Environmental Product Declaration

Outsulation® Plus MD System

EXTERIOR INSULATION AND FINISH SYSTEMS (EIFS)

Outsulation Plus MD offers superior, single sourced, cost effective energy efficient cladding solutions incorporating continuous insulation and air/water-resistive barrier technology

As a global leader contributing to sustainable buildings, Dryvit Systems, Inc. is committed to providing quality products and services while considering people, planet and prosperity in all business decisions. With manufacturing facilities in U.S., Canada, and Poland, Dryvit is a recognized leader for developing the world's most energy efficient, architecturally diverse, insulated cladding systems and decorative finishes for vertical wall surfaces. Utilizing responsible chemistry and exceptional manufacturing processes, we conserve resources and minimize our environmental impact to support and enhance healthy, vibrant communities. With an engaged and empowered workforce, Dryvit embraces a sustainable culture and creates lasting value for our stakeholders.

Outsulation Systems are more sustainable throughout their entire lifecycle when compared to other common wall claddings. Initially because the manufacturing process requires less energy and the lightweight composition reduces fuel cost during transportation. After installation, Outsulation Systems conserve energy by keeping heating and cooling cost at a minimum for the life of the building contributing to overall reduced environmental impact when accounting for the operational (i.e., use) phase of the building. Additional information at www.Dryvit.com, 1.800.556.7752.

UL CERTIFIED
ENVIRONMENTAL PRODUCT DECLARATION

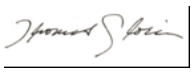
ENVIRONMENTAL PRODUCT DECLARATION

OUTSULATION® SYSTEMS
EXTERIOR INSULATION AND FINISH SYSTEMS (EIFS)

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	Dryvit Systmens, INC
DECLARATION NUMBER	4786331058.101.1
DECLARED PRODUCT	Outsulation Systems
REFERENCE PCR	ULE (2013) and Institut Bauen and Umwelt e.V. (2012), Product Category Rules (PCR) for preparing an EPD for VACUUM INSULATION PANELS
DATE OF ISSUE	July 11, 2014
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:	UL Environment Panel Review 333 Pfingsten Road Northbrook, IL 60611 epd@ul.com
This declaration was independently verified in accordance with ISO 14025 by Underwriters Laboratories ☐ INTERNAL ☒ 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

ENVIRONMENTAL PRODUCT DECLARATION

OUTSULATION® SYSTEMS
EXTERIOR INSULATION AND FINISH SYSTEM (EIFS)

According to ISO 14025

Product

Product Description

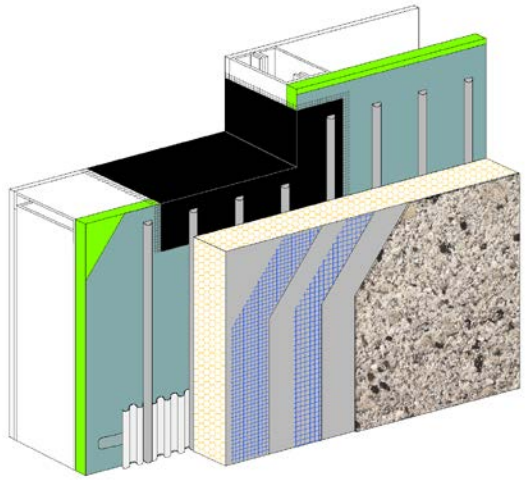


Figure 1: Outsulation® Plus MD Cross-Section

The Outsulation family of systems are available with and without moisture drainage. They provide an exterior continuous insulated cladding, which as a single source solution achieves all building and Energy Code requirements. Outsulation systems consist of the following components as determined by code and project performance requirements: Backstop® NT air/water-resistive barrier (when specified), Adhesive/Drainage Medium, Continuous Insulation (CI) board, Base Coat and Reinforcing Mesh and a final Finish Coat, which can represent the appearance of stucco, brick, limestone, granite and metal panels in any number of textures or colors.

Outsulation® systems are installed with EPS CI board ranging from one to four inches thick, with two inches being most common. With a specified R-value of 3.85 per inch EPS foam, the Outsulation® systems range from R-3.85 to R-15.4, with R-7.7 as most commonly installed. Detailed data and results in this EPD are presented with 2-in EPS, and a sensitivity analysis presents the cradle-to-grave results representing the range of EPS thicknesses up to 4 inches. This EPD represents Outsulation® systems installed on buildings in the U.S. The LCA data in this EPD are based on manufacturing data from Dryvit's four U.S. facilities: Dryvit headquarters in West Warwick, RI, Sand Springs, OK, Columbus, GA, and Woodlake, CA.

Application

Outsulation systems are highly durable and ideal exterior cladding solutions for both new and renovation construction in both the commercial and residential construction markets. Outsulation systems are rigorously tested to perform on all building types and offer unlimited design flexibility through the use of decorative shapes, textures and colors to suit any architectural style. Since 1969, Outsulation systems have been specified and installed on nearly 500,000 building across the world.

Material Content – Assembly of Outsulation® systems

The EIFS cladding can be assembled at the construction site or applied onto prefabricated panels in a manufacturing facility. The process of applying Outsulation systems begins after the substrate is installed. When specified, the water-resistive barrier is applied to the substrate surface as an air and moisture barrier. EPS foam board is then applied with Dryvit adhesive, followed by Dryvit basecoat and reinforcing mesh. The basecoated surface is covered with Primer (optional) and then Dryvit Finish is applied as the final layer. None of these are hazardous materials.

	2-in EPS foam (2- in)	Fiberglass Mesh	Adhesive/ Basecoat	Cement	Water-Resistive Barrier	Primer	Dryvit Finish Topcoat	Total Density
kg/m2	0.77	0.15	2.68	3.27	1.09	0.16	2.63	**10.76**
%	7%	1%	25%	30%	10%	2%	24%	**100%**

Table 1: Layers and Density of Outsulation® systems (2-in EPS)

Constituent	Adhesive/ Basecoat	Water-Resistive Barrier	Primer	Finish Topcoat	Mode of Transport	Avg distance to facility
Solvent	✓	✓	✓	✓	Truck	50
Resins	✓	✓	✓	✓	Truck	250
Aggregate	✓	✓		✓	Truck	883
Fine filler		✓	✓	✓	Truck	1160
Titanium dioxide slurry		✓	✓	✓	Truck	560
Other materials	✓	✓		✓	Truck	500
Water	✓	✓	✓	✓		

Table 2: Outsulation® systems Product Constituents

Packaging of the Dryvit products, 5-gal polypropylene pails weighing 2.5 lb, are included in the model. Quantities of the products are delivered to the job site as follows:

	Adhesive/ Basecoat	Water-Resistive Barrier	Primer	Finish Topcoat
Fill weight: bag/pail	50/60	60	50	68.5

Table 3: Delivery Status of Dryvit Products

Reference Service Life

A reference service life is not provided, as this EPD excludes the use stage.

Life Cycle Assessment

Declared Functional Unit / Reference Flow

This EPD refers to the life cycle of 1 m^2 of Outsulation® systems.

	Unit	Min EPS ←		→ Max EPS
		1 inch (min-max)	2 inch (min-max)	4 inch (min-max)
Declared unit	**m^2**	1	**1**	1
Surface weight	**kg/m^2**	7.93-10.37	**8.32-10.76**	9.09-11.53
Thickness	**Meter**	0.032	**0.057**	0.108
Conversion factor to 1 kg	**m2/kg**	0.126-0.096	**0.12-0.093**	0.11-0.087

Table 4: Summary of Outsulation® systems Mass With Range of EPS Thicknesses

System Boundaries

The EPD is cradle to gate – with options: in addition to the production stage, the LCA includes other life cycle stages. The use stage is excluded.

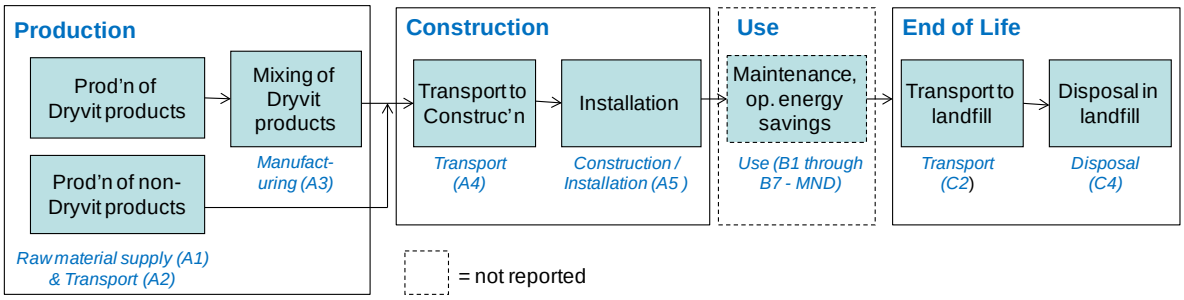


Figure 2: System Boundaries

Life Cycle Stages – Modeling

Production Stage

Figure 3 Bellagio, Las Vegas, NV

The production stage includes extraction and manufacture of all raw materials and their delivery to the production site, manufacturing, and packaging, to the point at which they are ready for shipment to the customer. The LCA includes production of all components in the installed system (Table 1). Dryvit does not manufacture the EPS, fiberglass mesh, or cement, but these are included in the raw materials.

At manufacturing, material constituents are measured and blended in large vessels using purchased grid electricity. The finished product is packaged into pails and shipped ready for installation. Each product is made separately, thus vessels are rinsed between batches using water. No detergents are used. A dust collection system is used to protect workers and prevent release of airborne particulates during blending operations, These operations pertain to all four manufacturing facilities; these are covered under ISO 9001-2008 Quality Management System and ISO 14001-2004 Environmental Management System. Electricity use is modeled as representative to each region.

Construction Process Stage

Construction process stage includes transportation to the installation site and installation. All of the components are modeled as transported an average of 250 mi by diesel truck to the building site.

The Outsulation components are installed at the building site. All materials are Dryvit-specified, and trained plasterers perform the work. Installation is manual. An average of 2.5% product loss and packaging are modeled as disposed of in a landfill or incinerated with energy recovery. Once Outsulation is installed and has cured, it is essentially inert.

End of Life Stage

At end of life, the product is sent to a construction and demolition landfill. None of the materials are reused or recycled. A diesel truck is assumed to transport these materials 30 miles to their final destination.

Other Modeling Information

Cut-off Criteria

A cut-off goal of 99.5% of both energy and total mass inputs has been defined, and this goal was met.

Allocation

No allocations of coproducts were needed to be performed since Dryvit products are produced at separate times in the facilities. Processing data were collected for each individual product.

Figure 4 CB&E Office Building

Data Used and Data Quality

Dryvit supplied primary data on its bill of materials and manufacturing operations. The Dryvit facilities surveyed in the LCA represent 100% of the Outsulation Plus MD sold in the U.S. Data are from FY 2013, and the technology modeled is current and representative. For the remaining data, secondary data was supplied by U.S. LCI and EcoInvent databases. While EcoInvent data are largely European, they are deemed the best available data where U.S. data or other published LCAs on materials were not available. The selection of U.S. LCI and EcoInvent databases ensures a plausible set of generic and background data. Commercially-available SimaPro LCA software was used to model the system.

Comparability

The scope of this EPD excludes the use phase of Outsulation® systems. Since comparison of building products is only possible in the context of a product's use in and its impacts on the building, this EPD may not be used to make comparisons between this product and other building insulation products.

Results and Interpretation

Baseline Results

Results are presented in terms of the total life cycle, except where modules were not declared. Each results table presents the total plus the breakdown of the modules that are included within the system boundary (i.e., dominance analysis presenting percentages of the totals).

Product Stage			Constr-uction Process		Use Stage							End-of-Life Stage				Benefits & Loads Beyond Sys. Bd.
Raw Material Supply	Transport	Manufacturing	Transport	Construction-installation process	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	MND	X	MND	X	MND

Table 5: Description of the System Boundary (X = included; MND = module not declared)

TRACI 2.0 Impact Assessment Results

			Product Stage			Construction Process		End-of-Life	
Impact category	Unit	Total	A1	A2	A3	A4	A5	C2	C4
Global warming potential	kg CO2 eq	1.51 E+01	86%	4%	7%	3%	0%	1%	0%
Ozone depletion potential	kg CFC-11 eq	2.65 E-07	96%	0%	0.1%	0.7%	0.2%	0%	3%
Acidification potential	kg SO2 eq	1.11 E-01	85%	3%	8%	2%	0.4%	1%	0.4%
Eutrophication potential	kg N eq	1.23 E-02	95%	2%	1%	1%	0%	0.3%	1%
Smog formation potential	kg O3 eq	1.21 E+00	79%	8%	5%	5%	0.4%	1%	1%

Table 6: Impact Assessment Results

Resource Use Results

			Product Stage			Construction Process		End-of-Life	
Impact Category	Unit	Total	A1	A2	A3	A4	A5	C2	C4
Renewable primary energy as energy carrier	MJ	7.42 E-01	0.5%	0%	99%	0%	0%	0%	0%
Renewable primary energy resources as material utilization	MJ	0	0%	0%	0%	0%	0%	0%	0%
Total use of renewable primary energy resources	MJ	7.42 E-01	0.5%	0%	99%	0%	0%	0%	0%
Non-renewable primary energy as energy carrier	MJ	1.79 E+02	86%	4%	6%	3%	0%	1%	1%
Non-renewable primary energy as material utilization	MJ	4.06 E+01	100%	0%	0%	0%	0%	0%	0%

Total use of non-renewable primary energy resources	MJ	**2.20 E+02**	89%	3%	5%	2%	0%	1%	1%
Use of secondary material	kg	**0**	0%	0%	0%	0%	0%	0%	0%
Use of renewable secondary fuels	MJ	**0**	0%	0%	0%	0%	0%	0%	0%
Use of non-renewable secondary fuels	MJ	**0**	0%	0%	0%	0%	0%	0%	0%
Use of net fresh water	m3	**8.96 E+00**	72%	0%	28%	0%	0%	0%	0.5%

Table 7: Resource Use Results

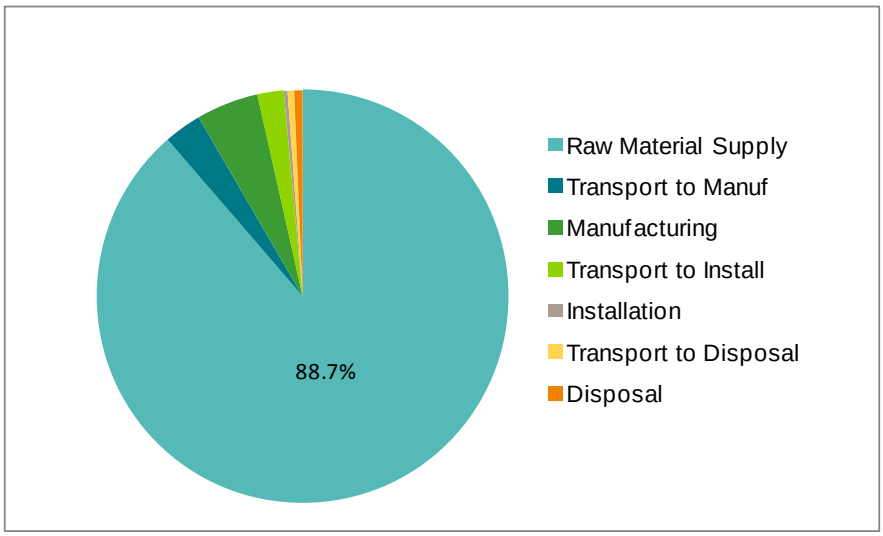


Figure 5: Non-Renewable Energy Resources (MJ)

For Non-Renewable Energy Resources, raw material supply makes up 88.7% of the total, which includes embodied energy in the product (i.e., in the EPS) and energy from fuel and electricity use. Because Outsulation systems include insulation it can significantly lower the energy consumption of the building during the use phase. However, this benefit is not shown since Use Phase is not part of the system boundary.

For many of the results categories, the Product Stage in general contributes the majority of the life cycle impact.

Output Flows and Waste Categories

			Product Stage			Construction Process		End-of-Life	
Impact Category	**Unit**	**Total**	**A1**	**A2**	**A3**	**A4**	**A5**	**C2**	**C4**
Hazardous waste disposed	kg	**0**	0%	0%	0%	0%	0%	0%	0%
Non-hazardous waste disposed	kg	**1.13 E+01**	0%	0%	0%	0%	5%	0%	95%
Radioactive waste disposed	kg	**0**	0%	0%	0%	0%	0%	0%	0%
Components for re-use	kg	**0**	0%	0%	0%	0%	0%	0%	0%
Materials for recycling	kg	**0**	0%	0%	0%	0%	0%	0%	0%
Materials for energy recovery	kg	**0**	0%	0%	0%	0%	0%	0%	0%
Exported electrical energy	MJ	**0**	0%	0%	0%	0%	0%	0%	0%
Exported thermal energy	MJ	**0**	0%	0%	0%	0%	0%	0%	0%

Table 8: Output Flows and Waste Categories Results

Sensitivity Analysis

The TRACI impact results are presented for the full life cycle profiles with varying EPS thicknesses.

		Total Life Cycles		
Impact category	**Unit**	**EPS 1-in**	**EPS 2-in**	**EPS 4-in**
Global warming potential	kg CO2 eq	1.30 E+01	1.51 E+01	1.90 E+01
Ozone depletion potential	kg CFC-11 eq	2.65 E-07	2.65 E-07	2.66 E-07
Acidification potential	kg SO2 eq	9.17 E-02	1.11 E-01	1.46 E-01
Eutrophication potential	kg N eq	1.20 E-02	1.23 E-02	1.29 E-02
Smog formation potential	kg O3 eq	1.03 E+00	1.21 E+00	1.56 E+00

Table 9: Sensitivity on Range of EPS Thicknesses

Product Technical Data

Name	Value	Test Standard / Organization
ISO 9000 - Quality management	N/A	ISO 9001
ISO 14001 Certification (Environmental Management System) for all facilities	N/A	ISO 14001:2004
ICC-ES Code Compliance Evaluation Report	N/A	ESR-1232, 1543, 1547, 1692, 1693, 1821
Standard Test Method for Determining the Drainage Efficiency of Exterior Insulation and Finish Systems (EIFS) Clad Wall Assemblies	Min 90%	ASTM E2273
Standard Test Method for Evaluating Water-Resistive Barrier (WRB) Coatings Used Under Ext. Insulation and Finish Systems (EIFS) for EIFS with Drainage	N/A	ASTM E2570
Standard Specification for PB Exterior Insulation and Finish Systems	N/A	ASTM E2568
Tensile Strength	Min 15 psi	ASTM E2134
Thermal Conductivity	0.63 K-m2/W @ 75F	ASTM C518
Standard Test Method for Surface Burning Characteristics of Building Materials	Flame Spread ≤ 25, Smoke Developed ≤ 450	ASTM E84
Standard Test Method for Determining Ignitability of Exterior Wall Assemblies Using a Radiant Heat Energy Source	No ignition at 12.5 kw/sq m	NFPA 268
Standard Fire Test Method for Eval. of Fire Propagation Characteristics of Ext. Non-Load-Bearing Wall Assemblies Containing Combustible Components	Resist Flame propagation	NFPA 285
Tensile Bond	Min 104 kPa (15 psi)	ASTM E2134
Freeze/Thaw Resistance	60 cycles	ASTM E2485
Abrasion Resistance	500 liters	ASTM D968
Accelerated Weathering	2000 hrs	ASTM G155

Mildew Resistance	28 days – no growth	ASTM D3273
Water Resistance	14 days exposure	ASTM D2247

Table 10: Technical and Construction Data

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