the calendar year from January – December 2021. Background data for upstream and downstream processes (i.e., raw materials, energy resources, transportation, and ancillary materials) were obtained from the Sphera's Managed LCA Content (MLC) (fka GaBi CUP 2023.1) and Ecoinvent databases.

Technology coverage: Data were collected for the production of paver products at Unilock's 13 manufacturing facility in North America.

Geographical coverage: All Unilock products are manufactured in Canada and in the USA. As such, the geographical coverage for this study is based on North America for system boundaries for all processes and products. Whenever US/CA/NA background data were not readily available, European data or global data were used as proxies.

Estimates and Assumptions

All of the raw materials and energy inputs have been modeled using processes and flows that closely follow actual production data on raw materials and processes. All reported material and energy flows have been accounted for. Furthermore, all primary data were collected using customized data collection templates, sent by email to Unilock by Sphera. Upon reciept, each questionnaire was cross-checked for completeness and plausibility using mass balance and internal and external benchmarking. If gaps, outliers, or other inconsistencies occurred, Sphera engaged with Unilock to resolve any issues

No significant assumptions have been made beyond the aforementioned.

Proxy data were applied to some materials where no matching life cycle inventories were available, as documented in the background report.

Cut-off-Criteria

As required by ISO 14040/44, in case of insufficient input data or data gaps for a unit process, the cut-off criteria were 1% of renewable and non-renewable primary energy usage and 1% of the total mass input of that unit process. The total of neglected input flows per module was a maximum of 5% of energy usage and mass.

In practice, all inputs and outputs, for which data are available, have been included in the calculation. Data gaps have been filled by conservative assumptions with average or generic data. Capital items for the production processes (machines, buildings, etc.) were not taken into consideration. No known flows are deliberately excluded from this EPD.

Period Under Review

Data for Unilock's Drycast was collected for three plants: Georgetown & Ayr plants (Ontario, Canada) and Marengo plant (IL). The remaining Drycast data were extrapolated based on their annual production and corresponding regional electricity grids[1]. Data represents the annual production from January – December 2021.

Data Sources

The LCA model was created using the LCA FE 10 software system for life cycle engineering, developed by Sphera (Sphera, 2023). Background life cycle inventory data for raw materials and processes were obtained from the MLC (fka GaBi) 2023.1 database (CUP 2023.1). Specific Ecoinvent datasets are collected from Ecoinvent 3.2 database as suggested in the PCR Part B (ULE, 2020). Primary manufacturing data were provided by Unilock.

Data for Unilock's Drycast pavers were collected for three plants: Georgetown & Ayr plants (Ontario, Canada) and, Marengo, IL, US plant. The remaining Drycast data were extrapolated based on their annual production and corresponding regional electricity grids.

This EPD recognizes fly ash, silica fume and slag as recovered materials and thus the environmental impacts allocated to these materials are limited to the treatment processes and transportation required for their use as concrete material inputs.

Data Quality

A variety of tests and checks were performed by the LCA practitioner throughout the project to ensure high quality of the completed LCA. Checks included an extensive internal review of the project specific LCA models developed as well as the background data used. A full data quality assessment is documented in the background report.

Time Coverage: The results presented in this study for Unilock paver products are intended to be representative of the production period of January - December 2021. Background data for upstream and downstream processes (i.e., raw materials, energy resources, transportation, and ancillary materials) were obtained from the Sphera's Managed LCA Content (MLC) (fka GaBi CUP 2023.1) and Ecoinvent databases. The results are considered to be valid for five years or until significant technological changes occur.

Technology Coverage: Data on material composition and manufacturing processes are primary data from Unilock. The current practice and technology reflecting Drycast paver production are documented in the manufacturing section.

Geographical Coverage: The intended geographical coverage is North America. Details of the exact geographical coverage of where the data were collected, processes take place, country of principal manufacture, etc. are documented in the previous sections.

Allocation

No multi-output allocation was required in the foreground system of the study.

Allocation of background data (energy and materials) taken from the MLC (fka GaBi database) 2023.1 databases and is documented online at https://sphera.com/life-cycle-assessment-lca-software/ .

Life Cycle Assessment Results

North American life cycle impact assessment (LCIA) results are declared using TRACI 2.1 (Bare, 2012; EPA, 2012) methodology, with the exception of GWP which is reported using the IPCC AR5 (IPCC, 2013) methodology, excluding biogenic carbon. CML -IA v4.8 result for ADP_{fossil} are presented as a requirement for the PCR part A (ULE, 2022). Primary energy use represents the lower heating value (LHV) a.k.a. net calorific value (NCV).

LCIA results are relative expressions and do not predict actual impacts, the exceeding of thresholds, safety margins or risks.

[1] A weighted average is calculated from 13 production sites. Vertical averaging is performed where the flow of goods are captured within each facility and then an average is calculated. The results displayed are production weighted average across 13 production sites in North America and also for each sites in the Annex.

The result for the weighted average Drycast product is given in Table 4, per the declared unit of 1m³ of pavers. Production weighted Drycast average data is used in order to do the LCA analysis in this EPD. Vertical averaging is performed where the flow of goods are captured within each facility and then an average is calculated.

No biogenic carbon emission or removal was recorded from the product or packaging. There was no biogenic Carbon Emission from combustion of waste from renewable sources used in production processes as well. Accounting for the reaction of atmospheric carbon dioxide is not relevant for the product evaluated. Calcination calculations used a default of 525 kg CO_2/tonne, assuming 91.4% clinker in the cement (ULE, 2020; PCA, 2021).

The six LCIA categories are globally deemed mature enough to be included in Type III environmental declarations. Other categories are being developed and defined and LCA should continue making advances in their development. However, the EPD users shall not use additional measures for comparative purposes.

Cement accounts for as much as 89% (including ODP) of the impacts of the concrete mixes included in this EPD and thus manufacturer specific cement impacts could result in variation of as much as 44.5% (38% if ODP is not considered) (ULE, 2020).

Many of the LCI and waste indicators are considered as emerging LCA impact categories and inventory items. These items are still under development and can have high levels of uncertainty that preclude international acceptance pending further development. Use caution when interpreting data in these categories.

Table 4 Weighted Average Result for Declared Unit of 1 m³ Drycast paver product

Impact Category	Unit	A1	A2	A3
	LCIA results			
IPCC, AR5 (IPCC, 2013)				
Global warming potential (GWP 100)	kg CO_2 eq.	5.39E+02	1.90E+01	8.14E+01
TRACI v2.1 and CML-IA v4.8				
Ozone depletion potential (ODP)	kg CFC 11 eq.	7.75E-06	4.18E-14	1.16E-08
Acidification potential (AP)	kg SO_2 eq.	1.29E+00	1.09E-01	3.69E-01
Eutrophication potential (EP)	kg N eq.	3.41E-01	8.23E-03	1.90E-02
Smog formation potential (SFP)	kg O_3 eq.	2.23E+01	2.81E+00	8.62E+00
Abiotic resource depletion potential of non-renewable (fossil) energy resources (ADP_{fossil})	MJ	2.90E+03	2.63E+02	1.00E+03
Additional result per the PCR				
GWP emission from calcination	kg CO_2 eq.		480	
	LCI indicators			
Renewable primary resources used as energy carrier (fuel) (RPR_E)	MJ	6.40E+02	9.93E+00	1.43E+03
Renewable primary resources with energy content used as material (RPR_M)	MJ	0.00E+00	0.00E+00	1.35E+02
Non-renewable primary resources used as an energy carrier (fuel) ($NRPR_E$)	MJ	3.74E+03	2.65E+02	1.16E+03
Non-renewable primary resources with energy content used as material ($NRPR_M$)	MJ	0.00E+00	0.00E+00	6.00E+01
Renewable secondary fuels (RSF)	MJ	0.00E+00	0.00E+00	0.00E+00
Non-renewable secondary fuels (NRSF)	MJ	0.00E+00	0.00E+00	0.00E+00
Recovered energy (RE)	MJ	0.00E+00	0.00E+00	0.00E+00
Secondary materials (SM)	kg	0.00E+00	0.00E+00	0.00E+00

Impact Category	Unit	A1	A2	A3
Use of net fresh water resources (FW)	m^3	2.41E+02	3.44E-02	4.75E-01
Output & waste indicators				
Hazardous waste disposed (HWD)	kg	0.00E+00	0.00E+00	0.00E+00
Non-hazardous waste disposed (NHWD)	kg	6.29E+01	0.00E+00	2.18E+02
High-level radioactive waste, conditioned, to final repository (HLRW)	kg	2.98E-04	7.74E-07	8.05E-05
Intermediate- and low-level radioactive waste, conditioned, to final repository (ILLRW)	kg	2.50E-01	6.52E-04	6.73E-02
Components for re-use (CRU)	kg	0.00E+00	0.00E+00	0.00E+00
Materials for recycling (MFR)	kg	0.00E+00	0.00E+00	0.00E+00
Materials for energy recovery (MER)	kg	0.00E+00	0.00E+00	0.00E+00
Recovered energy exported from the product system (EE)	MJ	0.00E+00	0.00E+00	0.00E+00

Comparability: Comparisons cannot be made between product-specific or industry average EPDs at the design stage of a project before a building has been specified. Comparisons may be made between product-specific or industry average EPDs at the time of product purchase when product performance and specifications have been established and serve as a functional unit for comparison. Environmental impact results shall be converted to a functional unit basis before any comparison is attempted.
Any comparison of EPDs shall be subject to the requirements of ISO 21930. EPDs are not comparative assertions and are either not comparable or have limited comparability when they have different system boundaries, are based on different product category rules or are missing relevant environmental impacts. Such comparison can be inaccurate and could lead to erroneous selection of materials or products which are higher impact, at least in some impact categories.
When comparing EPDs created using this PCR, variations and deviations are possible. Example of variations: Different LCA software and background LCI datasets may lead to different results for upstream or downstream of the life cycle stages declared.
Comparison of the environmental performance of paver products using EPD information shall be based on the product's use and impacts at the building level, and therefore EPDs may not be used for comparability purposes when not considering the building energy use phase as instructed under this PCR.

The individual plant results variation from the Drycast weighted average is given in Table 5, per the declared unit of $1m^3$ of pavers.

Table 5 Individual plant contribution variation for $1m^3$ of Drycast paver product

	GWP kg CO_2 eq.	AP kg SO_2 eq.	EP kg N eq.	SFP kg O_3 eq.	ADP_{fossil} MJ, surplus
Georgetown, ON	123%	142%	76%	140%	135%
Aurora, IL (1)	125%	142%	77%	139%	138%
Brewster, NY (1)	123%	141%	76%	139%	135%
Ayr, ON	120%	134%	58%	138%	158%
Aurora, IL (2)	123%	136%	59%	139%	163%
Elkhorn, WI	123%	136%	59%	139%	162%
Gormley, ON	120%	134%	58%	138%	158%
Marengo, IL	78%	63%	138%	61%	46%
Brighton, MI	79%	63%	138%	61%	48%
Rittman, OH	78%	63%	138%	61%	46%
Brewster, NY (2)	75%	61%	138%	60%	40%

	GWP kg CO_2 eq.	AP kg SO_2 eq.	EP kg N eq.	SFP kg O_3 eq.	ADP_{fossil} MJ, surplus
Uxbridge, MA	76%	62%	137%	60%	43%
Pickering, ON	74%	62%	137%	60%	40%

The statistical distribution between all Drycast facilities is presented in Table 6. Facility specific results are presented in the Annex.

Table 6 Statistical metrics of LCIA results for 1 m³ of Drycast paver product for all Unilock facilities

Parameter	Unit	MIN (A1-A3)	MAX (A1-A3)	Max/Min Ratio (A1-A3)	MEAN (A1-A3)	MEDIAN (A1-A3)	COV*
GWP	kg CO_2 eq.	4.76E+02	8.00E+02	5.95E-01	6.49E+02	7.66E+02	22%
ODP	kg CFC 11 eq.	4.99E-06	1.01E-05	4.92E-01	7.78E-06	6.84E-06	29%
AP	kg SO_2 eq.	1.08E+00	2.51E+00	4.32E-01	1.82E+00	2.37E+00	37%
EP	kg N eq.	2.15E-01	5.10E-01	4.22E-01	3.66E-01	2.82E-01	37%
SFP	kg O_3 eq.	2.01E+01	4.71E+01	4.28E-01	3.46E+01	4.65E+01	38%
ADP_{fossil}	MJ	1.65E+03	6.80E+03	2.43E-01	4.20E+03	5.63E+03	53%

**Coefficient of variation*

Visualization of Life Cycle Impact Assessment

Figure -3 represents an overview of the contributions by stage to the environmental impacts associated with the production on 1 m³ of Drycast concrete paving product.

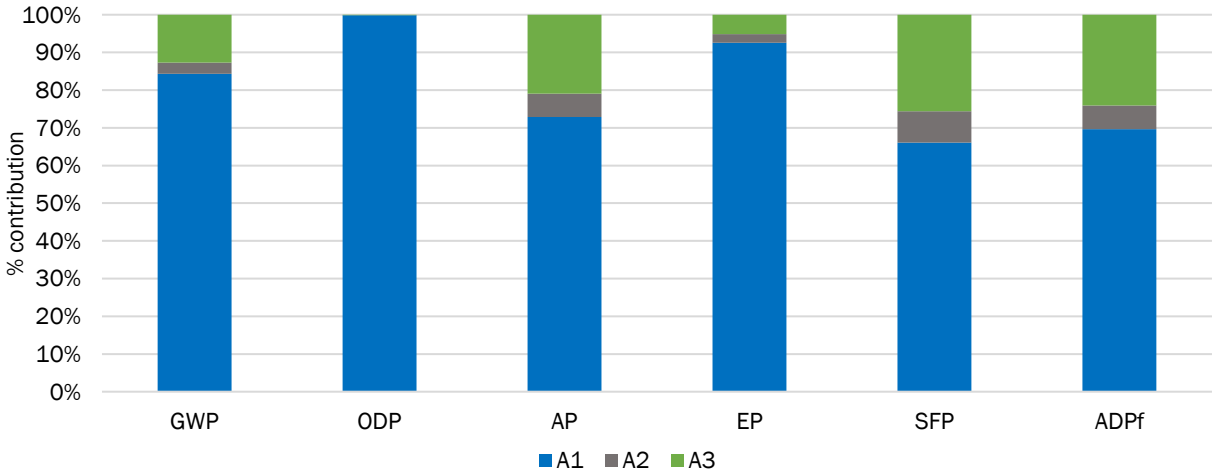


Figure 3 : Impact results for 1 m³ of Drycast paver product per module

The components to manufacture paver products are further divided into the following categories and the results are presented in Figure-4:

- Admixtures : Plasticiser, Retarder and Air entrainer
- Aggregates
- Energy & Utilities: Electricity, Natural gas, Diesel, Propane, Water
- Gravel
- Limestone material
- Mortar mix
- Portland cement: All cements except slag cement and cement from Canada
- QC GU cement
- Slag cement
- Quartz
- Packaging
- Other raw materials: Everything that was not classified as above (Sand, feldspar/granite, Ebony grit, MgO, Coatings & fluids, Asphalt base sand, lubricants)
- Waste

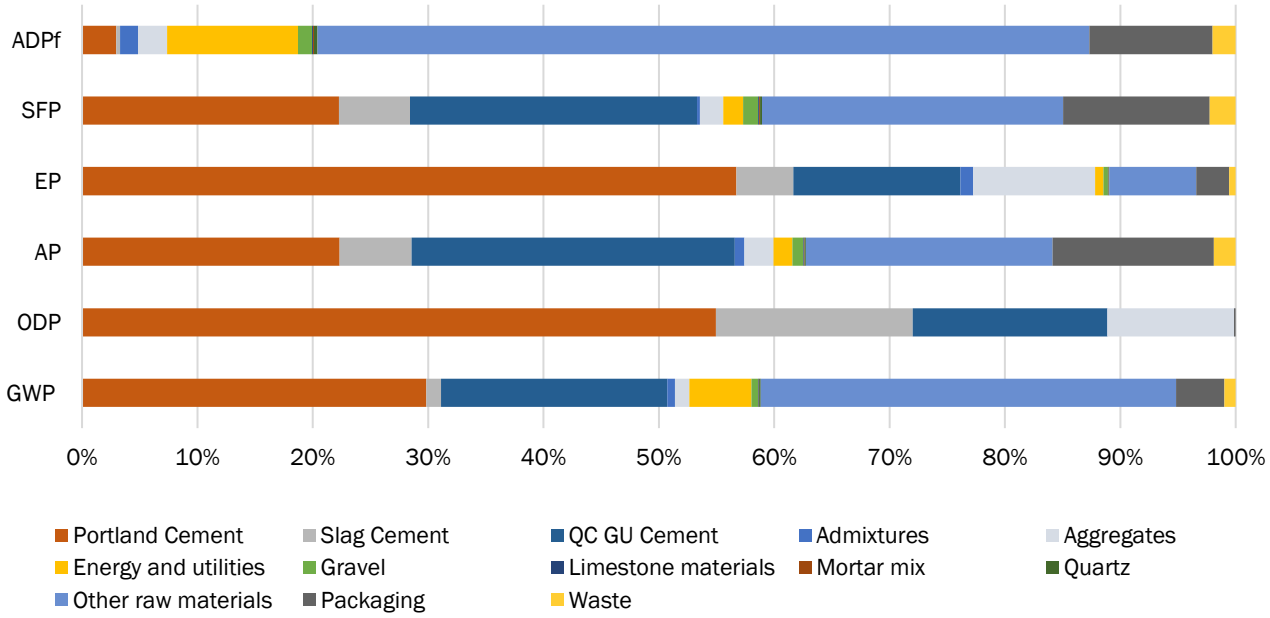


Figure 4: LCIA component results for – 1 m³ Drycast paver product

Interpretation

Module A1 (raw material supply) accounts for the majority (66.8% to 84.7%) of potential environmental impacts associated with the production of 1 m³ of Drycast pavers. A3 (manufacturing) is the second largest contributor to every impact category (10.8% to 23.3%), excluding ODP. Whereas A2 (inbound transportation) has a smaller contribution to each impact category (4.5% to 14.9%).

For the contribution analysis, for all impact categories, the cements (Portland, slag and GU) and other raw materials drive most of the GWP environmental impacts. Packaging and energy have between 2% to 7% contribution. Whereas waste produced during the process has the minimum contribution.

Third party verified ISO 14040/44 secondary LCI data sets contribute more than 67% of total impact (either at the unit process level or in aggregate) to any of the required impact categories identified by the applicable PCR.

Additional Environmental Information

Environment and Health During Manufacturing

Environmental, occupational health and safety practices are in accordance with OSHA and individual state requirements. The process and the products do not contain any materials or substances for which there exists a route to exposure that leads to humans or flora/fauna in the environment being exposed to said materials or substances at levels exceeding safe health thresholds. There are no substances required to be reported as hazardous associated with the production of this product.

Further Information

Further information can be found at https://unilock.com/

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Annex

Table A-1: Plant specific A1-A3 (total) results for Drycast facilities (results presented for 1m³ of paver production)

Indicator	Unit	Georgetown, ON	Aurora, IL (1)	Brewster, NY (1)	Ayr, ON	Aurora, IL (2)	Elnkhorn, WI	Gormley, ON	Marengo, IL	Brighton, MI	Rittman, OH	Brewster, NY (2)	Uxbridge, MA	Pickering, ON
GWP	kg CO2 eq.	7.88E+02	8.00E+02	7.89E+02	7.66E+02	7.88E+02	7.86E+02	7.66E+02	5.01E+02	5.06E+02	5.01E+02	4.80E+02	4.86E+02	4.76E+02
ODP	kg CFC 11 eq.	6.84E-06	6.84E-06	6.83E-06	4.99E-06	5.00E-06	4.99E-06	4.99E-06	1.01E-05	1.01E-05	1.01E-05	1.01E-05	1.01E-05	1.01E-05
AP	kg SO2 eq.	2.50E+00	2.51E+00	2.49E+00	2.37E+00	2.40E+00	2.40E+00	2.37E+00	1.11E+00	1.12E+00	1.11E+00	1.08E+00	1.09E+00	1.09E+00
EP	kg N eq.	2.81E-01	2.82E-01	2.81E-01	2.15E-01	2.17E-01	2.17E-01	2.15E-01	5.09E-01	5.10E-01	5.09E-01	5.07E-01	5.06E-01	5.06E-01
SFP	kg O3 eq.	4.71E+01	4.70E+01	4.68E+01	4.65E+01	4.69E+01	4.69E+01	4.65E+01	2.04E+01	2.06E+01	2.05E+01	2.01E+01	2.02E+01	2.03E+01
ADP_{fossil}	MJ, surplus	5.63E+03	5.74E+03	5.63E+03	6.57E+03	6.80E+03	6.76E+03	6.57E+03	1.91E+03	1.98E+03	1.90E+03	1.68E+03	1.77E+03	1.65E+03
Indicator	**Unit**	**Georgetown, ON**	**Aurora, IL (1)**	**Brewster, NY (1)**	**Ayr, ON**	**Aurora, IL (2)**	**Elnkhorn, WI**	**Gormley, ON**	**Marengo, IL**	**Brighton, MI**	**Rittman, OH**	**Brewster, NY (2)**	**Uxbridge, MA**	**Pickering, ON**
RPRe	MJ	2.08E+03	2.08E+03	2.08E+03	2.08E+03	2.08E+03	2.08E+03	2.08E+03	2.08E+03	2.08E+03	2.08E+03	2.08E+03	2.08E+03	2.08E+03
RPRm	MJ	1.35E+02	1.35E+02	1.35E+02	1.35E+02	1.35E+02	1.35E+02	1.35E+02	1.35E+02	1.35E+02	1.35E+02	1.35E+02	1.35E+02	1.35E+02
NRPRe	MJ	5.16E+03	5.16E+03	5.16E+03	5.16E+03	5.16E+03	5.16E+03	5.16E+03	5.16E+03	5.16E+03	5.16E+03	5.16E+03	5.16E+03	5.16E+03
NRPRm	MJ	6.00E+01	6.00E+01	6.00E+01	6.00E+01	6.00E+01	6.00E+01	6.00E+01	6.00E+01	6.00E+01	6.00E+01	6.00E+01	6.00E+01	6.00E+01
SM	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RSF	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NRSF	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
RE	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
FW	m³	2.41E+02	2.41E+02	2.41E+02	2.41E+02	2.41E+02	2.41E+02	2.41E+02	2.41E+02	2.41E+02	2.41E+02	2.41E+02	2.41E+02	2.41E+02
Indicator	**Unit**	**Georgetown, ON**	**Aurora, IL (1)**	**Brewster, NY (1)**	**Ayr, ON**	**Aurora, IL (2)**	**Elnkhorn, WI**	**Gormley, ON**	**Marengo, IL**	**Brighton, MI**	**Rittman, OH**	**Brewster, NY (2)**	**Uxbridge, MA**	**Pickering, ON**
HWD	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
NHWD	kg	2.81E+02	2.81E+02	2.81E+02	2.81E+02	2.81E+02	2.81E+02	2.81E+02	2.81E+02	2.81E+02	2.81E+02	2.81E+02	2.81E+02	2.81E+02
HLRW	kg	3.79E-04	3.79E-04	3.79E-04	3.79E-04	3.79E-04	3.79E-04	3.79E-04	3.79E-04	3.79E-04	3.79E-04	3.79E-04	3.79E-04	3.79E-04
ILLRW	kg	3.18E-01	3.18E-01	3.18E-01	3.18E-01	3.18E-01	3.18E-01	3.18E-01	3.18E-01	3.18E-01	3.18E-01	3.18E-01	3.18E-01	3.18E-01
CRU	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MFR	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
MER	kg	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
EE	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00