Environmental Product Declaration **Summary**

Product | ASCEND® Composite Cladding

ASCEND® Composite Cladding

With tall exposures and the deeply grained look of real wood, ASCEND captures the high-end aesthetics today's homeowners demand. But with ASCEND, installation is quicker and easier than that of fiber cement, engineered wood and other composite panels. In fact, ASCEND can often be installed by fewer laborers working at a time. After it's installed, ASCEND doesn't just perform . . . it lasts. And lasts. And lasts. Keeping that "just-installed" look for as long as it's up, ASCEND requires minimal maintenance, day after day, year after year. ASCEND is a winner for homeowners, builders, remodelers and installers alike.

EPD Program and Program Operator:	**NSF International**
General Program Instructions:	**UL Part B: Cladding Product Systems**
Manufacturer Name and Address:	**Associated Materials, LLC (www.alside.com) 3773 State Road Cuyahoga Falls, OH 44223**
Manufacturer Location:	**West Salem, OH**
Declaration Prepared by:	**Doug Mazeffa (dmazeffa@associatedmaterials.com)**
Declaration Number:	**EPD10943**

Certified Environmental Product Declaration
www.nsf.org

Reference PCR:	**Cladding Product Systems**
Functional Unit:	**1m² of cladding over 75-year building lifetime**
Product's Intended Application:	**Exterior Cladding**
Reference Service Lifetime:	**50 Years**
Applicable Markets:	**United States and Canada**
Date of Issue:	**04/15/2024 – 04/15/2029**
Period of Validity:	**5 Years**
Data Set Variability and Quality:	**Mean, Very Good**
EPD Type:	**Product-Specific**
EPD Scope:	**Cradle-Grave**
Years of Primary Data:	**2022 Calendar Year**
LCA Software and Version:	**LCAFE v10.7**
LCI Databases:	**LCAFE datasets, ecoinvent v3.4, and Industry Data**
LCIA Methodology:	**TRACI 2.1**

Subcategory PCR Review Conducted by:	**Jim Mellantine, Christopher White, Ph.D. and Phillip Moser, P.E. (MA)**
This life cycle assessment was conducted in accordance with ISO 14025 and 21930 by:	[signature]
This life cycle assessment was conducted in accordance with ISO 14044 and the Reference PCR by:	[signature]
Limitations:	Comparisons cannot be made between product-specific or industry average EPDs at the design stage of a project before a building has been specified. Comparisons may be made between product-specific or industry average EPDs at the time of product purchase when product performance and specifications have been established and serve as a functional unit for comparison. Environmental impact results shall be converted to a functional unit basis before any comparison is attempted. Any comparison of EPDs shall be subject to the requirements of ISO 21930. EPDs are not comparative assertions and are either not comparable or have limited comparability when they have different system boundaries, are based on different PCRs, or are missing relevant environmental impacts. Such comparisons can be inaccurate and could lead to erroneous selection of materials or products which are higher impact, at least in some impact categories.

Product Definition

ASCEND is a family of siding products manufactured by Associated Materials in Cuyahoga Falls, Ohio. Siding is designed to cover and protect the exterior of residential dwellings. For information about ASCEND or other Alside products, please visit *www.alside.com*.

Under the PCR for Cladding, ASCEND fits under the following definition:

> *"Cladding consists of materials applied to a building exterior to separate a building from the natural environment and provide an outer building skin or layer, including, but not limited to, veneers, siding, wall panels, architectural trim, and embellishments such as cornices, soffits, and fascia."* (Page 5 of Reference PCR)

ASCEND is manufactured in a way similar to other polymeric building materials. Raw materials are added in appropriate quantities which are mixed and extruded into the proper shape and cut. The siding is manually packed, shipped, and transported to the point of sale. A customer travels to the point of sale to purchase the siding and transports it to the project site. The siding is installed at the site and any unused siding is transported to be disposed. The siding is periodically cleaned and may need to be replaced depending on the lifetime of the building. Once its useful life has ended, it is disposed of as part of construction debris to landfill.

To utilize a cradle-grave system boundary, the reference PCR stipulates using a 75-year service lifetime. Since polymeric siding is designed and warranted to last for a lifetime, a conservative 50-year reference service lifetime was utilized. Only occasional cleaning is expected to occur before the end of its useful life, although a replacement factor was utilized.

The typical composition of ASCEND siding is shown below.

- Polymeric Resin (60-85%)
- Other polymers (0-15%)
- Pigments (0-5%)
- Glass Fibers (0-10%)
- Additives (1-5%)
- Polystyrene Foam Insulation (0-5%)

Cladding is treated as an article and will not result in exposure to hazardous chemicals under normal conditions of use. However, per ISO 21930 requirements, the below raw materials in the product composition have a GHS hazard classification associated with them.

- Glass Fibers (CAS 65997-17-3) H303, H333, H335, H350i
- Titanium Dioxide (CAS 14363-67-7) GHS08

Other than the materials listed above and based on the information available to Associated Materials from its suppliers, no other raw materials in this product are considered hazardous.

An image of the cradle-grave system boundary appears later in the EPD as Figure 1. Please note that modules B1, B3, B5, and C1 do not appear as no impacts occur in these modules. This is consistent with the industry average EPDs created by the cladding industry.

About Associated Materials

Associated Materials is a leader in exterior building products for residential and commercial remodeling and new construction markets. We produce vinyl windows, vinyl and composite siding and accessories, and metal building products—and distribute these and other essential building products to ensure customers find everything they need for their exteriors. Our legacy goes back to the inception of Alside in 1947, and we've since expanded our family of industry-leading brands to also include Gentek, Alpine and Preservation. Because of our unique vertical integration of manufacturing capabilities, installation services and distribution locations, we are a true partner with contractors, remodelers, builders and architects for building products and services. With headquarters in Cuyahoga Falls, Ohio, Associated Materials has been **building products better** for more than 75 years.

Functional Unit

Per the reference PCR, 1m² of installed siding was used as a functional unit. An assumed building lifetime of 75 years was also used to be consistent with the reference PCR and the vinyl siding's industry average EPDs. In addition, all required accessories to install the cladding were included in the LCA models.

Other technical specifications stated by the reference PCR appear in the table below, but many are not relevant to this type of cladding product. Please visit *www.ascendcompositecladding.com* for more information regarding technical specifications.

TABLE 1: Technical Specifications

Functional Unit Properties	Value	Functional Unit Properties	Value
Mass (kg/m²)	2.6	**R-Value**	2.0
Thickness (mm)	19.1	**Water Vapor Permeance**	Not Applicable
Tensile Strength	Not Applicable	**Liquid Water Absorption**	Not Applicable
Modulus of Elasticity	Not Applicable	**Airborne Sound Reduction**	Not Applicable
U-Value	Not Applicable	**Sound Absorption Reduction**	Not Applicable

Allocation Rules

Allocation was avoided whenever possible, however if it could not be avoided, the following hierarchy of allocation methods was utilized:

- Mass, or other biophysical relationship; and
- Economic value

In the LCA models, mass allocation only had to be used during the end-of-life modules and for packaging. No other allocation was necessary for this EPD and no co-products are created during the cladding manufacturing process.

Treatment of Biogenic Carbon

Cladding products manufactured by Associated Materials do not presently contain bio-based content, and any difference due to biogenic carbon on the GWP results was negligible. In addition, land use change impacts, delayed emissions and carbonation were also not relevant for these type of cladding products as currently manufactured.

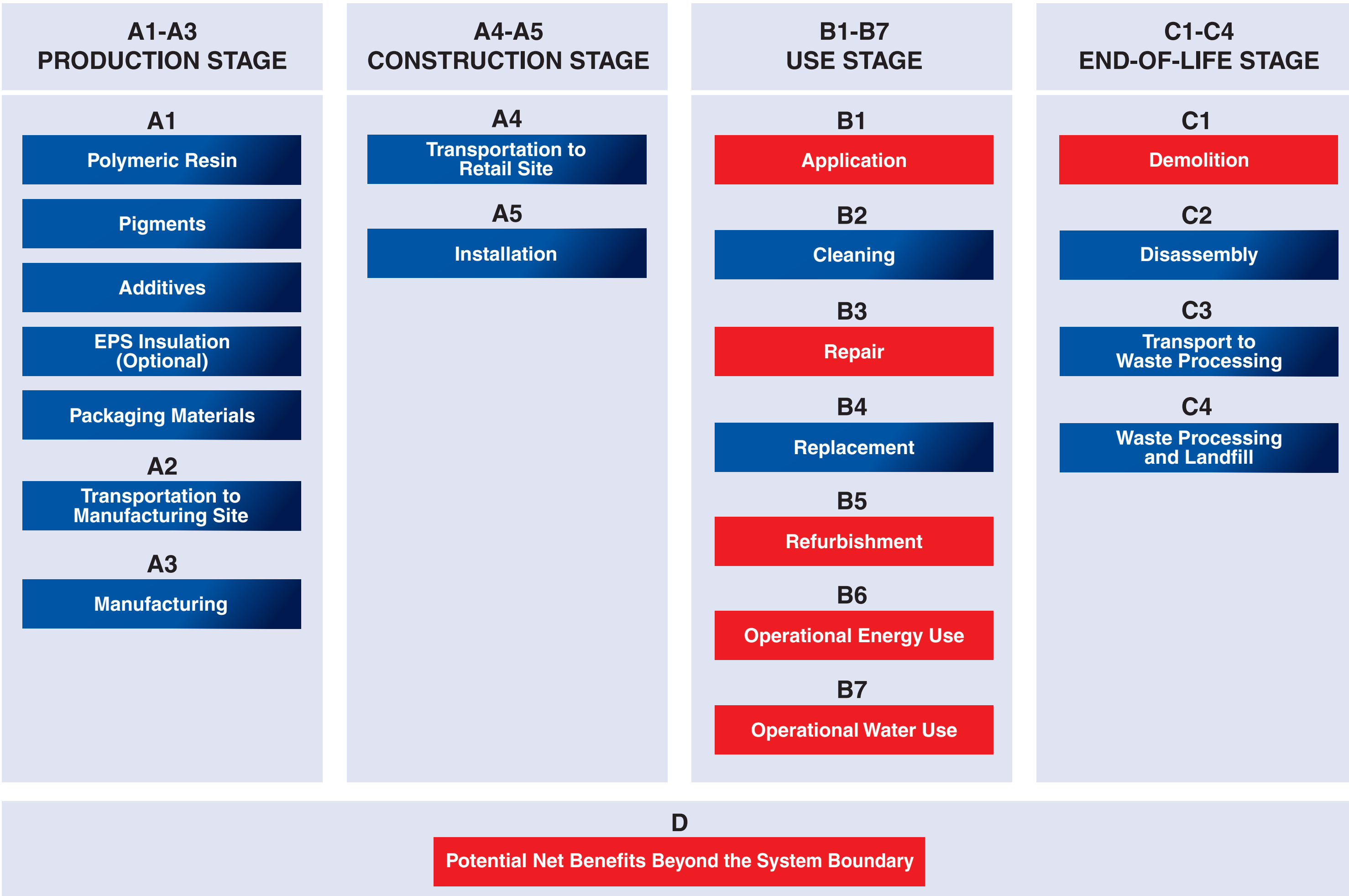
System Boundary

This LCA included all relevant steps in the siding manufacturing process as described in the reference PCR. The system boundary begins with the extraction of raw materials which are extruded to create the siding and ends with the end-of-life modules where the used siding is sent to landfill. Included are all relevant resource extraction, manufacturing, transportation and application steps from A1-C4. Module D was not considered for this EPD. All relevant processes were accounted for by the LCA models.

As described in the reference PCR, the following items were excluded from the assessment, and they were expected to not substantially affect the results.

- Personnel impacts;
- Research and development activities;
- Business travel;
- Capital goods;
- Any secondary packaging;
- All infrastructure including point-of-sale; and
- Any installation tools beyond nails and a nail gun

FIGURE 1: Overview of System Boundary Included in this LCA Report and EPDs
An image of the cradle-grave system boundary appears below. Please note that modules B1, B3, B5, and C1 appear in red as no impacts occur in these modules even though they were considered in the assessment. This is consistent with the industry average EPDs created by the cladding industry.



A brief overview of what occurs in each module appears below:

A1 – RAW MATERIAL SUPPLY
A1 consists of the impacts to make the various raw materials used in siding that are eventually blended and added to an extruder in step A3. A1 also includes the impact of producing the siding fasteners and primary packaging which is identical for all polymeric siding products manufactured by our organization.

A2 – TRANSPORT
A2 consists of transportation of the raw materials to Associated Materials manufacturing sites.

TABLE 2: Transportation Distances for Raw Materials

Step	Distance (Vehicle Type)	Data Source
Raw Materials	423 km (Truck/Diesel)	Primary Data – Average (by Mass) of Raw Material Distance for Cladding
Packaging Container	104 km (Truck/Diesel)	Primary Data – Average of 2022 Data

A3 – MANUFACTURING
A3 consists of the manufacturing process in which a measured quantity of raw materials is added into an extruder where the siding is shaped into the appropriate form and then cut and loaded manually into cardboard boxes where it is loaded onto trucks.

TABLE 3: Production Values

Production Step	Assumption	Comments
Machinery Cleaning (Water)	0.1% of product manufactured by weight	Estimate
Energy Needed to Manufacture	1.61 MJ per square meter	Average of 2022 calendar year of sites making polymeric cladding

A4 – TRANSPORT TO SITE
A4 consists of Associated Materials' transportation to a local distribution center and eventually to an Alside or Gentek retail store where it is purchased by the customer. Customers (contractors and builders) typically transport the materials in a pickup truck to the job site. A pickup truck with a fuel economy of 15 miles per gallon was used in this study. Metrics appear in Table 2 on page 4.

TABLE 4: Transport Assumptions

Step	Distance (Vehicle Type)	Data Source
Truck Utilization Rate	72%	Primary Data – 2022 Data
Gross Density of Products Transported	1530 kg/m³	Primary Data – 2022 Data
Factory-Distribution Center	325 km (Truck/Diesel)	Primary Data – Average of 2022 Data
Distribution Center-Store	563 km (Truck/Diesel)	Primary Data – Average of 2022 Data
Customer to Store	16 km (Pickup Truck/Gasoline)	Primary Data – 2022 Customer Survey

A5– INSTALLATION
A5 consists of the customer installing the siding, typically with a nail gun.

TABLE 5: Installation Specifications/Inputs

Installation Metrics per Functional Unit	Unit	Value
Installation Scrap Rate	%	5%
Ancillary Materials	kg	0.26 (staples/screws)
Product Loss Beyond Functional Unit	kg	0 (included within installation scrap rate)
Waste Materials at Construction Site	kg	0.065
Electricity Consumption – Nailgun	MJ	0.5
Other Resources or Energy Carriers	kg/MJ	N/A
Other Output Materials	kg	0
Mass of Packaging	kg	0.052
Biogenic Carbon in Packaging	kg CO_2e	0 (any negative flows set to zero in LCIs)
Direct Emissions to Air, Water and Soil	kg	N/A
VOC Emissions	g/L	N/A (inherently non-emitting)
Freshwater Consumption	m³	0

B1 – USE
No processes occur during the B1 module.

Alside

B2 – MAINTENANCE
B2 consists of the optional cleaning of the siding by the homeowner.

TABLE 6: Maintenance Inputs/Outputs

Maintenance Metrics	Unit/Description	Value/Frequency
Maintenance Required	Cleaning with water and mild soap solution (optional)	Every 2 Years
Emissions to Air, Water or Soil	kg of water during cleaning	13.99 kg over assumed lifetime of building per m^2
VOC Emissions	g/L	N/A (inherently non-emitting)

TABLE 7: Cleaning Water Values Used in LCA Models

Cleaning Step	Value	Data Source
Consumer Application Cleaning (Water)	378 ml water per m^2 of siding per cleaning event	Estimate

B3 – REPAIR
No processes, emissions, releases or assumptions occur during the B3 module.

B4– REPLACEMENT
B4 consists of replacement of the siding if it has finished its useful life.

TABLE 8: Service Lifetime and Product Specifications

Reference Service Life Metrics	Unit	Value
Reference Service Life	Years	50
Product Specifications	See product literature for details	

TABLE 9: Replacement Inputs/Factors

Replacement Metrics	Units	Value
Assumed Lifetime of Building	Years	75
Replacement Factor	Ratio	0.5
Ancillary Materials (Screws/Staples)	kg	0.13
Energy Inputs – Nailgun	MJ	0.25
Emissions to Air, Water or Soil	kg	N/A
Waste Materials from Repair (Used Siding)	–	–
Freshwater Consumption	m^3	0

B5 – REFURBISHMENT
No processes occur during the B5 module.

C1 – DECONSTRUCTION
The siding and any packaging materials are manually removed and disposed of by the contractor. This process is manual, and no impacts occur during this stage.

C2 – TRANSPORT
The waste materials and used siding are transported via dump truck to sanitary landfill. See Table 2 for transport distances.

TABLE 10: End of Life Assumptions

End of Life Metrics	Unit/Value	Value
Dump Truck to Landfill	96 km (Dump Truck/Diesel)	Conservative Estimate

C3 – WASTE PROCESSING
The waste materials and used siding are processed before being disposed.

C4 – DISPOSAL
C4 consists of the treatment/disposal of the used siding in a sanitary landfill.

TABLE 11: Disposal Assumptions

End of Life Metrics	Unit/Value	Value
Collection Type	Collected with Mixed Construction Waste	100%
Disposal Type	Landfill	100%
Total Disposal Amount	kg	2.88
Removals of Biogenic Carbon (Excluding Packaging)	kg CO2e	N/A

Data Collection Process

As with most cradle-to-grave LCAs, the data was a mix of both primary and secondary sources. Primary source data came solely from Associated Materials' facilities and was represented as an average from the 2022 calendar year.

All chemical contents of the formulas were precisely measured quantities and are accurate in each formula to 0.001%. Because Associated Materials does not manufacture the majority of its raw materials, data for these inputs primarily came from secondary sources such as commercially available LCA databases, industry-derived databases/LCIs, or via suppliers. Since an EPD tool is being developed, all materials that could be used to make vinyl siding were included within the LCIs selected for the tool. With the exception of additives, the key materials used to make polymeric siding are fairly consistent across product lines.

Transportation distances up until point of sale were calculated using Associated Materials' internal data and were based off an average of the 2022 calendar year. When possible, distances were limited to specific materials that were marked for inclusion in the cladding product family. Sale-to-Grave transportation distances and assumptions were representative of an average using Associated Materials' 2022 data (which included customer data for the C modules). These will be used for all cladding products assessed with the tool as they would not vary between product lines.

Energy data was created by averaging the energy usage from the Associated Materials plants that manufacture cladding products. As only the total energy intensity was recorded (i.e. not at the device level), this number was then evenly split across the cladding manufacturing steps.

Installation data was taken from internal data or the use of estimates (water needed for cleaning, for example). In general, alignment with the industry average EPD assumptions was sought unless primary source data was available. This occurred in some of the C modules where Associated Materials' internal installation business had primary source data available.

Finally, per ISO 21930, both the modularity and polluter pays principles were followed in the LCA models.

Treatment of Missing Data

There were rare cases of data being unavailable for intermediate materials used in the manufacturing process. Mostly, this was limited to additives with minimal impacts to the LCA results. However, this did occur. When this occurred, an attempt was made to model the chemical reaction or manufacturing process to create the intermediate material. If this was not possible due to a lack of data (or the information was protected by intellectual property) then a chemical analogue was selected. All analogues are disclosed in the input section of the LCA report below.

Reference PCR Data Requirements

The reference PCR required that primary data be used for operations under direct control of the reporting company and LCIs leading to greater than >15% of the LCIA results. This was achieved in the LCA models. For other areas of the supply chain, using appropriate secondary data was possible. Given the importance of certain raw materials to the LCIA results, Associated Materials did engage the suppliers of any LCI that contributed more than 5% to an impact category. For the most critical LCIs (resin granulates and glass fibers/copolymers), the supplier directed Associated Materials to the most appropriate LCI commercially available and/or one that was developed by an industry association which was imported into LCAFE. The data sources used in the LCA models are described below.

Data Sources and Quality

When primary data was unavailable, data was taken from either Sphera, ecoinvent, or VSI's industry life cycle inventory. A brief description of these databases is below:

TABLE 12: Overview of Databases Used in LCA Models

Database	Comments
Associated Materials	Primary source data taken as an average monthly value over a 12-month average of 2022 relevant facilities operation metrics.
Sphera	DB Version 10.7
ecoinvent	Version 3.4 – Most recent version available in LCAFE
VSI LCI	Most recent version of industry LCI. Last revised in 2022. Created via trade association by SSC and imported in LCAFE.

In general, technological appropriateness was treated as more relevant than geographic representativeness. Ideally, both would match the Associated Materials process, but on some occasions technologically appropriate data was only available for European or broad geographic inventories. This will lead to some uncertainty in the results, but it is not expected to greatly affect the overall performance.

For all truck processes, typical fuel economies were used to ensure reasonable values for their environmental assessment. For passenger vehicle transportation, the US average pickup truck mileage efficiency of 15 miles per gallon was used in the models.

During product installation, it was assumed that no impacts occurred beyond use of a nail gun (necessitating fasteners propelled via compressed air and electricity). During the use phase, some cleaning will be needed. The amount of cleaning water needed per cleaning event was estimated at 0.1 gallons per 1m² of cladding. In addition, it was assumed that a cleaning event would occur every other year (37 total cleaning events). Other ancillary materials were not considered.

Cladding is typically packaged in cardboard. The packaged product is loaded onto pallets for transportation to distribution and often to site. The cardboard was allocated by mass in terms of its eventual end-of-life fate (landfill).

Energy requirements for cladding production were taken from a 12-month average of Associated Materials data in 2022 from the plants that produce a specific cladding product line. Since appliance-level data was unavailable, energy was evenly split between the devices used during the manufacturing process. Specific regional grid mixes were included in the calculator to model the electricity used in these facilities.

Geographic Coverage

All cladding products are manufactured by Associated Materials in either the US or Canada. Regional grid and transportation assumptions were used based on production volume to account for any regional differences between product manufacturing impacts. ASCEND is currently made in our West Salem, OH facility.

Temporal Coverage

Primary data was collected from the relevant manufacturing facilities from the 2022 calendar year. Secondary data reflected the most up-to-date versions of commercially available LCA databases mentioned in this LCA Report.

TABLE 13: Overview of LCA Impact Categories

Global Warming Potential

Global warming is an average increase in the temperature of the atmosphere near the Earth's surface and in the troposphere, which can contribute to changes in global climate patterns. Global warming can occur from a variety of causes, both natural and human induced. In common usage, "global warming" often refers to the warming that can occur as a result of increased emissions of greenhouse gases from human activities (US Environmental Protection Agency 2008b).

Biogenic carbon was both included and excluded in the analysis as stipulated by the PCR.

Ozone Depletion Potential

Ozone within the stratosphere provides protection from radiation, which can lead to increased frequency of skin cancers and cataracts in the human populations. Additionally, ozone has been documented to have effects on crops, other plants, marine life, and human-built materials. Substances which have been reported and linked to decreasing S-10637-OP-1-0 REVISION: 0 DATE: 6/22/2012 Page 13 | 24 Document ID: S-10637-OP-1-0 Date: 7/24/2012 the stratospheric ozone level are chlorofluorocarbons (CFCs) which are used as refrigerants, foam blowing agents, solvents, and halons which are used as fire extinguishing agents (US Environmental Protection Agency 2008j).

Acidification Potential

Acidification is the increasing concentration of hydrogen ion (H+) within a local environment. This can be the result of the addition of acids (e.g., nitric acid and sulfuric acid) into the environment, or by the addition of other substances (e.g., ammonia) which increase the acidity of the environment due to various chemical reactions and/or biological activity, or by natural circumstances such as the change in soil concentrations because of the growth of local plant species n (US Environmental Protection Agency 2008q).

Smog Formulation Potential

Ground level ozone is created by various chemical reactions, which occur between nitrogen oxides (NOx) and volatile organic compounds (VOCs) in sunlight. Human health effects can result in a variety of respiratory issues including increasing symptoms of bronchitis, asthma, and emphysema. Permanent lung damage may result from prolonged exposure to ozone. Ecological impacts include damage to various ecosystems and crop damage. The primary sources of ozone precursors are motor vehicles, electric power utilities and industrial facilities (US Environmental Protection Agency 2008e).

Eutrophication Potential

Eutrophication is the "enrichment of an aquatic ecosystem with nutrients (nitrates, phosphates) that accelerate biological productivity (growth of algae and weeds) and an undesirable accumulation of algal biomass" (US Environmental Protection Agency 2008d).

Abiotic Resource Depletion (Fossil)

Abiotic Resource Depletion (Fossil) measures the consumption of fossil fuel resources faster than it can be replenished. In the TRACI 2.1 Method overview, EPA stresses how critical of an issue resource depletion represents while also noting the difficulty in quantifying it.

Underlying Life Cycle Assessment Methodology

The LCA model was constructed using the LCAFE 10.7 software with a combination of primary and secondary data sources (described in the Inputs and Data Quality Sections below). All modeling was consistent with the reference PCR and results were reported using the TRACI 2.1 characterization factors to satisfy both the requirements of the PCR and ISO 21930.

The overlying manufacturing processes (and therefore LCA steps) are generally the same between polymeric cladding compositions except for the amounts and certain types of raw materials that are added into the product itself.

Cut-Off Rules

The cut-off rules prescribed by the reference PCR required a minimum of 95% of the total mass, energy, and environmental relevance be captured by the LCA models. All cladding compositions were modeled to at least 99.5% of their material content by weight. No significant flows were excluded from the LCA models, and the 5% threshold prescribed by the PCR was not exceeded.

Life Cycle Impact Assessment

The purpose of the Life Cycle Impact Assessment (LCIA) is to show the link between the life cycle inventory results and potential environmental impacts. As such, these results are classified and characterized into several impact categories which are listed and described below. The TRACI 2.1 method was used and the LCIA results are formatted to be conformant with the PCR which was based on ISO 21930. This method is widely accepted for use in the US and is developed by the US EPA. It is important to consider that the LCIA results expressed in this report and any subsequent EPDs are potential impacts, relative, and do not necessarily represent specific risks or damages.

Life Cycle Impact Assessment Results

The LCA results are documented and grouped separately below into the following stages as defined by ISO 21930.

- Total Impact (across the entire cradle-grave lifecycle)
- Product Stage (A1-A3)
- Construction and Design Stage (A4-A5)
- Use and Maintenance Stage (B1-B5)
- End-Of-Life Stage (C1-C4)

No weighting or normalization was done to the results. At this time, it is not recommended to weight the results of the LCA or the subsequent EPD. It is important to remember that LCA results show potential and expected impacts and these should not be used as firm thresholds/ indicators of safety and/or risk. As with all scientific processes, there is uncertainty within the calculation and measurement of all impact categories and care should be taken when interpreting the results.

TABLE 14: LCIA Results for PVC Capstock ASCEND

Impact Category	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	C1	C2	C3	C4	Total
Global Warming Potential	5.68E+00	2.50E-02	5.75E-01	2.50E-02	5.25E-01	0.00E+00	2.00E-02	0.00E+00	3.41E+00	0.00E+00	0.00E+00	1.53E-03	2.50E-02	2.50E-01	1.05E+01
Acidification Potential	2.80E-02	2.88E-04	8.03E-04	3.25E-04	4.53E-03	0.00E+00	2.88E-05	0.00E+00	1.70E-02	0.00E+00	0.00E+00	1.37E-05	6.23E-05	2.88E-03	5.39E-02
Eutrophication Potential	2.02E-03	1.71E-05	6.35E-05	1.96E-05	6.40E-05	0.00E+00	1.05E-05	0.00E+00	1.09E-03	0.00E+00	0.00E+00	8.15E-07	4.58E-06	7.65E-02	7.98E-02
Ozone Depletion Potential	1.34E-08	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	6.71E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.10E-10	2.03E-08
Smog Formation Potential	2.80E-01	6.00E-03	1.21E-02	8.00E-03	3.53E-02	0.00E+00	1.34E-04	0.00E+00	1.71E-01	0.00E+00	0.00E+00	2.85E-04	1.98E-03	3.58E-03	5.18E-01
Resource Depletion Potential	2.04E+01	6.25E-03	1.40E+00	6.33E-02	3.25E-01	0.00E+00	1.00E+00	0.00E+00	1.11E+01	0.00E+00	0.00E+00	3.00E-03	3.45E-02	2.22E-02	3.43E+01

TABLE 15: Resource Metrics for PVC Capstock ASCEND

Resource Metric	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	C1	C2	C3	C4	Total
Non-Renewable Resources (kg)	1.30E+01	0.00E+00	9.60E-01	0.00E+00	0.00E+00	0.00E+00	5.00E-02	0.00E+00	7.00E+00	0.00E+00	0.00E+00	0.00E+00	1.00E-02	5.60E-04	2.11E+01
Renewable Resources (kg)	3.03E+03	2.34E-05	5.17E+02	2.34E-05	1.00E-02	0.00E+00	1.27E+01	0.00E+00	1.77E+03	0.00E+00	0.00E+00	1.11E-06	5.52E+00	4.48E+00	5.34E+03
Non-Renewable Energy Resources (MJ)	1.76E+02	4.90E-01	1.58E+01	4.90E-01	9.83E+00	0.00E+00	7.60E-01	0.00E+00	1.01E+02	0.00E+00	0.00E+00	2.00E-02	2.80E-01	1.70E-01	3.05E+02
Renewable Energy Resources (MJ)	2.71E+01	0.00E+00	2.51E+00	0.00E+00	0.00E+00	0.00E+00	2.00E-02	0.00E+00	1.48E+01	0.00E+00	0.00E+00	0.00E+00	3.00E-02	9.99E-04	4.45E+01
Freshwater Consumption (kg)	3.00E-02	0.00E+00	3.88E-03	0.00E+00	0.00E+00	0.00E+00	1.40E+01	0.00E+00	2.00E-02	0.00E+00	0.00E+00	0.00E+00	6.83E-05	1.29E-05	1.41E+01
Removals of Biogenic Carbon (kg)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nonhazardous Waste (kg)	4.68E+00	0.00E+00	6.10E-01	0.00E+00	0.00E+00	0.00E+00	1.00E-02	0.00E+00	2.64E+00	0.00E+00	0.00E+00	0.00E+00	1.00E-02	0.00E+00	7.95E+00
Hazardous Waste (kg)	1.58E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.26E-11	0.00E+00	1.58E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.15E-06
HL Radioactive Waste (kg)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
LL & IL Radioactive Waste (kg)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Secondary Materials (kg)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Renewable Secondary Fuels (MJ)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Non-Renewable Secondary Fuels (MJ)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Components for Reuse (kg)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Components for Recycling (kg)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for Energy Recovery (MJ)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

TABLE 16: LCIA Results for ASA Capstock ASCEND

Impact Category	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	C1	C2	C3	C4	Total
Global Warming Potential	5.50E+00	2.50E-02	5.75E-01	2.50E-02	5.25E-01	0.00E+00	5.00E-02	0.00E+00	3.33E+00	0.00E+00	0.00E+00	1.53E-03	2.50E-02	2.50E-01	1.03E+01
Acidification Potential	2.50E-02	2.88E-04	8.03E-04	3.25E-04	4.53E-03	0.00E+00	7.20E-05	0.00E+00	1.55E-02	0.00E+00	0.00E+00	1.37E-05	6.23E-05	2.88E-03	4.94E-02
Eutrophication Potential	2.00E-03	1.71E-05	6.35E-05	1.96E-05	6.40E-05	0.00E+00	2.63E-05	0.00E+00	1.08E-03	0.00E+00	0.00E+00	8.15E-07	4.58E-06	7.65E-02	7.98E-02
Ozone Depletion Potential	7.88E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.94E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.10E-10	1.20E-08
Smog Formation Potential	2.68E-01	6.00E-03	1.21E-02	8.00E-03	3.53E-02	0.00E+00	3.35E-04	0.00E+00	1.64E-01	0.00E+00	0.00E+00	2.85E-04	1.98E-03	3.58E-03	4.99E-01
Resource Depletion Potential	2.06E+01	6.25E-02	1.40E+00	6.33E+00	3.25E-01	0.00E+00	3.25E-01	0.00E+00	1.43E+01	0.00E+00	0.00E+00	2.50E-03	2.25E-02	2.20E-02	4.34E+01

TABLE 17: Resource Metrics for ASA Capstock ASCEND

Resource Metric	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	C1	C2	C3	C4	Total
Non-Renewable Resources (kg)	4.44E+00	0.00E+00	9.60E-01	0.00E+00	0.00E+00	0.00E+00	5.00E-02	0.00E+00	5.40E+00	0.00E+00	0.00E+00	0.00E+00	1.00E-02	5.60E-04	1.09E+01
Renewable Resources (kg)	1.11E+03	2.34E-05	5.17E+02	2.34E-05	1.00E-02	0.00E+00	1.27E+01	0.00E+00	1.63E+03	0.00E+00	0.00E+00	1.11E-06	5.52E+00	4.48E+00	3.28E+03
Non-Renewable Energy Resources (MJ)	6.57E+01	4.90E-01	1.58E+01	4.90E-01	9.83E+00	0.00E+00	7.60E-01	0.00E+00	9.24E+01	0.00E+00	0.00E+00	2.00E-02	2.80E-01	1.70E-01	1.86E+02
Renewable Energy Resources (MJ)	1.03E+01	0.00E+00	2.51E+00	0.00E+00	0.00E+00	0.00E+00	2.00E-02	0.00E+00	1.28E+01	0.00E+00	0.00E+00	0.00E+00	3.00E-02	9.99E-04	2.57E+01
Freshwater Consumption (kg)	2.80E-01	0.00E+00	3.88E-03	0.00E+00	0.00E+00	0.00E+00	1.40E+01	0.00E+00	2.00E-02	0.00E+00	0.00E+00	0.00E+00	6.83E-05	1.29E-05	1.43E+01
Removals of Biogenic Carbon (kg)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Nonhazardous Waste (kg)	4.68E+00	0.00E+00	6.10E-01	0.00E+00	0.00E+00	0.00E+00	1.00E-02	0.00E+00	2.64E+00	0.00E+00	0.00E+00	0.00E+00	1.00E-02	0.00E+00	7.95E+00
Hazardous Waste (kg)	1.58E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	4.26E-11	0.00E+00	1.58E-06	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	3.15E-06
HL Radioactive Waste (kg)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
LL & IL Radioactive Waste (kg)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Secondary Materials (kg)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Renewable Secondary Fuels (MJ)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Non-Renewable Secondary Fuels (MJ)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Components for Reuse (kg)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Components for Recycling (kg)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Materials for Energy Recovery (MJ)	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00

Interpretation

All the interpretations below are based on the assumptions used throughout the LCA that we derived from ISO standards, the reference PCR, industry data, and LCA best-practices wherever possible. It should be noted that the results represent a typical instance per functional unit of the product and real-world impacts may vary. Please see the statement on comparability and limitations sections for more detail.

With the exception of Eutrophication, at least 70% of the environmental impact across each impact category was from the raw materials used to make the cladding (A1). The materials with the largest impacts were the polymeric resin, any copolymers, and the EPS backing. This was not surprising given the amount of resources needed to manufacture these intermediate products and also that they typically represent a substantial portion of the product composition (>80%).

The overall impact of the transportation steps was also significant for Global Warming Potential, but as much of it came from transportation outside of Associated Materials' direct control, little can be done by the manufacturer to reduce this impact. Installation and disposal had relatively small impacts relative to raw materials extraction. The partial replacement of the siding after 50 years was a significant impact, but this is due to the raw materials needed to create the replacement siding.

The relatively low impacts (<1% of any impact category) during application and end-of life were expected given the limited inputs needed and outputs generated for these life cycle stages. The one exception to this was eutrophication, for which almost 90% of its impact occurred in module C4. Given that siding is presently disposed of in landfills and no agricultural products are used in its manufacture, this result was reasonable.

It is important to remember that these results are not necessarily designed to support comparison although they are compliant with ISO guidelines to be eligible to do so. EPDs created from different programs may not be compatible. Cases may exist where the selection of different assumptions or methodologies could lead to incompatible results.

Study Completeness

Completeness estimates are subjective as it is impossible for any LCA or inventory to be 100% complete. However, based on expert judgment, it is believed that given the overall data quality that the study is at least 95% complete. As such, at least 95% of system mass, energy, and environmental relevance is covered. No flows comprising more than 1% of mass, energy, or environmental impact was knowingly omitted.

Comparability Requirements, Limitations and Uncertainty

Comparisons cannot be made between product-specific or industry average EPDs at the design stage of a project before a building has been specified. Comparisons may be made between product-specific or industry average EPDs at the time of product purchase when product performance and specifications have been established and serve as a functional unit for comparison. Environmental impact results shall be converted to a functional unit basis before any comparison is attempted.

Any comparison of EPDs shall be subject to the requirements of ISO 21930. EPDs are not comparative assertions and are either not comparable or have limited comparability when they have different system boundaries, are based on different PCRs, or are missing relevant environmental impacts. Such comparisons can be inaccurate and could lead to erroneous selection of materials or products which are higher impact, at least in some impact categories.

In addition, EPDs from different manufacturers may use different LCA tools, Life Cycle Inventories, and/or assumptions that may inherently make results impossible to compare. Finally, there is no measure of overall uncertainty in LCA, and confidence varies between impact categories, meaning caution shall be taken when attempting to compare EPDs.

Comparison of the environmental performance of cladding using EPD information shall be based on the product's use and impacts at the building level, and therefore EPDs may not be used for comparability purposes when not considering the building energy use phase as instructed under this PCR. Full conformance with the PCR for North American Cladding Product Systems allows EPD comparability only when all stages of a Cladding Product System's life cycle have been considered. However, variations and deviations are possible.

Emissions to Water, Soil and to Indoor Air

Given its resilient nature, and since many polymeric siding products have a limited lifetime warranty, no significant emissions to water, soil and/or indoor air are expected to occur. However, during cleaning, dirt and runoff water may be released to the environment. This was captured in the LCA models to the best of our ability given how much variation would occur during actual cleaning events.

Critical Review

Since the goal of this LCA is to create a B2B EPD, it was submitted for review by NSF International. NSF commissioned Mr. Jack Geibig of EcoForm to conduct the formal review.

Additional Environmental Information

Tables 18 and 19 below report the LCIA results for ASCEND per kg of siding for instances where the functional unit, reference service lifetime, or building lifetime may not best represent a specific project.

TABLE 18: LCIA Results for 1 kg PVC Capstock ASCEND

Impact Category	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	C1	C2	C3	C4	Total
Global Warming Potential	2.27E+00	1.00E-02	2.30E-01	1.00E-02	2.10E-01	0.00E+00	2.00E-02	0.00E+00	1.37E+00	0.00E+00	0.00E+00	6.11E-04	1.00E-02	1.00E-01	4.23E+00
Acidification Potential	1.12E-02	1.15E-04	3.21E-04	1.30E-04	1.81E-03	0.00E+00	2.88E-05	0.00E+00	6.79E-03	0.00E+00	0.00E+00	5.49E-06	2.49E-05	1.15E-03	2.16E-02
Eutrophication Potential	8.08E-04	6.85E-06	2.54E-05	7.82E-06	2.56E-05	0.00E+00	1.05E-05	0.00E+00	4.37E-04	0.00E+00	0.00E+00	3.26E-07	1.83E-06	3.06E-02	3.19E-02
Ozone Depletion Potential	5.37E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	2.69E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.38E-11	8.14E-09
Smog Formation Potential	1.12E-01	2.40E-03	4.85E-03	3.20E-03	1.41E-02	0.00E+00	1.34E-04	0.00E+00	6.83E-02	0.00E+00	0.00E+00	1.14E-04	7.93E-04	1.43E-03	2.07E-01
Resource Depletion Potential	8.14E+00	2.50E-03	5.60E-01	2.53E-02	1.30E-01	0.00E+00	1.28E-02	0.00E+00	4.43E+00	0.00E+00	0.00E+00	1.20E-03	1.38E-02	8.88E-03	1.33E+01

TABLE 19: LCIA Results for 1 kg ASA Capstock ASCEND

Impact Category	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	C1	C2	C3	C4	Total
Global Warming Potential	2.20E+00	1.00E-02	2.30E-01	1.00E-02	2.10E-01	0.00E+00	2.00E-02	0.00E+00	1.33E+00	0.00E+00	0.00E+00	6.11E-04	1.00E-02	1.00E-01	4.12E+00
Acidification Potential	1.00E-02	1.15E-04	3.21E-04	1.30E-04	1.81E-03	0.00E+00	2.88E-05	0.00E+00	6.19E-03	0.00E+00	0.00E+00	5.49E-06	2.49E-05	1.15E-03	1.98E-02
Eutrophication Potential	8.00E-04	6.85E-06	2.54E-05	7.82E-06	2.56E-05	0.00E+00	1.05E-05	0.00E+00	4.33E-04	0.00E+00	0.00E+00	3.26E-07	1.83E-06	3.06E-02	3.19E-02
Ozone Depletion Potential	3.15E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	1.58E-09	0.00E+00	0.00E+00	0.00E+00	0.00E+00	8.38E-11	4.81E-09
Smog Formation Potential	1.07E-01	2.40E-03	4.85E-03	3.20E-03	1.41E-02	0.00E+00	1.34E-04	0.00E+00	6.58E-02	0.00E+00	0.00E+00	1.14E-04	7.93E-04	1.43E-03	2.00E-01
Resource Depletion Potential	8.22E+00	2.50E-02	5.60E-01	2.53E+00	1.30E-01	0.00E+00	1.30E-01	0.00E+00	5.73E+00	0.00E+00	0.00E+00	1.00E-03	9.00E-03	8.80E-03	1.73E+01

The use of insulated siding may result in appreciable energy savings for structures in certain climates. Since this benefit was outside the functional unit and scope of the EPD, no estimate regarding potential impact savings was determined for this EPD. Please see the Department of Energy study at the following link for more information: *https://www.energy.gov/eere/buildings/articles/building-america-technology-solutions-new-and-existing-homes-insulated.*

For further information regarding ASCEND including technical data sheets, brochures, or other literature, please visit *https://ascendcompositecladding.com.*

Preferred End-of Life Options for Polymeric Cladding

Please visit *https://www.vinylsiding.org/why-vinyl/sustainability/find-a-vinyl-siding-recycling-center/* for information about disposing vinyl siding. Contact your local municipality for additional information regarding recycling opportunities.

However, given the extremely low recycling rates in North America for post-consumer polymeric siding at this time, all siding was assumed to be sent to landfill for the purposes of the LCA results represented in this EPD. However, Associated Materials actively participates in the Vinyl Siding Institute's Revinylize program which aims to create a nationally-available recycling program for polymeric siding

References

ISO 14025:2006 *Environmental labels and declarations – Type III environmental declarations – Principles and procedures.*

ISO 14040:2006 *Environmental management – Life cycle assessment – Principles and framework.*

ISO 14044:2006 *Environmental management – Life cycle assessment – Requirements and guidelines.*

ISO 21930:2017 *Sustainability in building construction – Environmental declaration of building products.*

Tool for the Reduction and Assessment of Chemical and Other Environmental Impacts (TRACI) TRACI version 2.1. The Environmental Protection Agency. August 2012.

UL Product Category Rule Part B: Cladding Product Systems EPD Requirements – *https://www.ul.com/services/product-category-rules-pcrs*

Vinyl Siding Institute – *https://www.vinylsiding.org/why-vinyl/sustainability/find-a-vinyl-siding-recycling-center/*

Vinyl Siding Institute Industry Average EPDs – *https://www.vinylsiding.org/why-vinyl/sustainability/*

Certified Environmental Product Declaration
www.nsf.org