

DUR-A-FLEX

Epoxy Flooring Systems



The Dur-A-Flex family of epoxy flooring systems offer the most protection for your money, providing superior resistance to chemical spills, heavy equipment and continuous traffic. Install a seamless, sanitary, easy to maintain surface that works as hard as you do, in any environment.



As one of the leading manufacturers of resinous floor and wall solutions, Dur-A-Flex designs products with people and the environment in mind. Most Dur-A-Flex floor and wall systems are VOC-compliant, phthalate-free, and meet LEED® requirements for low-emitting materials. We strive to give our customers the confidence that they are not only choosing the right floor for the job, but also the right floor for the environment. Now, with our Environmental Product Declarations (EPDs) and Health Product Declarations (HPDs), our customers have tools to efficiently evaluate the environmental and human health impacts of our high-performance products.



ENVIRONMENTAL PRODUCT DECLARATION





Epoxy Flooring Systems

According to ISO 14025

This declaration is an environmental product declaration (EPD) in accordance with ISO 14025. EPDs rely on Life Cycle Assessment (LCA) to provide information on a number of environmental impacts of products over their life cycle. **Exclusions:** EPDs do not indicate that any environmental or social performance benchmarks are met, and there may be impacts that they do not encompass. LCAs do not typically address the site-specific environmental impacts of raw material extraction, nor are they meant to assess human health toxicity. EPDs can complement but cannot replace tools and certifications that are designed to address these impacts and/or set performance thresholds – e.g. Type 1 certifications, health assessments and declarations, environmental impact assessments, etc. **Accuracy of Results:** EPDs regularly rely on estimations of impacts, and the level of accuracy in estimation of effect differs for any particular product line and reported impact. **Comparability:** EPDs are not comparative assertions and are either not comparable or have limited comparability when they cover different life cycle stages, are based on different product category rules or are missing relevant environmental impacts. EPDs from different programs may not be comparable.



PROGRAM OPERATOR	UL Environment	
DECLARATION HOLDER	Dur-A-Flex	
DECLARATION NUMBER	4787853760.101.1	
DECLARED PRODUCT	Epoxy Flooring Systems	
REFERENCE PCR	Part A (IBU/UL v1.2), Part B (IBU) Requirements for floor coverings. UL Part B addendum	
DATE OF ISSUE	April 27, 2017	
PERIOD OF VALIDITY	5 Years	
CONTENTS OF THE DECLARATION	Product definition and information about building physics Information about basic material and the material's origin Description of the product's manufacture Indication of product processing Information about the in-use conditions Life cycle assessment results Testing results and verifications	
The PCR review was conducted by:	Institut Bauen und Umwelt e.V. Addendum: UL Environment epd@ulenvironment.com	
This declaration was independently verified in accordance with ISO 14025 by Underwriters Laboratories <input type="checkbox"/> INTERNAL <input checked="" type="checkbox"/> EXTERNAL	 Wade Stout, UL Environment	
This life cycle assessment was independently verified in accordance with ISO 14044 and the reference PCR by:	 Thomas Gloria, Industrial Ecology Consultants	

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Product Description

Company

Dur-A-Flex is a global provider of seamless commercial and industrial resinous flooring systems and polymer components – epoxies, urethanes, and methyl methacrylates (MMA) plus premium colored quartz aggregates. Dur-A-Flex is also a principal supplier of colored quartz aggregate to the seamless flooring industry.

The experts at Dur-A-Flex know the product, its application to the customer's specific industry, and how to overcome issues that can come up on the job – helping the customer get the job done right and on time.

Dur-A-Flex sells floor systems to suit the most demanding flooring applications, with a complete range of Dur-A-Flex products including primers & sealers, membrane & crack fillers, resurfacers and performance topcoats.

Product

The product is the Epoxy Flooring System designed for commercial, industrial, and institutional use. The product is manufactured at Dur-A-Flex's manufacturing facility in East Hartford, CT. Specifically, this EPD represents a typical product in the Epoxy family of products from a single manufacturing plant.

This EPD is representative of Dur-A-Flex manufacturing in the US.

Application

Dur-A-Flex's Epoxy system is used in a variety of applications where durability and stain and chemical resistance is required, including, but not limited to: health care, education, grocery, retail, pharmaceutical, and chemical industries.

Technical Information

Name	Test Method	Value	Unit
Hardness (Shore D)	ASTM D 2240	75-80	D
Compressive Strength	ASTM C 579	110	N/mm ²
Tensile Strength	ASTM D 638	26	N/mm ²
Abrasion Resistance CS17 Wheel, 1000g load 1,000 Cycles	ASTM D 4060	24	mg loss
Coefficient of Friction Standard Slip-Resistant	ASTM D 2047	>0.6	-
VOC Content	EPA Method 24	0	g/L
Surface Burning Characteristics	ASTM E84	Class A	-

Delivery Status

Each flooring system consists of multiple layers on the floor, each of which are applied using a "kit" from Dur-A-Flex. Each kit contains resin, hardener, and potentially aggregates, though not every kit will contain an aggregate. Broadcast media and epoxy products are sold and shipped in bulk.

Environment



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Base Materials

Base materials for products in the Epoxy Flooring System include:

Material	Amount
Epoxy Resin	26%
Epoxy Hardener	18%
Colored Flake	56%

Manufacture

Dur-A-Flex flooring products are manufactured at their East Hartford, CT facility. The Epoxy flooring systems are multi-layer, multi-component systems, consisting of combinations of resins, hardeners, and aggregates. The majority of the components are formulated on-site at Dur-A-Flex's facility, though some are manufactured by their suppliers. All components are packaged on-site in either plastic or metal containers, depending on the quantity and product. These containers are then placed in cardboard boxes, stacked on pallets, plastic-wrapped, and are either shipped directly to the customer or to one of Dur-A-Flex's two warehouses.

The two primary processes at the Dur-A-Flex facility are liquid mixing and aggregate coloring. For all on-site formulated liquid components, raw materials are added to a mixing tank by weight via an automated batch process. Raw materials are added one at a time, followed by mixing for a specified length of time for each addition. Once the batch is completed, it is quality tested and then sent to the packaging line. During packaging, the product is added to the plastic or metal containers by weight, based on the flooring system specified.

In the aggregate coloring process which is not used for every system, sand or quartz is added to mixing tanks along with pigments, which are then heated using either natural gas or electricity. This process bakes the pigment onto the aggregate, causing a curing process. Once fully colored and cured, the colored aggregate is placed into super-sacks and sent to the packaging line where it is placed into smaller bags by weight.

Environment and Health During Manufacturing

Dur-A-Flex meets all federal and state standards related to the Environment and Health during manufacturing. Additionally, Dur-A-Flex employs a strict waste minimization and recycling program that reduces and recycles waste produced in the manufacturing process.

Beyond what is regulated, there are no additional environment and health considerations during the production of goods.



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Packaging

All components are packaged on-site in either plastic or metal containers, depending on the quantity and type of product. These containers are then placed in cardboard boxes, stacked on pallets, plastic-wrapped, and are either shipped directly to the customer or to one of Dur-A-Flex's two warehouses.

Each flooring system consists of multiple layers on the floor, each of which are applied using a "kit" from Dur-A-Flex. Each kit contains pre-weighed amounts of resin, hardener, and aggregates, though not every kit will contain an aggregate. Broadcast media and epoxy products are sold and shipped in bulk.

Product Installation

Full installation instructions can be found online at <http://dur-a-flex.com/Home/ContractorCenter/>

In general, installation is achieved through the mixing and spreading of the components of the epoxy flooring system.

Environment and Health During Use

There are no environmental or health considerations during the use of the product.

Reference Service Life

It is assumed the flooring systems will last for 5-25 years, depending on the use and care of the floor. However, as this is a Cradle-to-Gate study with options, excluding use phase, the reference service life can be disregarded.

Extraordinary Effects

In the event of flooding, the flooring can be mopped to remove excess water, with no impact on the environment. If the flooring is mechanically destroyed, there are no impacts on the environment. Information on fire performance can be found in the technical data section of the EPD.

Re-Use Phase

If required, the flooring system can be refinished in place using a new top-coat layer.

Disposal

It is assumed the epoxy products will be disposed of with the underlying floor in a construction landfill. The distance waste is transported to the landfill is assumed to be <100 miles, but 100 miles was used in the model as a conservative estimate.

Further Information

Additional information regarding Dur-A-Flex's sustainability program and environmental legal compliance can be found at <http://dur-a-flex.com/Home/EcoFriendly/>



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Life Cycle Assessment

Declared Unit

The declared unit according to the PCR is 1 m² of finished flooring.

Name	Value	Unit
Declared Unit	1	m ²
Conversion factor to 1 kg	0.3799	-

System Boundary

An LCA for products in which a functional life is not declared can be one of three options. These options include a Cradle-to-Shipping-Gate LCA, a Cradle-to-Building LCA or a Cradle-to-Building-with-EOL Stage LCA.

This particular LCA is a Cradle-to-Gate with options study.

A summary of the life cycle stages included in this LCA is presented in the following table.

Module Name	Description	Analysis Period	Summary of Included Elements
A1	Product Stage: Raw Material Supply	2015	Raw Material sourcing and processing as defined by secondary data.
A2	Product Stage: Transport	2015	Shipping from supplier to manufacturing site. Fuel use requirements estimated based on product weights and estimated distance.
A3	Product Stage: Manufacturing	2015	Energy, water and material inputs required for manufacturing products from raw materials. Packaging Materials included as well.
A4	Construction Process Stage: Transport	2015	Shipping from manufacturing site to project site. Fuel use requirements estimated based on product weights and mapped distance.
A5	Construction Process Stage: Installation	2015	Installation and packaging material waste.
B1	Use Stage: Use	N/A	Module Not Declared
B2	Use Stage: Maintenance	N/A	Module Not Declared
B3	Use Stage: Repair	N/A	Module Not Declared
B4	Use Stage: Replacement	N/A	Module Not Declared
B5	Use Stage: Refurbishment	N/A	Module Not Declared
B6	Operational Energy Use	N/A	Energy not required for use.
B7	Operational Water Use	N/A	Water not required for use.
C1	EOL: Deconstruction	2015	No inputs required for deconstruction.
C2	EOL: Transport	2015	Shipping from project site to landfill. Fuel use requirements estimated based on product weight and mapped distance.
C3	EOL: Waste Processing	2015	Waste processing not required. All waste can be processed as is.
C4	EOL: Disposal	2015	Assumes all products are sent to landfill. Landfill impacts modeled based on secondary data.
D	Benefits beyond system	N/A	Module Not Declared



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Estimates and Assumptions

Landfilling at End of Life – All products were considered to be landfilled at end of life.

Installation Tools – Accessory materials, such as trowels, are required, though not included in the study as these are multi-use tools and the impacts per declared unit is considered negligible.

The inclusion of overhead energy, water and waste data was determined appropriate due to the method in which Dur-A-Flex tracks energy use.

Cut-off Criteria

All inputs in which data were available were included.

Material inputs greater than 1% (based on total mass of the individual components of the product) were included within the scope of analysis. Material inputs less than 1% were included if sufficient data were available to warrant inclusion and/or the material input was thought to have significant environmental impact. Cumulative excluded material inputs and environmental impacts are less than 5% based on total weight of the declared unit.

Some material and energy inputs may have been excluded within the GaBi datasets used for this project. All GaBi datasets have been critically reviewed and conform to the exclusion requirement of the PCR.

No hazardous and toxic releases, which are mandatory to be monitored and reported to the U.S TRI, are released from the facility.

Background Data

All background data was sourced from GaBi databases. GaBi version 7.3.3.153 was used to complete the assessment.

Data Quality

Geographical Coverage

The geographical scope of the manufacturing portion of the life cycle is East Hartford, CT, USA. This is Dur-A-Flex's primary manufacturing facility. All primary data were collected from this location. The geographic coverage of primary data is considered excellent.

The geographical scope of the raw material acquisition, customer distribution, site installation and use portions of the life cycle is the United States of America. Locations and shipping distance values were determined through the analysis of purchasing and sales data using GIS mapping software. This data is considered very good.

Disposal and end-of-life geographic coverage (i.e. site of disposal location) was assumed based on research relating to the average distance an American lives from a landfill. This data is considered good.

Time Coverage

Primary data were provided by Dur-A-Flex associates and represent all information from Dur-A-Flex's facility for calendar year 2015. Using 2015 data meets the PCR requirements. Time coverage of this data is considered very good.

Data necessary to model cradle-to-gate unit processes was sourced from thinkstep LCI datasets. Time coverage of the GaBi datasets varies from approximately 2010 to present. All datasets rely on at least one 1-year average data. Overall time coverage of the datasets is considered good and meets the requirement of the PCR that all data be updated within a 10-year period. The specific time coverage of secondary datasets can be referenced in the section titled Generic Data.

Technological Coverage

Primary data provided by Dur-A-Flex is specific to the technology that the company uses in manufacturing their product. It is site specific and considered of good quality. It is worth noting that the energy and water used in manufacturing the product includes overhead energy such as lighting, heating and sanitary use of water. Sub-metering was not available to extract process only energy and water use from the total energy use. Sub-metering would improve the technological coverage of data quality.



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Data necessary to model cradle-to-gate unit processes was sourced from GaBi LCI datasets. Technological coverage of the datasets is considered good relative to the actual supply chain of Dur-A-Flex. While improved life cycle data from suppliers would improve technological coverage, the use of lower quality generic datasets does meet the goal of this LCA.

Allocation Procedures

General principles of allocation were based on ISO14044. Where possible, allocation was avoided. When allocation was necessary it was done on a physical mass basis.

Comparability

Basically, a comparison or an evaluation of EPD data is only possible if all the data sets to be compared were created according to EN 15804 and the building context, respectively the product-specific characteristics of performance, are taken into account. The used background database has to be mentioned.

LCA: Scenarios and Additional Technical Information

The following technical information is a basis for the declared modules and can be used for developing specific scenarios in the context of a building assessment. All indicated values refer to the declared functional unit.

Name	Value	Unit
A4: Transport to the construction site		
Liters of Fuel	42	L/100km
Transport Distance	1534	km
Capacity Utilization	67	%
A5: Installation in the building		
Material Loss	0.302	kg
C1-C4: End-of-Life		
Collected as mixed construction waste	2.63	kg
Landfilling	2.63	kg



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LCA Results

The following tables disclose the life cycle results for 1 m² of installed Epoxy Flooring System.

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 from the gate to the site	Assembly	Use	Maintenance	Repair	Replacement	Refurbishment	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	X	X	MND	MND	MND	MND	MND	MND	MND	X	X	X	X	MND

Results of the LCA – Environmental Impact: 1 m² of installed Epoxy flooring system

Results of the LCA - Environmental Impact, TRACI 2.1										
Parameter	Unit	A1-A3	A4	A5	B1-B7	C1	C2	C3	C4	D
Global Warming Air, incl. biogenic carbon	[kg CO2-Equiv.]	9.33E+00	3.55E-01	8.71E-03	MND	0.00E+00	3.34E-02	0.00E+00	4.25E-02	N/A
Ozone Depletion Air	[kg CFC 11-Equiv.]	1.09E-08	2.45E-12	3.13E-14	MND	0.00E+00	2.30E-13	0.00E+00	4.20E-14	N/A
Acidification	[kg SO2-Equiv.]	2.06E-02	1.53E-03	4.81E-05	MND	0.00E+00	1.44E-04	0.00E+00	2.74E-04	N/A
Eutrophication	[kg N-Equiv.]	3.18E-03	1.29E-04	4.01E-06	MND	0.00E+00	1.21E-05	0.00E+00	2.28E-05	N/A
Smog Air	[kg O3-Equiv.]	3.06E-01	5.07E-02	1.16E-03	MND	0.00E+00	4.77E-03	0.00E+00	5.35E-03	N/A
Abiotic Depletion for fossil resources	[MJ surplus energy]	2.06E+01	6.73E-01	1.51E-02	MND	0.00E+00	6.34E-02	0.00E+00	6.86E-02	N/A

Results of the LCA - Environmental Impact, CML2001 - Jan. 2016										
Parameter	Unit	A1-A3	A4	A5	B1-B7	C1	C2	C3	C4	D
Global Warming Potential	[kg CO2-Equiv.]	9.49E+00	3.56E-01	8.74E-03	MND	0.00E+00	3.35E-02	0.00E+00	4.27E-02	N/A
Ozone Layer Depletion Potential	[kg R11-Equiv.]	8.37E-09	2.30E-12	2.94E-14	MND	0.00E+00	2.16E-13	0.00E+00	4.00E-14	N/A
Acidification Potential	[kg SO2-Equiv.]	1.92E-02	1.14E-03	4.12E-05	MND	0.00E+00	1.08E-04	0.00E+00	2.51E-04	N/A
Eutrophication Potential	[kg Phosphate-Equiv.]	3.94E-03	3.09E-04	7.27E-06	MND	0.00E+00	2.91E-05	0.00E+00	3.42E-05	N/A
Photochem. Ozone Creation Potential	[kg Ethene-Equiv.]	2.42E-03	1.22E-04	3.58E-06	MND	0.00E+00	1.15E-05	0.00E+00	1.98E-05	N/A
Abiotic Depletion	[kg Sb-Equiv.]	2.22E-05	6.07E-08	2.37E-09	MND	0.00E+00	5.71E-09	0.00E+00	1.49E-08	N/A
Abiotic Depletion for fossil resources	[MJ surplus energy]	1.52E+02	4.99E+00	1.17E-01	MND	0.00E+00	4.70E-01	0.00E+00	5.50E-01	N/A



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Results of the LCA – Resource Use: 1 m² of installed Epoxy flooring system

Results of the LCA - Resource Use										
Parameter	Unit	A1-A3	A4	A5	B1-B7	C1	C2	C3	C4	D
PERE	MJ, net calorific value	4.80E+00	1.22E-01	8.95E-03	MND	0.00E+00	1.15E-02	0.00E+00	6.64E-02	N/A
PERM	MJ, net calorific value	0.00E+00	0.00E+00	0.00E+00	MND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	N/A
PERT	MJ, net calorific value	4.80E+00	1.22E-01	8.95E-03	MND	0.00E+00	1.15E-02	0.00E+00	6.64E-02	N/A
PENRE	MJ, net calorific value	1.60E+02	5.01E+00	1.19E-01	MND	0.00E+00	4.72E-01	0.00E+00	5.69E-01	N/A
PENRM	MJ, net calorific value	0.00E+00	0.00E+00	0.00E+00	MND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	N/A
PENRT	MJ, net calorific value	1.60E+02	5.01E+00	1.19E-01	MND	0.00E+00	4.72E-01	0.00E+00	5.69E-01	N/A
SM	Kg	0.00E+00	0.00E+00	0.00E+00	MND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	N/A
RSF	MJ, net calorific value	0.00E+00	0.00E+00	0.00E+00	MND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	N/A
NRSF	MJ, net calorific value	0.00E+00	0.00E+00	0.00E+00	MND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	N/A
FW	M ³	0.00E+00	0.00E+00	0.00E+00	MND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	N/A
PERE	Use of renewable primary energy excluding renewable primary energy resources used as raw materials				PENRT	Total use of non renewable primary energy resources (primary energy and primary energy resources used as raw materials)				
PERM	Use of renewable primary energy resources used as raw materials				SM	Use of secondary materials				
PERT	Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials)				RSF	Use of renewable secondary fuels				
PENRE	Use of non renewable primary energy excluding non renewable primary energy resources used as raw materials				NRSF	Use of non renewable secondary fuels				
PENRM	Use of non renewable primary energy resources used as raw materials				FW	Net use of fresh water				

Results of the LCA – Output Flows and Waste Categories: 1 m² of installed Epoxy flooring system

Results of the LCA - Waste and Output Flows										
Parameter	Unit	A1-A3	A4	A5	B1-B7	C1	C2	C3	C4	D
HWD	Kg	0.00E+00	0.00E+00	0.00E+00	MND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	N/A
NHWD	Kg	2.77E+00	4.82E-02	3.14E-01	MND	0.00E+00	4.53E-03	0.00E+00	2.73E+00	N/A
RWD	Kg	1.35E-03	8.76E-06	9.76E-07	MND	0.00E+00	8.24E-07	0.00E+00	7.68E-06	N/A
CRU	Kg	0.00E+00	0.00E+00	0.00E+00	MND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	N/A
MFR	Kg	0.00E+00	0.00E+00	0.00E+00	MND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	N/A
MET	Kg	0.00E+00	0.00E+00	0.00E+00	MND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	N/A
EEE	MJ, net calorific value	0.00E+00	0.00E+00	0.00E+00	MND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	N/A
EET	MJ, net calorific value	0.00E+00	0.00E+00	0.00E+00	MND	0.00E+00	0.00E+00	0.00E+00	0.00E+00	N/A
HWD	Disposed-of-hazardous WASTE				MFR	Materials for recycling				
NHWD	Disposed-of non-hazardous WASTE				MET	Materials for energy recovery				
RWD	Disposed-of Radioactive WASTE				EEE	Exported electrical energy				
CRU	Components for reuse				EET	Exported thermal energy				



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LCA: Interpretation

A Dominance Analysis evaluates each life cycle stage and compares the impacts from that stage to the sum of the impacts calculated for all declared modules. A Dominance Analysis was completed for the results.

The dominance analysis shows the vast majority of the impacts come from the life cycle stages A1-A3. Within the raw materials used, the largest contributors to the impacts are the epoxy resins and hardeners.

It is important to note that data quality may have an impact on the results of an LCA. Overall data quality is considered good. Improvements can be made through the modification of datasets to incorporate more regional specificity, both in terms of energy and technology. Utilizing Dur-A-Flex specific upstream data provided by suppliers would lead to improvement in data quality. However, the data used in this assessment was considered appropriate in relation to the goal, scope and budget of the project.

References

1. Life Cycle Assessment, Dur-A-Flex, Epoxy and Hybrid Flooring Systems. WAP Sustainability Consulting. March 2017.
2. Part A: Calculation Rules for the Life Cycle Assessment and Requires on the Project report. UL and IBU. v1.3. 2014
3. Part B: Requirements on the EPD for Floor Coverings. IBU. v1.4. 2016
4. Addendum: Product Category Rules for preparing an environmental product declaration (EPD) for PCR: *Part B: Requirements on the EPD for Flooring Products, IBU v1.6. 2014*. UL Environment. V1. 2014
5. ISO 14044: 2006 Environmental Management – Life cycle assessment – Requirements and Guidelines.
6. ISO 14025:2006 Environmental labels and declarations – Type III environmental declarations – Principles and Procedures.

