koroseal

VERIFIED by SCS GLOBAL SERVICES ENVIRONMENTAL PRODUCT DECLARATION BASED ON LCA

Declaration Owner

Koroseal Interior Products
3875 Embassy Parkway, Suite 110
Fairlawn, Ohio 44333
Phone: 855-753-5474
info@koroseal.com

Products:

JustRite-60, MatteRite-60, & EZRite-50 Dry Erase Wallcoverings

Functional Unit

The functional unit is one square meter of installed wallcovering product with a RSL of 10 years

EPD Number and Period of Validity

SCS-EPD-08770
EPD Valid March 16, 2023 through March 15, 2028

Product Category Rule

UL Product Category Rules for Building-Related Products and Services, Part A: Life Cycle Assessment Calculation Rules and Reporting Requirements

UL Part B: Wall and Door Protection EPD Requirements

Program Operator

SCS Global Services
2000 Powell Street, Ste. 600, Emeryville, CA 94608
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SCSglobal SERVICES

Declaration owner:	Koroseal Interior Products
Address:	3875 Embassy Parkway, Suite 110, Fairlawn, Ohio 44333
Declaration Number:	SCS-EPD-08770
Declaration Validity Period:	EPD Valid March 16, 2023 through March 15, 2028
Program Operator:	SCS Global Services
Declaration URL Link:	https://www.scsglobalservices.com/certified-green-products-guide
LCA Practitioner:	Ilan MacAdam-Somer, SCS Global Services
LCA Software and LCI database:	OpenLCA 1.10.3 software and the Ecoinvent v3.7.1 database
Product's Intended Application:	Decorative and dry erase board
Product RSL:	10 years
Markets of Applicability:	Domestic and International
EPD Type:	Product-Specific
EPD Scope:	Cradle-to-Grave
LCIA Method and Version:	TRACI 2.1 and CML-IA Baseline
Independent critical review of the LCA and data, according to ISO 14044 and ISO 14071	☐ internal ☒external
LCA Reviewer:	Lindita Bushi, Ph.D., Athena Sustainable Materials Institute
Part A Product Category Rule:	PCR Guidance for Building-Related Products and Services Part A: Life Cycle Assessment Calculation Rules and Report Requirements. Version 3.2. UL Environment. Sept. 2018
Part A PCR Review conducted by:	Lindita Bushi, PhD (Chair); Hugues Imbeault-Tétreault, ing., M.Sc.A.; Jack Geibig
Part B Product Category Rule:	UL Part B: Wall and Door Protection EPD Requirements
PCR Review conducted by:	Dr, Lindita Bushi, Lisa Lauren, and Jim Mellentine
Independent verification of the declaration and data, according to ISO 21930, ISO 14025 and the PCR	☐ internal ☒ external
EPD Verifier:	Lindita Bushi, Ph.D., Athena Sustainable Materials Institute
Declaration Contents:	

Disclaimers: *This EPD conforms to ISO 14025, 14040, 14044, and ISO 21930.*

Scope of Results Reported: *The PCR requirements limit the scope of the LCA metrics such that the results exclude environmental and social performance benchmarks and thresholds, and exclude impacts from the depletion of natural resources, land use ecological impacts, ocean impacts related to greenhouse gas emissions, risks from hazardous wastes and impacts linked to hazardous chemical emissions.*

Accuracy of Results: *Due to PCR constraints, this EPD provides estimations of potential impacts that are inherently limited in terms of accuracy.*

Limitations: *Environmental declarations from different programs (ISO 14025) may not be comparable.*
Comparison of the environmental performance of Wall and Door Protection 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 use phase as instructed under this PCR.
Full conformance with the PCR for Wall and Door Protection Products allows EPD comparability only when all stages of a life cycle have been considered. However, variations and deviations are possible". Example of variations: Different LCA software and background LCI datasets may lead to differences results for upstream or downstream of the life cycle stages declared.

1. Summary of Results

This section contains a summary of the cradle-to-grave LCIA results for all three dry erase wallcovering products (**Tables 2 – 4**) which includes the impact categories required by the PCR [1]—global warming potential (GWP), acidification potential (AP), eutrophication potential (EP), ozone depletion potential (ODP), smog potential (POCP) and fossil fuel depletion (FFD) —using the impact method required by the PCR for North America, TRACI 2.1 [2], and International markets, CML-IA Baseline [3]. The LCIA contribution results can be found in **Section 5** and the LCI results can be found in **Section 6.**

Table 1. *The life cycle modules included within the system boundary.*

Product			Construction Process		Use							End-of-life				Benefits and loads beyond the system boundary
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Raw material extraction and processing	Transport to manufacturer	Manufacturing	Transport	Construction - installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstruction demolition	Transport	Waste processing	Disposal	Reuse, recovery and/or recycling potential
X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	MND

X = Module Included | MND = Module Not Declared

Table 2. *Summary results of the JR-60 Dry Erase Wallcovering environmental impact per functional unit (one m^2 of installed product with a RSL of 10yrs in a building with an ESL of 75yrs) reported by life cycle module.*

Impact Category (units)	A1	A2	A3	A4	A5	B2	B4	C2	C4
TRACI 2.1									
Global Climate Change - (kg CO_2 eq)	1.48	$6.11x10^{-2}$	0.387	0.164	0.239	15.2	15.1	$3.42x10^{-3}$	$1.93x10^{-3}$
Smog Formation – (kg O_3 eq)	$8.20x10^{-2}$	$6.79x10^{-3}$	$1.49x10^{-2}$	$1.95x10^{-2}$	$1.38x10^{-2}$	0.937	0.894	$3.83x10^{-4}$	$4.66x10^{-4}$
Acidification – (kg SO_2 eq)	$6.47x10^{-3}$	$2.75x10^{-4}$	$1.09x10^{-3}$	$8.13x10^{-4}$	$9.57x10^{-4}$	$5.93x10^{-2}$	$6.24x10^{-2}$	$1.53x10^{-5}$	$1.72x10^{-5}$
Eutrophication – (kg N eq)	$6.23x10^{-3}$	$6.40x10^{-5}$	$1.27x10^{-3}$	$1.79x10^{-4}$	$8.73x10^{-4}$	$7.58x10^{-2}$	$5.60x10^{-2}$	$3.58x10^{-6}$	$3.08x10^{-6}$
Ozone Depletion – (kg CFC-11 eq)	$1.03x10^{-6}$	$1.49x10^{-8}$	$1.75x10^{-7}$	$4.00x10^{-8}$	$1.39x10^{-7}$	$4.00x10^{-6}$	$9.00x10^{-6}$	$8.33x10^{-10}$	$1.01x10^{-9}$
Fossil Fuel Depletion – (MJ surplus, LHV)	3.46	0.135	0.674	0.362	0.517	54.0	33.5	$7.53x10^{-3}$	$9.39x10^{-3}$
CML-IA Baseline									
Climate Change – (kg CO_2 eq)	1.50	$6.12x10^{-2}$	0.390	0.165	0.243	15.4	15.3	$3.42x10^{-3}$	$1.93x10^{-3}$
Photochemical Oxidation - (kg C_2H_4 eq)	$3.11x10^{-4}$	$7.77x10^{-6}$	$6.56x10^{-5}$	$2.26x10^{-5}$	$4.75x10^{-5}$	$6.19x10^{-3}$	$2.96x10^{-3}$	$4.35x10^{-7}$	$4.82x10^{-7}$
Acidification – (kg SO_2 eq)	$6.12x10^{-3}$	$2.39x10^{-4}$	$1.03x10^{-3}$	$6.94x10^{-4}$	$8.97x10^{-4}$	$5.75x10^{-2}$	$5.84x10^{-2}$	$1.31x10^{-5}$	$1.42x10^{-5}$
Eutrophication – (kg PO_4 eq)	$3.07x10^{-3}$	$5.43x10^{-5}$	$6.10x10^{-4}$	$1.55x10^{-4}$	$4.43x10^{-4}$	$2.74x10^{-2}$	$2.81x10^{-2}$	$3.04x10^{-6}$	$3.15x10^{-6}$
Ozone Depletion – (kg CFC-11 eq)	$8.70x10^{-7}$	$1.12x10^{-8}$	$1.31x10^{-7}$	$3.01x10^{-8}$	$1.15x10^{-7}$	$3.88x10^{-6}$	$7.46x10^{-6}$	$6.26x10^{-10}$	$7.56x10^{-10}$
Depletion of Abiotic Resource Fossil Fuel - (MJ, LHV)	27.5	0.920	5.25	2.47	4.03	401	261	$5.15x10^{-2}$	$6.26x10^{-2}$

Table 3. *Summary results of the MR-60 Dry Erase Wallcovering environmental impact per functional unit (one m^2 of installed product with a RSL of 10yrs in a building with an ESL of 75yrs) reported by life cycle module.*

Impact Category (units)	A1	A2	A3	A4	A5	B2	B4	C2	C4
TRACI 2.1									
Global Climate Change - (kg CO_2 eq)	1.15	$6.39x10^{-2}$	0.387	0.121	0.199	15.2	9.62	$2.44x10^{-3}$	$1.38x10^{-3}$
Smog Formation – (kg O_3 eq)	$6.44x10^{-2}$	$7.12x10^{-3}$	$1.49x10^{-2}$	$1.72x10^{-2}$	$1.17x10^{-2}$	0.937	0.634	$2.75x10^{-4}$	$3.35x10^{-4}$
Acidification – (kg SO_2 eq)	$5.17x10^{-3}$	$2.87x10^{-4}$	$1.09x10^{-3}$	$7.53x10^{-4}$	$8.13x10^{-4}$	$5.93x10^{-2}$	$4.39x10^{-2}$	$1.09x10^{-5}$	$1.22x10^{-5}$
Eutrophication – (kg N eq)	$5.20x10^{-3}$	$6.70x10^{-5}$	$1.27x10^{-3}$	$1.32x10^{-4}$	$7.65x10^{-4}$	$7.58x10^{-2}$	$4.79x10^{-2}$	$2.56x10^{-6}$	$2.20x10^{-6}$
Ozone Depletion – (kg CFC-11 eq)	$8.94x10^{-7}$	$1.56x10^{-8}$	$1.75x10^{-7}$	$2.92x10^{-8}$	$1.24x10^{-7}$	$4.00x10^{-6}$	$7.96x10^{-6}$	$5.95x10^{-10}$	$7.19x10^{-10}$
Fossil Fuel Depletion – (MJ surplus, LHV)	2.66	0.141	0.674	0.264	0.420	54.0	3.74	$5.38x10^{-3}$	$6.71x10^{-3}$
CML-IA Baseline									
Climate Change – (kg CO_2 eq)	1.16	$6.40x10^{-2}$	0.390	0.121	0.203	15.4	9.69	$2.44x10^{-3}$	$1.38x10^{-3}$
Photochemical Oxidation - (kg C_2H_4 eq)	$2.51x10^{-4}$	$8.13x10^{-6}$	$6.56x10^{-5}$	$2.04x10^{-5}$	$3.99x10^{-5}$	$6.19x10^{-3}$	$1.98x10^{-3}$	$3.10x10^{-7}$	$3.44x10^{-7}$
Acidification – (kg SO_2 eq)	$4.88x10^{-3}$	$2.39x10^{-4}$	$1.03x10^{-3}$	$6.70x10^{-4}$	$7.65x10^{-4}$	$5.75x10^{-2}$	$4.02x10^{-2}$	$9.32x10^{-6}$	$1.01x10^{-5}$
Eutrophication – (kg PO_4 eq)	$2.57x10^{-3}$	$5.68x10^{-5}$	$6.10x10^{-4}$	$1.32x10^{-4}$	$3.83x10^{-4}$	$2.74x10^{-2}$	$2.36x10^{-2}$	$2.17x10^{-6}$	$2.25x10^{-6}$
Ozone Depletion – (kg CFC-11 eq)	$7.40x10^{-7}$	$1.17x10^{-8}$	$1.31x10^{-7}$	$2.20x10^{-8}$	$1.00x10^{-7}$	$3.88x10^{-6}$	$6.47x10^{-6}$	$4.47x10^{-10}$	$5.40x10^{-10}$
Depletion of Abiotic Resources, Fossil Fuel - (MJ, LHV)	21.2	0.963	5.25	1.80	3.27	401	59.7	$3.68x10^{-2}$	$4.46x10^{-2}$

Table 4. *Summary results of the EZ-50 Dry Erase Wallcovering environmental impact per functional unit (one m^2 of installed product with a RSL of 10yrs in a building with an ESL of 75yrs) reported by life cycle module.*

Impact Category (units)	A1	A2	A3	A4	A5	B2	B4	C2	C4
TRACI 2.1									
Global Climate Change - (kg CO_2 eq)	1.11	$6.39x10^{-2}$	0.403	0.116	0.197	15.2	9.38	$2.44x10^{-3}$	$1.38x10^{-3}$
Smog Formation – (kg O_3 eq)	$6.15x10^{-2}$	$7.12x10^{-3}$	$1.62x10^{-2}$	$1.52x10^{-2}$	$1.13x10^{-2}$	0.937	0.606	$2.75x10^{-4}$	$3.35x10^{-4}$
Acidification – (kg SO_2 eq)	$4.88x10^{-3}$	$2.87x10^{-4}$	$1.17x10^{-3}$	$6.58x10^{-4}$	$7.89x10^{-4}$	$5.93x10^{-2}$	$4.17x10^{-2}$	$1.09x10^{-5}$	$1.22x10^{-5}$
Eutrophication – (kg N eq)	$4.65x10^{-3}$	$6.70x10^{-5}$	$1.36x10^{-3}$	$1.20x10^{-4}$	$7.65x10^{-4}$	$7.58x10^{-2}$	$4.58x10^{-2}$	$2.56x10^{-6}$	$2.20x10^{-6}$
Ozone Depletion – (kg CFC-11 eq)	$8.22x10^{-7}$	$1.56x10^{-8}$	$1.77x10^{-7}$	$2.82x10^{-8}$	$1.13x10^{-7}$	$4.00x10^{-6}$	$7.33x10^{-6}$	$5.95x10^{-10}$	$7.19x10^{-10}$
Fossil Fuel Depletion – (MJ surplus, LHV)	2.58	0.141	0.700	0.255	0.409	54.0	3.14	$5.38x10^{-3}$	$6.71x10^{-3}$
CML-IA Baseline									
Climate Change – (kg CO_2 eq)	1.12	$6.40x10^{-2}$	0.407	0.116	0.200	15.4	9.45	$2.44x10^{-3}$	$1.38x10^{-3}$
Photochemical Oxidation - (kg C_2H_4 eq)	$2.39x10^{-4}$	$8.13x10^{-6}$	$6.94x10^{-5}$	$1.79x10^{-5}$	$3.92x10^{-5}$	$6.19x10^{-3}$	$1.93x10^{-3}$	$3.10x10^{-7}$	$3.44x10^{-7}$
Acidification – (kg SO_2 eq)	$4.62x10^{-3}$	$2.39x10^{-4}$	$1.10x10^{-3}$	$5.74x10^{-4}$	$7.42x10^{-4}$	$5.75x10^{-2}$	$3.81x10^{-2}$	$9.32x10^{-6}$	$1.01x10^{-5}$
Eutrophication – (kg PO_4 eq)	$2.30x10^{-3}$	$5.68x10^{-5}$	$6.58x10^{-4}$	$1.15x10^{-4}$	$3.83x10^{-4}$	$2.74x10^{-2}$	$2.25x10^{-2}$	$2.17x10^{-6}$	$2.25x10^{-6}$
Ozone Depletion – (kg CFC-11 eq)	$6.85x10^{-7}$	$1.17x10^{-8}$	$1.32x10^{-7}$	$2.12x10^{-8}$	$9.21x10^{-8}$	$3.88x10^{-6}$	$5.99x10^{-6}$	$4.47x10^{-10}$	$5.40x10^{-10}$
Depletion of Abiotic Resources, Fossil Fuel - (MJ, LHV)	20.5	0.963	5.45	1.74	3.19	401	55.0	$3.68x10^{-2}$	$4.46x10^{-2}$

2. Declaration Owner and Product Description

2.1 Koroseal Interior Products

Koroseal Interior Products, referred to here on out as Koroseal, is a commercially distributed wallcovering and wall protection company providing services to largely hospitality industries, schools, and hospitals.

2.2 Product Description

Dry Erase Wallcovering Products

Three different types of Koroseal Dry Erase Wallcoverings (JustRite-60, MatteRite-60, and EZRite-50) are assessed. They are manufactured by laminating a PVDF clear film to a vinyl film, which is then laminated to either a woven or non-woven backing.

2.3 FURTHER INFORMATION

Further information on the product can be found on the manufacturer's website at https://koroseal.com/.

3. Scope of the Study

3.1 FUNCTIONS OF THE PRODUCT SYSTEM

The three dry erase wallcovering products serve the primary function as a dry erase board, but are also decorative. Based on the PCR [1], a functional unit (FU) of one square meter of installed product with a reference service life (RSL) of 10 years is used; the RSL is based on the products' warranty which was provided by the client. Given that an estimated service life (ESL) for the building in which the wallcoverings are installed is 75yrs, 6.5 product replacements are required over the lifetime of the product. The reference flow for the modeling of this system is also 1 square meter of wallcovering product. The FU properties, reference flow, RSL, and ESL are shown in **Table 5**. The technical characteristics of the product are shown in **Table 6**.

Table 5. *The functional unit, reference flow, product reference service life, and building estimated service life used within this EPD.*

Parameter	Value	Unit
Functional Unit	1	Square meter
Reference Flow	1	Square meter
Mass of JR-60 Product	0.668	Kilograms/m^2
Thickness of JR-60 Product	0.559	mm
Mass of MR-60 Product	0.509	Kilograms/m^2
Thickness of MR-60 Product	0.432	mm
Mass of EZ-50 Product	0.495	Kilograms/m^2
Thickness of EZ-50 Product	0.406	mm
Reference Service Life (RSL)	10	Years
Building Estimated Service Life (ESL)	75	Years

Table 6. *The product technical characteristics and the Construction Specification Institute (CSI) Masterformat codes and the UNSPSC Code.*

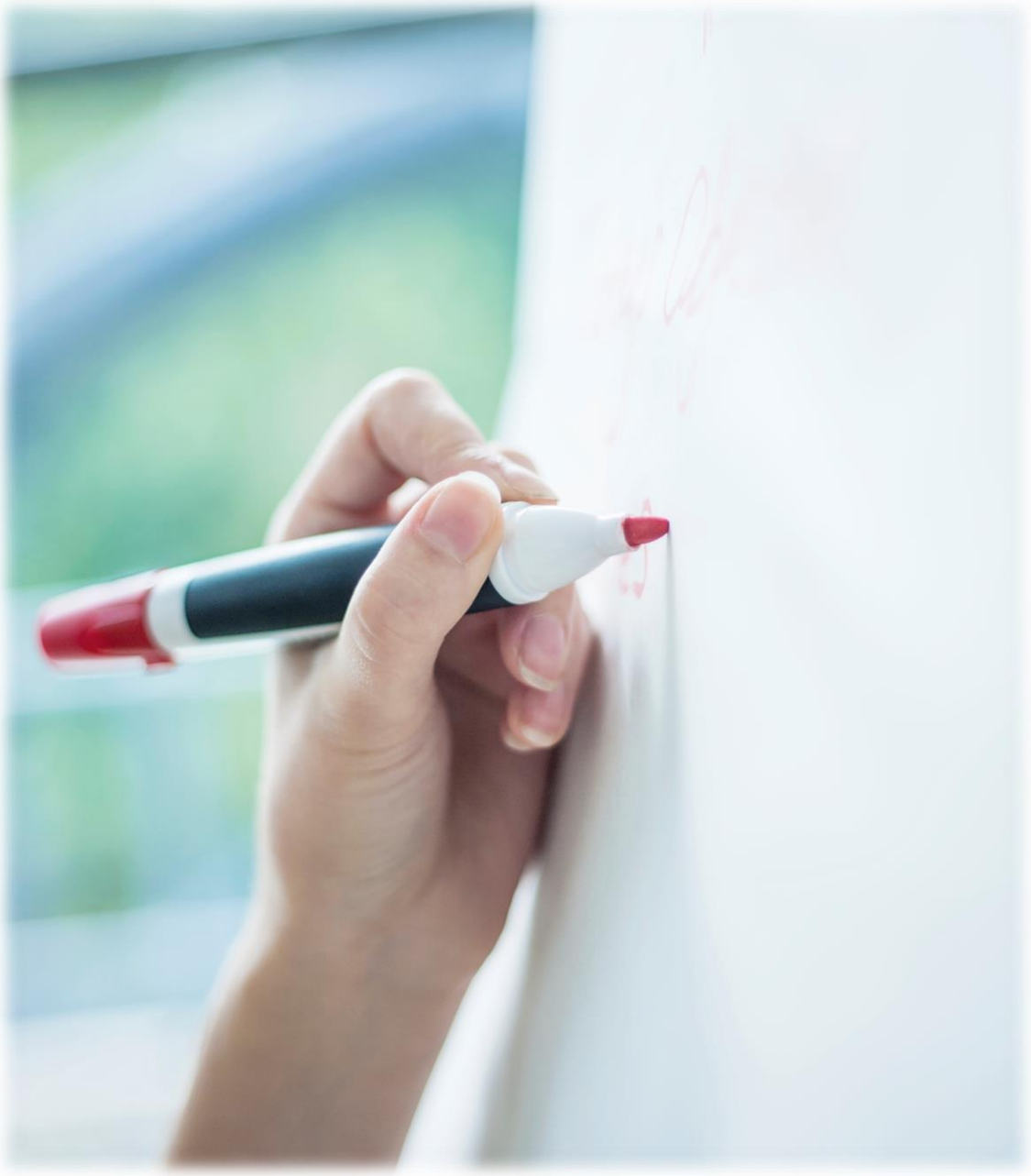
Technical Characteristic	JR-60	MR-60	EZ-50
VOC – CA Specification 01350, Standard Classroom and Office Space (Pass/Fail for Individual VOCs of Concern and Formaldehyde)	Pass	N/A	N/A
CSI Masterformat Code / UCSPSC Code	10 26 23 / 72151400		

3.2 PRODUCT MATERIAL COMPOSITION

The dry erase wallcoverings are composed of a combination of PVC film, adhesive, polyester and cotton backing, and dry erase film (**Table 7**).

Table 7. *The percent material composition of the wallcovering products.*

Raw Material	JR-60	MR-60	EZ-50
PVC Film	81%	75%	77%
Adhesive	6%	8%	8%
Polyester Backing	8%	11%	9%
Cotton Backing	2%	3%	2%
Dry Erase Film	3%	3%	3%
Total	**100%**	**100%**	**100%**



3.3 SYSTEM BOUNDARY

The system boundary includes the cradle-to-grave life cycle of the wallcovering product, which includes all inputs required and outputs generated from each life cycle module. The modules are described in **Table 8** and a flow diagram illustrating the processes involved within each life cycle module is shown below in **Figure 1**. Some modules have been excluded from this study (**Table 8**) since they aren't relevant to the life cycle of this wallcovering product**.**

Table 8. *A description of the life cycle phases included in this wallcovering product's system boundary.*

Module	Module description from the PCR	Included in System Boundary
A1	Raw Material extraction and upstream production: Includes raw material extraction and processing, as well as processing of secondary material inputs (e.g., recycled or reused materials).	X
A2	Transport to factory: Covers transport of raw materials and other inputs to the factory and internal transport.	X
A3	Manufacturing: Includes all fuels, electricity, and water used in manufacturing the product; the extraction and upstream production, transport to factory, and manufacturing of product packaging; transport and treatment of all waste generated at the manufacturing facility.	X
A4	Transport to the building site: Includes transport from the manufacturing facility to a central or intermediate storage site (if relevant) and transport to the construction site.	X
A5	Installation: Covers installation of the product into any type of construction works. This includes any wastage of the product that occurs during installation (including the A1 to A4 inputs required for that wastage), the transport and treatment of product packaging waste and the manufacture and transportation of ancillary materials, as well as energy or freshwater consumed, to install the product at the construction site.	X
B1	Use stage: Accounts for any required inputs to use the product and any volatile organic compounds (VOCs) emitted during the building ESL. While the dry erase wallcoverings require dry erase markers for use, due to the uncertainty in both the type and amount of dry erase markers used over a building's ESL, these impacts are not assessed. The VOC emission test results for the JR-60 product is reported in **Table 4.** While the other dry erase products were not tested, the PCR recommends reporting a value of zero for VOC emissions when unknown. The impact from this module is reported zero for all three products.	X
B2	Maintenance: Includes any maintenance required to keep the product operational over the 75yr building ESL.	X
B4	Replacement: If the product is replaced during the RSL, the amount of inputs required including all waste generated, transport, and treatment of waste of the replacement products. This wallcovering product requires 6.5 replacements over the building's ESL.	X
B3, B5	Repair and Refurbishment: Any inputs required to repair or refurbish the product. Thus product does not require any repair or refurbishment during the building ESL, so the impact associated with these modules is zero.	X
B6 – B7	Operational energy and water use: Any energy or water required to operate any integrated technical systems required to use the product. This product does not require any operational energy or water use, so the impact associated with these modules is zero.	X
C1	Deconstruction/demolition: Includes dismantling or demolition, of the construction product from the construction works and the energy use for this, including initial on-site sorting of the materials. There are no additional inputs required to deconstruct this product, so the impact associated with this module is zero.	X
C2	Transport to waste processing or disposal: Includes the transportation of the discarded construction product as part of the waste processing, for example to a recycling site and transportation of waste, to final disposal.	X
C3	Waste processing for generation of secondary materials (i.e. recycling): Includes the inputs required for recycling impacts from recycling. However, this product is not assumed to be recycled at end-of-life so the impact associated with this module is zero.	X
C4	Disposal of waste: Includes physical pre-treatment and management of the disposal site, including provision and transport of all materials, products and related energy and water use	X
D	Optional supplementary information about the potential net benefits from reuse, recycling and energy recovery beyond the system boundary of the studied product system.	MND

x = Module Included | MND = Module Not Declared

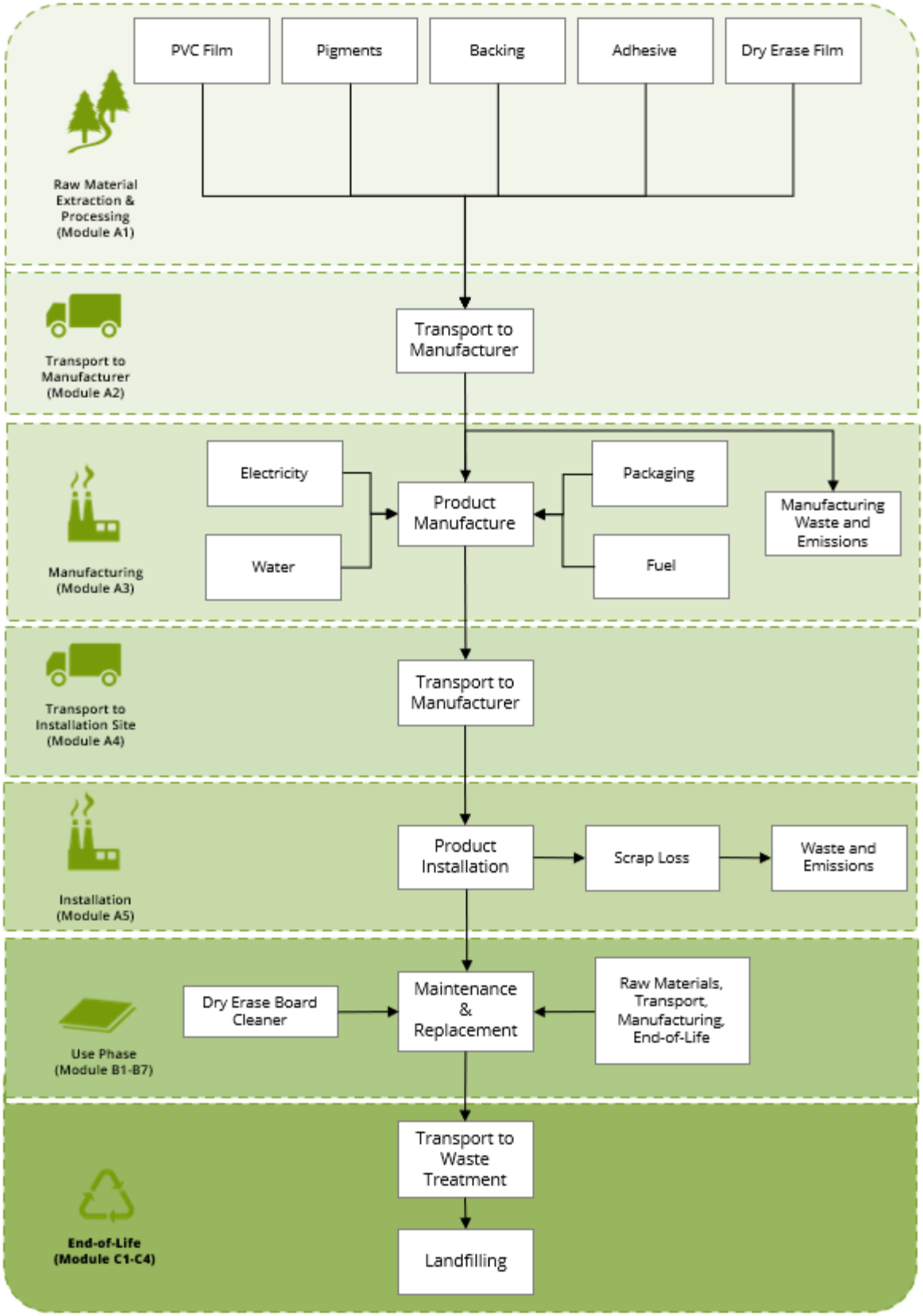


Figure 1. *Flow Diagram for the life cycle of the wallcovering product.*

4. Technical Information and Scenarios

4.1 LIFE CYCLE MODULES

(A1- A3) Raw Material Extraction, Transport, & Manufacturing

These three modules include the inputs and outputs necessary to produce the raw materials (**Table 7**), transport these raw materials to the manufacturing facility (located in Louisville, Kentucky), and then process the raw materials into the wallcovering product. The manufacturing module also includes the production of the product packaging. The A2 module transport parameters are shown in **Table 10.**

Manufacturing of the wallcovering product includes the following steps:

- Pigments are mixed
- Backing is assembled
- Backing and laminate are attached using heat and adhesive
- Embossing and cooling
- Product is packaged

These processing steps require electricity, freshwater, natural gas, propane, and packaging (cardboard box, paper core, and a label). The cotton backing used within the product contains biogenic carbon, which is shown in **Table 9**. Electricity is modeled using the NERC SERC regional grid mix [4]. Manufacturing also generates a small amount of air emissions and hazardous waste (waste oil and ink). Hazardous waste is assumed to be incinerated. Transport of waste is based on the EPA WARM model [5], which assumes a distance of 20 miles (~32km) from point of generation of waste to a disposal facility (e.g., landfill, recycling or incineration); transport is assumed to be done by diesel truck and utilizes the same transport parameters shown in **Table 10.** No substances required to be reported as hazardous are associated with the production of this product.

The type, mass, mode of transport, and distance raw materials were transported were provided by Koroseal. The quantity of manufacturing facility inputs and outputs were also provided by Koroseal.

Table 9. *The biogenic carbon content of the cotton backing used in each of the dry erase wallcovering products per square meter of installed wallcovering product.*

Material	Biogenic Carbon Content (kg CO_2 eq)
Product - Cotton Backing*	2.09×10^{-2}

* The cotton backing is estimated to contain 1.54 kg CO_2eq/kg cotton fiber, which is based on Hon (1996) [6]

Table 10. *The type, fuel utilization, and capacity utilization of truck transport used in all modules.*

Transport Specifications	Value
Truck - EURO 4, 16-32 MT Freight Lorry	
Diesel Fuel Utilization (kg/tkm)	3.67×10^{-2}
Capacity Utilization (%)	37%
A2 – Total Truck Transport	
JR-60 Raw Material Transport Distance – Truck (tkm)	0.375
MR-60 Raw Material Transport Distance – Truck (tkm)	0.392
EZ-50 Raw Material Transport Distance – Truck (tkm)	0.392

(A4) Transport to Installation Site

This module includes all transport from the manufacturing facility to the site of installation. Koroseal distributes its wallcovering product domestically, within the U.S., and internationally. For domestic distribution, the total sales of the wallcovering product to each U.S. state, and for international distribution, the country were provided. The capacity and fuel utilization of the truck modeled in this module are the same as the transport used in the A1-A3 modules (**Table 10**), while the capacity and fuel utilization of the ship transport is shown in **Table 11**. The weighted average distance the wallcovering product is transported to the installation site is shown in **(Table 11).**

Table 11. *The weighted average distance that the wallcovering product is transported to the site of installation.*

Type of Transport	JR-60	MR-60	EZ-50
43,000 Metric Ton Sea Container Ship			
Heavy Fuel Oil Utilization	$2.52x10^{-3}$	$2.52x10^{-3}$	$2.52x10^{-3}$
Capacity Utilization	70%	70%	70%
A4 - Transport Distances			
Truck (km)	1,510	1,466	1,448
Ship (km)	510	2,102	1,312

(A5) Installation

During installation 10% of the wallcovering products are lost as scrap; this value was provided by Koroseal. This module accounts for all additional inputs required and outputs generated during modules A1 – A4 to produce the extra product required to satisfy the functional unit of one square meter of installed product.

This module also accounts for the transport and waste treatment of the scrap and product packaging to a waste treatment facility. The paper core and cardboard contained within the packaging contain biogenic carbon, which is shown in **Table 12.** Transport for disposal of all manufacturing waste is based on the EPA WARM model [5], which assumes a distance of 20 miles (~32km) from point of generation of waste to a disposal facility (e.g., landfill, recycling or incineration). Waste is assumed to be transported by the same truck transport shown in **Table 10.** Product scrap is landfilled, which is based on the product waste disposal pathway required by Part A of the PCR [9] for the US; given that only 3% of the products are distributed internationally, the same product disposal pathway is used for all product scrap regardless of where it is distributed.

Waste treatment disposal pathways of packaging waste are based on more recent 2018 US EPA disposal statistics data [10], instead of the older US EPA data used by Part A of the PCR [9] for the US. Similar to product disposal, all product packaging is assumed to undergo the same disposal pathway regardless of where it is distributed to.

Installation of the product is done using hand tools following the manufacturer's recommended guidance. For the current assessment, the impacts associated with the product installation are assumed negligible and are excluded from the study using the cut-off criteria described in **Section 4.5**.

Table 12. *The biogenic carbon content of the product packaging per square meter of installed wallcovering product.*

Material	Biogenic Carbon Content (kg CO_2 eq)
Packaging – Paper Core+	$5.29x10^{-2}$
Packaging – Cardboard Box+	$6.73x10^{-2}$

+ The cellulose content of 1kg of paper products, including cardboard, are assumed to be 95% [6], which is converted to carbon using a cellulose carbon content of 43% [7, 8] and a CO_2eq using a conversion factor of 3.67.

(B2) Maintenance

This module accounts for any maintenance, including cleaning, of the products. The dry erase wallcovering products are cleaned periodically to remove dry erase markers from their surface. The material composition of a dry erase cleaner recommended by Koroseal was provided, which is comprised of a 0.1 – 2% concentration of a propylene glycol butyl ether in water. However, an Ecoinvent process for the production of this chemical was not available so the production of propylene glycol and butadiene was used instead. The quantity of cleaner was based on the density of propylene glycol

butyl ether, 0.885 kg/L, which is based on the SDS of the cleaner provided by Koroseal. An assumption of one gallon, or 3.78 liters, of dry erase cleaner consumed per year was used. Given the building's 75yr ESL, this account for 75 gallons of dry erase cleaner used during the life cycle of each of the three dry Erase wall covering products. A 2% concentration of cleaner was used for a total mass of 22 kg of cleaner consumed over the building's 75yr ESL.

(B4) Replacement

Based on warranty information provided by Koroseal and a literature review, a product lifetime of 10 years was assumed for this product. This entails 6.5 replacements of the product over the course of the 75-yr ESL. This module accounts for the impact from the A1- A5 and C1 - C4 modules when 6.5 more products are produced and disposed of at end-of-life.

(C2) Waste Transport

This module accounts for the transport of the product at its end-of-life to a waste treatment facility. Transport for disposal of all product waste is based on the EPA WARM model [5], which assumes a distance of 20 miles (~32km) from point of generation of waste to a disposal facility (e.g., landfill, recycling or incineration). Waste is assumed to be transported by the same truck transport shown in **Table 10**.

(C4) Waste Treatment

This module accounts for the impact from the treatment of all product waste, which utilizes the United States disposal pathway listed in the UL Part A PCR (100% landfilling) [9]. Given that international distribution composes ~3% of all product sales, the disposal of the wallcovering products in other countries is assumed to be the same as the US disposal pathway.

4.2 DATA SOURCES

Modeling of this LCA was conducted in openLCA v1.10.3 [11] and all datasets used were from the Ecoinvent 3.7.1 database [12]. **Table 13** below lists the individual datasets used.

Table 13. *The LCI datasets from the Ecoinvent v3.7.1 (2020) database used to model the dry erase product systems.*

Flow	Dataset
Raw Materials	
PVC Film	market for polyvinylchloride, suspension polymerised | polyvinylchloride, suspension polymerised | Cutoff, U - GLO
Adhesive – Neutral non-phthalate containing	*Proprietary data provided by the adhesive supplier*
Polyester Backing	market for textile, non woven polyester | textile, non-woven polyester | Cutoff, U - GLO
Cotton Backing	market for fibre, cotton | fibre, cotton | Cutoff, U - GLO
Pigments	market for alkyd paint, white, without solvent, in 60% solution state | alkyd paint, white, without solvent, in 60% solution state | Cutoff, U - RoW
Dry Erase Film	melamine impregnated paper production | paper, melamine impregnated | Cutoff, U - RER
All Transportation	
Truck Transport	market for transport, freight, lorry 16-32 metric ton, EURO4 | transport, freight, lorry 16-32 metric ton, EURO4 | Cutoff, U - RER
Rail Transport	market for transport, freight train | transport, freight train | Cutoff, U - US
Boat Transport	market for transport, freight, sea, container ship | transport, freight, sea, container ship | Cutoff, U - GLO
Manufacturing	
Electricity	market for electricity, medium voltage | electricity, medium voltage | Cutoff, U (US SERC, EIA 2019 Data) - US-SERC
Natural Gas*	heat production, natural gas, at industrial furnace >100kW | heat, district or industrial, natural gas | Cutoff, U (Natural Gas Combustion and Production Only) - US Production - Europe without Switzerland
Propane	market for propane, burned in building machine | propane, burned in building machine | Cutoff, U - GLO
Product Packaging	
Plastic Bag	packaging film production, low density polyethylene | packaging film, low density polyethylene | Cutoff, U - RER
Paper core	market for core board | core board | Cutoff, U - GLO
Label	packaging film production, low density polyethylene | packaging film, low density polyethylene | Cutoff, U - RER
Maintenance	
Dry Erase Cleaner	propylene glycol production, liquid | propylene glycol, liquid | Cutoff, U - RoW
	butadiene production | butadiene | Cutoff, U - RoW
Waste Treatment	
Treatment Hazardous Waste	market for hazardous waste, for incineration | hazardous waste, for incineration | Cutoff, U - Europe without Switzerland
Landfilling of Paper Material	treatment of waste paperboard, sanitary landfill | waste paperboard | Cutoff, U - CH
Incineration of Paper Material	treatment of waste paperboard, municipal incineration | waste paperboard | Cutoff, U - CH
Incineration of Plastic Material	treatment of waste polyethylene, municipal incineration | waste polyethylene | Cutoff, U - CH

*Utilizes a custom process built using Ecoinvent 3.7.1 [12] background datasets that is based on the average annual energy content of natural gas consumed within Kentucky in 2019 [13]

4.3 DATA QUALITY

The data quality assessment is discussed in **Table 14** below for each of the data quality parameters. No data gaps were allowed which were expected to significantly affect the outcome of the impact indicator or LCI resource results.

Table 14. *Data quality assessment of the Koroseal wallcovering product system.*

Data Quality Parameter	Data Quality Discussion
Time-Related Coverage: Age of data and the minimum length of time over which data is collected	The most recent available data are used, based on other considerations such as data quality and similarity to the actual operations. Typically, these data are less than 10 years old (typically 2015 or more recent). All of the data used represented an average of at least one year's worth of data collection. Manufacturer-supplied data (primary data) are based on annual production for 2019.
Geographical Coverage: Geographical area from which data for unit processes is collected to satisfy the goal of the study	The data used in the analysis provide the best possible representation available with current data. Electricity use for product manufacture is modeled using representative data for regional power mixes from the Ecoinvent LCI database, but the grid mixes are based on EIA data for the year 2019. Surrogate data used in the assessment are representative of global or European operations. Data representative of global operations are considered sufficiently similar to actual processes. Data representing product and packaging disposal are based on regional statistics.
Technology Coverage: Specific technology or technology mix	For the most part, data are representative of the actual technologies used for processing, transportation, and manufacturing operations.
Precision: Measure of the variability of the data values for each data expressed	Precision of results are not quantified due to a lack of data. Data collected for operations were typically averaged for one or more years and over multiple operations, which is expected to reduce the variability of results.
Completeness: Percentage of flow that is measured or estimated	The LCA model included all known mass and energy flows for production of the wallcovering product. In some instances, surrogate data used to represent upstream and downstream operations may be missing some data which is propagated in the model. No known processes or activities contributing to more than 1% of the total environmental impact for each indicator are excluded.
Representativeness: Qualitative assessment of the degree to which the data set reflects the true population of interest	Data used in the assessment represent typical or average processes as currently reported from multiple data sources and are therefore generally representative of the range of actual processes and technologies for production of these materials. Considerable deviation may exist among actual processes on a site-specific basis; however, such a determination would require detailed data collection throughout the supply chain back to resource extraction.
Consistency: Qualitative assessment of whether the study methodology is applied uniformly to the various components of the analysis	The consistency of the assessment is considered to be high. All secondary inventory data are from the Ecoinvent v3.7.1 database and are of similar quality and age.
Reproducibility: Qualitative assessment of the extent to which information about the methodology and data values would allow an independent practitioner to reproduce the results reported in the study	Based on the description of data and assumptions used, this assessment would be reproducible by other practitioners. All assumptions, models, and data sources are documented.
Sources of the Data: Description of all primary and secondary data sources	Data representing quantity and type of raw materials, mode and distance of raw material transport, manufacturing inputs used were provided by Koroseal. Manufacturing inputs represent an annual average and are considered of high quality due to the length of time over which these data are collected (one year), as compared to a snapshot that may not accurately reflect fluctuations in production. The Ecoinvent v3.7.1 database is used for secondary LCI datasets.
Uncertainty of the Information: Uncertainty related to data, models, and assumptions	Uncertainty related to materials in this product system is low. Upstream operations are modeled using background data and the study relied upon the use of existing representative datasets. These datasets contain relatively recent data (<10 years) and are generally geographically representative. Uncertainty related to the impact assessment methods used in the study are high. The impact assessment method required by the PCR includes impact potentials, which lack characterization of providing and receiving environments or tipping points.

4.4 ALLOCATION

This study follows the allocation guidelines of ISO 14044 [14] and allocation rules specified in the PCR and minimized the use of allocation wherever possible.

Mass allocation was deemed the most accurate and reproducible way of calculating the energy and material requirements for the manufacture of this wallcovering product. Primary data for resource use (e.g., electricity, natural gas, water), waste and emissions released, are allocated on a mass-basis as a fraction of total annual production.

Transportation was allocated based on the mass and distance the material transported.

4.5 CUT-OFF RULES

The cut-off criteria for including or excluding materials, energy, and emissions data from the study are in accordance with the PCR and are listed below.

- All inputs and outputs to a unit process are included in the LCA calculation for which data are available. Any data gaps are filled with representative data. Assumptions used for filling data gaps are documented in the LCA report.
- Where there is a data gap or insufficient data, criteria for exclusion of inputs and outputs is 1% of primary energy usage (renewable and non-renewable energy) and 1% on a mass basis for the specific unit process. The maximum criteria for exclusion of inputs and outputs is 5% of primary energy usage and mass across all modules included in the LCA.
- If a flow meets the above criteria for exclusion but is considered to have a significant potential environmental impact, it is included.
- No excluded processes were thought to have any significant impact on the total life cycle impact of this product.

According to the PCR, processes contributing greater than 1% of the total environmental impact indicator for each impact are included in the inventory. No data gaps were allowed which were expected to significantly affect the outcome of the indicator results. No known flows are deliberately excluded from this EPD.

4.6 SUMMARY OF ASSUMPTIONS

The assessment relied on several assumptions, described below:

- The production of propylene glycol and butadiene was assumed to be a suitable proxy and were in place of the propylene glycol butyl ether cleaner, as the production of this chemical does not exist in Ecoinvent. The proxies used are shown in **Table 13**.
- A quantity of 1 gal of cleaner per year was assumed.
- All truck and ship transport is assumed to be done by the vehicles with transportation specification listed in **Tables 10** and **11**.
- The transport distance of all waste from the point of generation to a treatment facility is based on the EPA WARM model [5] assumption of 20 miles (~32 km).
- The product is assumed to be landfilled without energy recovery from landfill gas at EOL.
- All hazardous waste is assumed to be incinerated without energy recovery.
- The average cellulose content of paper products assessed by Sahin and Arslan, 2008 [7], and the average carbon content of cellulose, hemi cellulose, and lignin assessed by Hon 1996 [6] and Cagnon et al., 2009 [8] were used to determine the biogenic carbon content of the paper core packaging and cotton woven backing materials, respectively.

4.7 PERIOD UNDER REVIEW

The period of review is January 1, 2019 through December 31, 2019

4.8 COMPARABILITY

The PCR this EPD was based on was not written to support comparative assertions. EPDs based on different PCRs, or different calculation models, may not be comparable. When attempting to compare EPDs or life cycle impacts of products from different companies, the user should be aware of the uncertainty in the final results, due to and not limited to, the practitioner's assumptions, the source of the data used in the study, and the specifics of the product modeled.

5. LCA Results

The LCIA results are presented in **Tables 15 - 17** below using the TRACI 2.1 [2] and CML-IA [3] characterization methodologies, as required by the PCR for North America and European markets: global warming (TRACI 2.1 IPCC AR4 and CML-IA Baseline IPCC AR5), acidification, eutrophication, ozone depletion, smog formation, and fossil fuel depletion. These six impact 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. It should be noted that the indicators prescribed by the PCR do not represent all categories of potential environmental and human health impact associated with the life cycle of the product, and this represents a general limitation of the LCA study. Additionally, these indicators have no "environmental relevance," as defined in the ISO-14044 §4.4.2.2.2, 4.4.2.2.4, and 4.4.5, with the exception of the "Global Warming Potential" indicator, which has low environmental relevance. That is, these "potential" results may or may not have any relationship to actual impacts occurring.

Any comparison of EPDs shall be subject to the requirements of the PCR [1]. 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.

The PCR requires the calculation of biogenic carbon emissions and removals. While the product packaging includes a small amount biogenic carbon, this carbon is assumed to be released at EOL or after landfilling. In addition, neither the TRACI 2.1 nor the CML-IA baseline characterization methodologies account for biogenic carbon uptake or biomass CO_2 emissions.

Note that the impact from modules B1, B3, B5, B6, and B7 are zero and are therefore not displayed in **Tables 15 - 17**.

Table 15. JR-60 LCIA Results. *The life cycle impact indicator category results for one square meter of installed JR-60 wallcovering product with an RSL of 10yrs in a building with an ESL of 75yrs. All values are rounded to three significant digits. Percentages in the second row of each impact category show the percent contribution of each life cycle module to the total of each impact category.*

Impact Category (units)	A1	A2	A3	A4	A5	B2	B4	C2	C4
TRACI 2.1									
Global Climate Change - (kg CO_2 eq)	1.48	$6.11x10^{-2}$	0.387	0.164	0.239	15.2	15.1	$3.42x10^{-3}$	$1.93x10^{-3}$
	5%	0%	1%	1%	1%	47%	46%	0%	0%
Smog Formation - (kg O_3 eq)	$8.20x10^{-2}$	$6.79x10^{-3}$	$1.49x10^{-2}$	$1.95x10^{-2}$	$1.38x10^{-2}$	0.937	0.894	$3.83x10^{-4}$	$4.66x10^{-4}$
	4%	0%	1%	1%	1%	48%	45%	0%	0%
Acidification - (kg SO_2 eq)	$6.47x10^{-3}$	$2.75x10^{-4}$	$1.09x10^{-3}$	$8.13x10^{-4}$	$9.57x10^{-4}$	$5.93x10^{-2}$	$6.24x10^{-2}$	$1.53x10^{-5}$	$1.72x10^{-5}$
	5%	0%	1%	1%	1%	45%	48%	0%	0%
Eutrophication - (kg N eq)	$6.23x10^{-3}$	$6.40x10^{-5}$	$1.27x10^{-3}$	$1.79x10^{-4}$	$8.73x10^{-4}$	$7.58x10^{-2}$	$5.60x10^{-2}$	$3.58x10^{-6}$	$3.08x10^{-6}$
	4%	0%	1%	0%	1%	54%	40%	0%	0%
Ozone Depletion - (kg CFC-11 eq)	$1.03x10^{-6}$	$1.49x10^{-8}$	$1.75x10^{-7}$	$4.00x10^{-8}$	$1.39x10^{-7}$	$4.00x10^{-6}$	$9.00x10^{-6}$	$8.33x10^{-10}$	$1.01x10^{-9}$
	7%	0%	1%	0%	1%	28%	63%	0%	0%
Fossil Fuel Depletion - (MJ surplus, LHV)	3.46	0.135	0.674	0.362	0.517	54.0	33.5	$7.53x10^{-3}$	$9.39x10^{-3}$
	4%	0%	1%	0%	1%	58%	36%	0%	0%
CML-IA Baseline									
Climate Change - (kg CO_2 eq)	1.50	$6.12x10^{-2}$	0.390	0.165	0.243	15.4	15.3	$3.42x10^{-3}$	$1.93x10^{-3}$
	5%	0%	1%	0%	1%	47%	46%	0%	0%
Photochemical Oxidation - (kg C_2H_4 eq)	$3.11x10^{-4}$	$7.77x10^{-6}$	$6.56x10^{-5}$	$2.26x10^{-5}$	$4.75x10^{-5}$	$6.19x10^{-3}$	$2.96x10^{-3}$	$4.35x10^{-7}$	$4.82x10^{-7}$
	3%	0%	1%	0%	0%	64%	31%	0%	0%
Acidification - (kg SO_2 eq)	$6.12x10^{-3}$	$2.39x10^{-4}$	$1.03x10^{-3}$	$6.94x10^{-4}$	$8.97x10^{-4}$	$5.75x10^{-2}$	$5.84x10^{-2}$	$1.31x10^{-5}$	$1.42x10^{-5}$
	5%	0%	1%	1%	1%	46%	47%	0%	0%
Eutrophication - (kg PO_4 eq)	$3.07x10^{-3}$	$5.43x10^{-5}$	$6.10x10^{-4}$	$1.55x10^{-4}$	$4.43x10^{-4}$	$2.74x10^{-2}$	$2.81x10^{-2}$	$3.04x10^{-6}$	$3.15x10^{-6}$
	5%	0%	1%	0%	1%	46%	47%	0%	0%
Ozone Depletion - (kg CFC-11 eq)	$8.70x10^{-7}$	$1.12x10^{-8}$	$1.31x10^{-7}$	$3.01x10^{-8}$	$1.15x10^{-7}$	$3.88x10^{-6}$	$7.46x10^{-6}$	$6.26x10^{-10}$	$7.56x10^{-10}$
	7%	0%	1%	0%	1%	31%	60%	0%	0%
Depletion of Abiotic Resources, Fossil Fuel - (MJ, LHV)	27.5	0.920	5.25	2.47	4.03	401	261	$5.15x10^{-2}$	$6.26x10^{-2}$
	4%	0%	1%	0%	1%	57%	37%	0%	0%

Table 16. MR-60 LCIA Results. *The life cycle impact indicator category results for one square meter of installed MR-60 wallcovering product with an RSL of 10yrs in a building with an ESL of 75yrs. All values are rounded to three significant digits. Percentages in the second row of each impact category show the percent contribution of each life cycle module to the total of each impact category.*

Impact Category (units)	A1	A2	A3	A4	A5	B2	B4	C2	C4
TRACI 2.1									
Global Climate Change - (kg CO_2 eq)	1.15	$6.39x10^{-2}$	0.387	0.121	0.199	15.2	9.62	$2.44x10^{-3}$	$1.38x10^{-3}$
	4%	0%	1%	0%	1%	57%	36%	0%	0%
Smog Formation - (kg O_3 eq)	$6.44x10^{-2}$	$7.12x10^{-3}$	$1.49x10^{-2}$	$1.72x10^{-2}$	$1.17x10^{-2}$	0.937	0.634	$2.75x10^{-4}$	$3.35x10^{-4}$
	4%	0%	1%	1%	1%	56%	38%	0%	0%
Acidification - (kg SO_2 eq)	$5.17x10^{-3}$	$2.87x10^{-4}$	$1.09x10^{-3}$	$7.53x10^{-4}$	$8.13x10^{-4}$	$5.93x10^{-2}$	$4.39x10^{-2}$	$1.09x10^{-5}$	$1.22x10^{-5}$
	5%	0%	1%	1%	1%	53%	39%	0%	0%
Eutrophication - (kg N eq)	$5.20x10^{-3}$	$6.70x10^{-5}$	$1.27x10^{-3}$	$1.32x10^{-4}$	$7.65x10^{-4}$	$7.58x10^{-2}$	$4.79x10^{-2}$	$2.56x10^{-6}$	$2.20x10^{-6}$
	4%	0%	1%	0%	1%	58%	37%	0%	0%
Ozone Depletion - (kg CFC-11 eq)	$8.94x10^{-7}$	$1.56x10^{-8}$	$1.75x10^{-7}$	$2.92x10^{-8}$	$1.24x10^{-7}$	$4.00x10^{-6}$	$7.96x10^{-6}$	$5.95x10^{-10}$	$7.19x10^{-10}$
	7%	0%	1%	0%	1%	30%	60%	0%	0%
Fossil Fuel Depletion - (MJ surplus, LHV)	2.66	0.141	0.674	0.264	0.420	54.0	3.74	$5.38x10^{-3}$	$6.71x10^{-3}$
	4%	0%	1%	0%	1%	87%	6%	0%	0%
CML-IA Baseline									
Climate Change - (kg CO_2 eq)	1.16	$6.40x10^{-2}$	0.390	0.121	0.203	15.4	9.69	$2.44x10^{-3}$	$1.38x10^{-3}$
	4%	0%	1%	0%	1%	57%	36%	0%	0%
Photochemical Oxidation - (kg C_2H_4 eq)	$2.51x10^{-4}$	$8.13x10^{-6}$	$6.56x10^{-5}$	$2.04x10^{-5}$	$3.99x10^{-5}$	$6.19x10^{-3}$	$1.98x10^{-3}$	$3.10x10^{-7}$	$3.44x10^{-7}$
	3%	0%	1%	0%	0%	72%	23%	0%	0%
Acidification - (kg SO_2 eq)	$4.88x10^{-3}$	$2.39x10^{-4}$	$1.03x10^{-3}$	$6.70x10^{-4}$	$7.65x10^{-4}$	$5.75x10^{-2}$	$4.02x10^{-2}$	$9.32x10^{-6}$	$1.01x10^{-5}$
	5%	0%	1%	1%	1%	55%	38%	0%	0%
Eutrophication - (kg PO_4 eq)	$2.57x10^{-3}$	$5.68x10^{-5}$	$6.10x10^{-4}$	$1.32x10^{-4}$	$3.83x10^{-4}$	$2.74x10^{-2}$	$2.36x10^{-2}$	$2.17x10^{-6}$	$2.25x10^{-6}$
	5%	0%	1%	0%	1%	50%	43%	0%	0%
Ozone Depletion - (kg CFC-11 eq)	$7.40x10^{-7}$	$1.17x10^{-8}$	$1.31x10^{-7}$	$2.20x10^{-8}$	$1.00x10^{-7}$	$3.88x10^{-6}$	$6.47x10^{-6}$	$4.47x10^{-10}$	$5.40x10^{-10}$
	7%	0%	1%	0%	1%	34%	57%	0%	0%
Depletion of Abiotic Resources, Fossil Fuel - (MJ, LHV)	21.2	0.963	5.25	1.80	3.27	401	59.7	$3.68x10^{-2}$	$4.46x10^{-2}$
	4%	0%	1%	0%	1%	81%	12%	0%	0%

Table 17. EZ-50 LCIA Results. *The life cycle impact indicator category results for one square meter of installed EZ-50 wallcovering product with an RSL of 10yrs in a building with an ESL of 75yrs. All values are rounded to three significant digits. Percentages in the second row of each impact category show the percent contribution of each life cycle module to the total of each impact category.*

Impact Category (units)	A1	A2	A3	A4	A5	B2	B4	C2	C4
TRACI 2.1									
Global Climate Change - (kg CO_2 eq)	1.11	$6.39x10^{-2}$	0.403	0.116	0.197	15.2	9.38	$2.44x10^{-3}$	$1.38x10^{-3}$
	4%	0%	2%	0%	1%	57%	35%	0%	0%
Smog Formation - (kg O_3 eq)	$6.15x10^{-2}$	$7.12x10^{-3}$	$1.62x10^{-2}$	$1.52x10^{-2}$	$1.13x10^{-2}$	0.937	0.606	$2.75x10^{-4}$	$3.35x10^{-4}$
	4%	0%	1%	1%	1%	57%	37%	0%	0%
Acidification - (kg SO_2 eq)	$4.88x10^{-3}$	$2.87x10^{-4}$	$1.17x10^{-3}$	$6.58x10^{-4}$	$7.89x10^{-4}$	$5.93x10^{-2}$	$4.17x10^{-2}$	$1.09x10^{-5}$	$1.22x10^{-5}$
	4%	0%	1%	1%	1%	55%	38%	0%	0%
Eutrophication - (kg N eq)	$4.65x10^{-3}$	$6.70x10^{-5}$	$1.36x10^{-3}$	$1.20x10^{-4}$	$7.65x10^{-4}$	$7.58x10^{-2}$	$4.58x10^{-2}$	$2.56x10^{-6}$	$2.20x10^{-6}$
	4%	0%	1%	0%	1%	59%	36%	0%	0%
Ozone Depletion - (kg CFC-11 eq)	$8.22x10^{-7}$	$1.56x10^{-8}$	$1.77x10^{-7}$	$2.82x10^{-8}$	$1.13x10^{-7}$	$4.00x10^{-6}$	$7.33x10^{-6}$	$5.95x10^{-10}$	$7.19x10^{-10}$
	7%	0%	1%	0%	1%	32%	59%	0%	0%
Fossil Fuel Depletion - (MJ surplus, LHV)	2.58	0.141	0.700	0.255	0.409	54.0	3.14	$5.38x10^{-3}$	$6.71x10^{-3}$
	4%	0%	1%	0%	1%	88%	5%	0%	0%
CML-IA Baseline									
Climate Change - (kg CO_2 eq)	1.12	$6.40x10^{-2}$	0.407	0.116	0.200	15.4	9.45	$2.44x10^{-3}$	$1.38x10^{-3}$
	4%	0%	2%	0%	1%	58%	35%	0%	0%
Photochemical Oxidation - (kg C_2H_4 eq)	$2.39x10^{-4}$	$8.13x10^{-6}$	$6.94x10^{-5}$	$1.79x10^{-5}$	$3.92x10^{-5}$	$6.19x10^{-3}$	$1.93x10^{-3}$	$3.10x10^{-7}$	$3.44x10^{-7}$
	3%	0%	1%	0%	0%	73%	23%	0%	0%
Acidification - (kg SO_2 eq)	$4.62x10^{-3}$	$2.39x10^{-4}$	$1.10x10^{-3}$	$5.74x10^{-4}$	$7.42x10^{-4}$	$5.75x10^{-2}$	$3.81x10^{-2}$	$9.32x10^{-6}$	$1.01x10^{-5}$
	4%	0%	1%	1%	1%	56%	37%	0%	0%
Eutrophication - (kg PO_4 eq)	$2.30x10^{-3}$	$5.68x10^{-5}$	$6.58x10^{-4}$	$1.15x10^{-4}$	$3.83x10^{-4}$	$2.74x10^{-2}$	$2.25x10^{-2}$	$2.17x10^{-6}$	$2.25x10^{-6}$
	4%	0%	1%	0%	1%	51%	42%	0%	0%
Ozone Depletion - (kg CFC-11 eq)	$6.85x10^{-7}$	$1.17x10^{-8}$	$1.32x10^{-7}$	$2.12x10^{-8}$	$9.21x10^{-8}$	$3.88x10^{-6}$	$5.99x10^{-6}$	$4.47x10^{-10}$	$5.40x10^{-10}$
	6%	0%	1%	0%	1%	36%	55%	0%	0%
Depletion of Abiotic Resources, Fossil Fuel - (MJ, LHV)	20.5	0.963	5.45	1.74	3.19	401	55.0	$3.68x10^{-2}$	$4.46x10^{-2}$
	4%	0%	1%	0%	1%	82%	11%	0%	0%

6. LCI Results

The following life cycle inventory (LCI) parameters specified by the PCR, shown in **Table 18** below, are reported in **Tables 19 – 21**. Note that the impact from modules B1, B3, B5, B6, and B7 are zero and are therefore not displayed in **Tables 19 - 21**.

Table 18. *The full name, abbreviation, and unit of additional LCI indicators required by the PCR. All energy indicators use lower heating value (LHV).*

Indicator Category	Abbreviation	Units
Resource use		
Use of renewable primary energy excluding renewable primary energy resources used as raw materials	RPRE	MJ, LHV
Use of renewable primary energy resources used as raw materials	RPRM	MJ, LHV
Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials	NRPRE	MJ, LHV
Use of non-renewable primary energy resources used as raw materials	NRPRM	MJ, LHV
Use of secondary material	SM	kg
Use of renewable secondary fuels	RSF	MJ, LHV
Use of non-renewable secondary fuels	NRSF	MJ
Use of net fresh water	FW	m^3
Waste and outflows		
Non-hazardous waste disposed	NHWD	kg
Hazardous waste disposed	HWD	kg
High-level Radioactive waste disposed	HLRW	kg
Intermediate Low Level Radioactive waste disposed	ILLRW	kg
Components for re-use	CRU	kg
Materials for recycling	MR	kg
Materials for energy recovery	MER	MJ, LHV
Recovered energy	RE	MJ, LHV

Table 19. JR-60 Resource Use and Waste Results. *Resource use and wastes results for one square meter of installed JR-60 wallcovering product with a RSL of 10yrs over the building's 75yr ESL. All values are rounded to three significant digits. Results representing energy flows are calculated using lower heating (i.e., net calorific) values. Percentages in the second row of each impact category show the percent contribution of each life cycle module to the total of each impact category.*

Impact Category (units)	A1	A2	A3	A4	A5	B2	B4	C2	C4
RPRe (MJ, NCV)	2.26	$1.24x10^{-2}$	0.693	$3.31x10^{-2}$	0.331	1.63	32.2	$6.94x10^{-4}$	$1.21x10^{-3}$
	6%	0%	2%	0%	1%	4%	87%	0%	0%
RPRm (MJ, NCV)	0.23	N/A	1.64	N/A	$2.54x10^{-2}$	0.00	12.3	N/A	N/A
	2%	N/A	12%	N/A	0.2%	0%	87%	N/A	N/A
NRPRe (MJ, NCV)	21.0	0.884	3.88	2.37	3.14	45.4	498	$4.94x10^{-2}$	$5.97x10^{-2}$
	4%	0%	1%	0%	1%	8%	87%	0%	0%
NRPRm (MJ, NCV)	11.2	N/A	0.270	N/A	1.27	0.00	82.6	N/A	N/A
	12%	N/A	0.3%	N/A	1%	0%	87%	N/A	N/A
SM (kg)	0.00	N/A	0.00	N/A	0.00	0.00	0.00	N/A	N/A
	0%	N/A	0%	N/A	0%	0%	0%	N/A	N/A
RSF (MJ, NCV)	0.00	N/A	0.00	N/A	0.00	0.00	0.00	N/A	N/A
	0%	N/A	0%	N/A	0%	0%	0%	N/A	N/A
NRSF (MJ, NCV)	0.00	N/A	0.00	N/A	0.00	0.00	0.00	N/A	N/A
	0%	N/A	0%	N/A	0%	0%	0%	N/A	N/A
RE (MJ, NCV)	0.00	N/A	0.00	N/A	0.00	0.00	0.00	N/A	N/A
	0%	N/A	0%	N/A	0%	0%	0%	N/A	N/A
FW (m3)	$7.05x10^{-2}$	$1.18x10^{-4}$	0.111	$3.11x10^{-4}$	$1.97x10^{-2}$	$3.74x10^{-2}$	1.57	0.00	$7.73x10^{-5}$
	4%	0%	6%	0%	1%	2%	87%	0%	0%
HWD (kg)	N/A	N/A	$1.38x10^{-4}$	N/A	$1.53x10^{-5}$	0.00	$9.97x10^{-4}$	N/A	N/A
	N/A	N/A	12%	N/A	1%	0%	87%	N/A	N/A
NWHD (kg)	N/A	N/A	0.00	N/A	0.00	0.00	0.00	N/A	N/A
	N/A	N/A	0%	N/A	0%	0%	0%	N/A	N/A
HLRW (kg)	$7.23x10^{-6}$	$7.13x10^{-8}$	$3.64x10^{-6}$	$1.89x10^{-7}$	$1.24x10^{-6}$	$8.25x10^{-6}$	$1.32x10^{-4}$	$3.99x10^{-9}$	$3.12x10^{-9}$
	5%	0%	2%	0%	1%	5%	86%	0%	0%
ILLRW (kg)	$3.87x10^{-5}$	$6.37x10^{-6}$	$1.79x10^{-5}$	$1.71x10^{-5}$	$9.00x10^{-6}$	$3.64x10^{-5}$	$8.13x10^{-4}$	$3.56x10^{-7}$	$4.30x10^{-7}$
	4%	1%	2%	2%	1%	4%	87%	0%	0%
CRU (kg)	N/A	N/A	N/A	N/A	N/A	0.00	0.00	N/A	0.00
	N/A	N/A	N/A	N/A	N/A	0%	0%	N/A	0%
MR (kg)	N/A	N/A	0.00	N/A	0.00	0.00	0.00	N/A	N/A
	N/A	N/A	0%	N/A	0%	0%	0%	N/A	N/A
MER (MJ, NCV)	N/A	N/A	0.00	N/A	0.00	0.00	0.00	N/A	N/A
	N/A	N/A	0%	N/A	0%	0%	0%	N/A	N/A

Table 20. MR-60 Resource Use and Waste Results. *Resource use and wastes results for one square meter of installed MR-60 wallcovering product with a RSL of 10yrs over the building's 75yr ESL. All values are rounded to three significant digits. Results representing energy flows are calculated using lower heating (i.e., net calorific) values. Percentages in the second row of each impact category show the percent contribution of each life cycle module to the total of each impact category.*

Impact Category (units)	A1	A2	A3	A4	A5	B2	B4	C2	C4
RPRe (MJ, NCV)	1.83	$1.30x10^{-2}$	0.693	$2.35x10^{-2}$	0.283	1.63	28.7	$5.02x10^{-4}$	$8.61x10^{-4}$
	6%	0%	2%	0%	1%	5%	87%	0%	0%
RPRm (MJ, NCV)	0.23	N/A	1.64	N/A	$2.54x10^{-2}$	0.00	12.3	N/A	N/A
	2%	N/A	12%	N/A	0.2%	0%	87%	N/A	N/A
NRPRe (MJ, NCV)	16.1	0.925	3.88	1.73	2.54	45.4	328	$3.53x10^{-2}$	$4.26x10^{-2}$
	4%	0%	1%	0%	1%	11%	82%	0%	0%
NRPRm (MJ, NCV)	8.32	N/A	0.270	N/A	0.954	0.00	62.0	N/A	N/A
	12%	N/A	0.4%	N/A	1%	0%	87%	N/A	N/A
SM (kg)	0.00	N/A	0.00	N/A	0.00	0.00	0.00	N/A	N/A
	0%	N/A	0%	N/A	0%	0%	0%	N/A	N/A
RSF (MJ, NCV)	0.00	N/A	0.00	N/A	0.00	0.00	0.00	N/A	N/A
	0%	N/A	0%	N/A	0%	0%	0%	N/A	N/A
NRSF (MJ, NCV)	0.00	N/A	0.00	N/A	0.00	0.00	0.00	N/A	N/A
	0%	N/A	0%	N/A	0%	0%	0%	N/A	N/A
RE (MJ, NCV)	0.00	N/A	0.00	N/A	0.00	0.00	0.00	N/A	N/A
	0%	N/A	0%	N/A	0%	0%	0%	N/A	N/A
FW (m3)	$6.43x10^{-2}$	$1.20x10^{-4}$	0.111	$2.27x10^{-4}$	$1.90x10^{-2}$	$3.74x10^{-2}$	1.50	0.00	$5.52x10^{-5}$
	4%	0%	6%	0%	1%	2%	87%	0%	0%
HWD (kg)	N/A	N/A	$1.38x10^{-4}$	N/A	$1.53x10^{-5}$	0.00	$9.97x10^{-4}$	N/A	N/A
	N/A	N/A	12%	N/A	1%	0%	87%	N/A	N/A
NWHD (kg)	N/A	N/A	0.00	N/A	0.00	0.00	0.00	N/A	N/A
	N/A	N/A	0%	N/A	0%	0%	0%	N/A	N/A
HLRW (kg)	$5.46x10^{-6}$	$7.46x10^{-8}$	$3.64x10^{-6}$	$1.34x10^{-7}$	$1.04x10^{-6}$	$8.25x10^{-6}$	$1.20x10^{-4}$	$2.85x10^{-9}$	$2.23x10^{-9}$
	4%	0%	3%	0%	1%	6%	87%	0%	0%
ILLRW (kg)	$3.00x10^{-5}$	$6.66x10^{-6}$	$1.79x10^{-5}$	$1.25x10^{-5}$	$7.65x10^{-6}$	$3.64x10^{-5}$	$7.30x10^{-4}$	$2.54x10^{-7}$	$3.07x10^{-7}$
	4%	1%	2%	1%	1%	4%	87%	0%	0%
CRU (kg)	N/A	N/A	N/A	N/A	N/A	0.00	0.00	N/A	0.00
	N/A	N/A	N/A	N/A	N/A	0%	0%	N/A	0%
MR (kg)	N/A	N/A	0.00	N/A	0.00	0.00	0.00	N/A	N/A
	N/A	N/A	0%	N/A	0%	0%	0%	N/A	N/A
MER (MJ, NCV)	N/A	N/A	0.00	N/A	0.00	0.00	0.00	N/A	N/A
	N/A	N/A	0%	N/A	0%	0%	0%	N/A	N/A

Table 21. EZ-50 Resource Use and Waste Results. *Resource use and wastes results for one square meter of installed EZ-50 wallcovering product with a RSL of 10yrs over the building's 75yr ESL. All values are rounded to three significant digits. Results representing energy flows are calculated using lower heating (i.e., net calorific) values. Percentages in the second row of each impact category show the percent contribution of each life cycle module to the total of each impact category.*

Impact Category (units)	A1	A2	A3	A4	A5	B2	B4	C2	C4
RPRe (MJ, NCV)	1.70	$1.30x10^{-2}$	0.834	$2.30x10^{-2}$	0.292	1.63	28.9	$5.02x10^{-4}$	$8.61x10^{-4}$
	5%	0%	2%	0%	1%	5%	87%	0%	0%
RPRm (MJ, NCV)	0.19	N/A	1.64	N/A	$2.15x10^{-2}$	0.00	12.0	N/A	N/A
	1%	N/A	12%	N/A	0.2%	0%	87%	N/A	N/A
NRPRe (MJ, NCV)	15.5	0.925	4.03	1.67	2.47	45.4	324	$3.53x10^{-2}$	$4.26x10^{-2}$
	4%	0%	1%	0%	1%	12%	82%	0%	0%
NRPRm (MJ, NCV)	8.08	N/A	0.270	N/A	0.928	0.00	60.3	N/A	N/A
	12%	N/A	0.4%	N/A	1%	0%	87%	N/A	N/A
SM (kg)	0.00	N/A	0.00	N/A	0.00	0.00	0.00	N/A	N/A
	0%	N/A	0%	N/A	0%	0%	0%	N/A	N/A
RSF (MJ, NCV)	0.00	N/A	0.00	N/A	0.00	0.00	0.00	N/A	N/A
	0%	N/A	0%	N/A	0%	0%	0%	N/A	N/A
NRSF (MJ, NCV)	0.00	N/A	0.00	N/A	0.00	0.00	0.00	N/A	N/A
	0%	N/A	0%	N/A	0%	0%	0%	N/A	N/A
RE (MJ, NCV)	0.00	N/A	0.00	N/A	0.00	0.00	0.00	N/A	N/A
	0%	N/A	0%	N/A	0%	0%	0%	N/A	N/A
FW (m3)	$5.32x10^{-2}$	$1.20x10^{-4}$	0.111	$2.15x10^{-4}$	$1.90x10^{-2}$	$3.74x10^{-2}$	1.46	0.00	$5.52x10^{-5}$
	3%	0%	7%	0%	1%	2%	87%	0%	0%
HWD (kg)	N/A	N/A	$1.38x10^{-4}$	N/A	$1.53x10^{-5}$	0.00	$9.97x10^{-4}$	N/A	N/A
	N/A	N/A	12%	N/A	1%	0%	87%	N/A	N/A
NWHD (kg)	N/A	N/A	0.00	N/A	0.00	0.00	0.00	N/A	N/A
	N/A	N/A	0%	N/A	0%	0%	0%	N/A	N/A
HLRW (kg)	$5.30x10^{-6}$	$7.46x10^{-8}$	$3.73x10^{-6}$	$1.31x10^{-7}$	$1.02x10^{-6}$	$8.25x10^{-6}$	$1.20x10^{-4}$	$2.85x10^{-9}$	$2.23x10^{-9}$
	4%	0%	3%	0%	1%	6%	87%	0%	0%
ILLRW (kg)	$2.89x10^{-5}$	$6.66x10^{-6}$	$1.87x10^{-5}$	$1.20x10^{-5}$	$7.51x10^{-6}$	$3.64x10^{-5}$	$7.18x10^{-4}$	$2.54x10^{-7}$	$3.07x10^{-7}$
	3%	1%	2%	1%	1%	4%	87%	0%	0%
CRU (kg)	N/A	N/A	N/A	N/A	N/A	0.00	0.00	N/A	0.00
	N/A	N/A	N/A	N/A	N/A	0%	0%	N/A	0%
MR (kg)	N/A	N/A	0.00	N/A	0.00	0.00	0.00	N/A	N/A
	N/A	N/A	0%	N/A	0%	0%	0%	N/A	N/A
MER (MJ, NCV)	N/A	N/A	0.00	N/A	0.00	0.00	0.00	N/A	N/A
	N/A	N/A	0%	N/A	0%	0%	0%	N/A	N/A

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