



# Environmental Product Declaration



Environmental Product Declaration for polyurethane spray foam (SPF) insulation by Canadian Urethane Spray Equipment (CUSE)



## ADMINISTRATIVE INFORMATION

### International Certified Environmental Product Declaration

<b>Declared Product:</b>	This Environmental Product Declaration (EPD) covers spray foam product produced by Canadian Urethane Spray Equipment Declared unit: 1 m2 of installed spray polyurethane foam insulation for RSI = 1
<b>Declaration Owner:</b>	Canadian Urethane Spray Equipment
	5 Colby Court
	Waterloo, Ontario
	www.polymac-usa.com/cuse
<b>Program Operator:</b>	Labeling Sustainability
	Address, 11670 W Sunset Blvd.
	City, State, Los Angeles, CA
	http://labelingsustainability.com/
<b>Product Category Rule:</b>	ISO 21930:2017 Sustainability in buildings and civil engineering works – Core rules for environmental product declarations of construction product and services and Sub Product Category Rule Part B: Building Envelope Thermal Institution EPD Requirements UL 10010-1
	PCR Program Operator: UL Environment, Underwriters Laboratories Inc.
	PCR review was conducted by: Thomas Gloria, PhD
<b>Independent LCA Reviewer and EPD Verifier:</b>	This declaration was independently verified in accordance with ISO 14025:2006
	Independent verification of the declaration, according to ISO 14025:2006
	Internal External X
	Third Party Verifier
	Geoffrey Guest, Certified 3rd Party Verifier under Labeling Sustainability Program ( <a href="http://www.labelingsustainability.com">www.labelingsustainability.com</a> ), CSA Group ( <a href="http://www.csaregistries.ca">www.csaregistries.ca</a> )
<b>Date of Issue:</b>	30 January 2023
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<b>EPD Number:</b>	379516c5-4b4f-4fad-a77a-0a2fc3767e78-2





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## COMPANY DESCRIPTION

Canadian Urethane Spray Equipment (CUSE) is a distributor of premium quality spray foam equipment and the Grizzly Gold Spray Foam Systems. CUSE's goal is to build long term relationships with SPF Contractors in the supply of equipment, parts, and foam systems.

CUSE products are strategically designed to help a contractor's operation to run smoothly by providing contractors with PMC machines for installation. When compared to circuit board-based machines, PMC machines from CUSE last longer, are easier to fix with less required maintenance, and experience less downtime and which equals more profitability. From residential SPF insulation projects to high-volume commercial spray jobs, PMC machines provide the durability and dependability to complete the job. PMC machines are constructed to exacting standards and are 100% guaranteed.

## STUDY GOAL

The intended application of this life cycle assessment (LCA) is to comply with the procedures for creating a Type III environmental product declaration (EPD) and publish the EPD for public review on the website, [www.labelingsustainability.com](http://www.labelingsustainability.com). This level of study is in accordance with EPD Product Category Rule (PCR) for Spray foam insulation published by UL Environment, entitled "Guidance for Building-Related Products and Services Part B: Building Envelope Thermal Insulation EPD Requirements"; International Standards Organization (ISO) 14025:2006 Environmental labels and declarations, Type III environmental declarations-Principles and procedures; ISO 14044:2006 Environmental management, Life cycle assessment- Requirements and guidelines; and ISO 14040:2006 Environmental management, Life cycle assessment-Principles and framework. The performance of this study and its subsequent publishing is in alignment with the business-to-business (B2B) communication requirements for the environmental assessment of building products. The study does not intend to support comparative assertions and is intended to be disclosed to the public.

This project report was commissioned to differentiate Canadian Urethane Spray Equipment from their competition, to generate an advantage for the organization, and improve the environmental performance of Canadian Urethane Spray Equipment by continuously measuring, controlling, and reducing the environmental impacts of their products. This report also complies with Leadership in Energy and Environmental Design (LEED) rating system to help projects achieve their credit goal. The intended audience for this LCA report is Canadian Urethane Spray Equipment employees, their suppliers, project specifiers of their products, architects, and engineers. The EPD report is also available for policy makers, government officials interested in sustainability, academic professors, and LCA professionals. This LCA report does not include product comparisons or other facilities.



## DESCRIPTION OF PRODUCT AND SCOPE

This EPD covers the following Spray Polyurethane Foam (SPF) insulation:

### 1. Grizzly Gold (2lb ccSPF):

Grizzly Gold is a 2lb HFO-blown insulation with a low global warming impact. Grizzly Gold is the first CCMC approved HFO foam system with an ultra-low Global Warming Potential (GWP) of 1. It is an approved air barrier and soil gas barrier that defends against radon and other dangerous gases.

Spray polyurethane foam (SPF) is made on the jobsite by combining polymeric methylene-diphenyl diisocyanate (pMDI/MDI or A-side) with an equal volume of a polyol blend (B-side). Sides A and B react and expand at the point of application in the building envelope to form polyurethane foam. The foamed-in-place SPF provides both thermal insulation and air sealing to the building.

2lb closed-cell, or medium density foam, (ccSPF) provides a water-resistant insulation, air-sealing, water vapor control and delivers added structural performance to the building.

All types of spray polyurethane foam provide insulation (R-value) and air sealing (air-impermeable) when installed at a typical thickness in a building enclosure. The high R-value per inch of closed-cell SPF insulation can reduce assembly thickness and framing materials. These factors should be considered when comparing SPF to similar products and are the reason for the functional unit calculations. The functional unit for thermal insulation is one m<sup>2</sup> of installed insulation material with a thickness that gives an average thermal resistance RSI = 1 m<sup>2</sup>K/W and with a building service life of 75 years (packaging included). The R-value is the manufacturer's representative value for the material's service life and is determined by ASTM C 518 and ASTM C1303, whichever is applicable. The unit for the functional unit mass is kg.

Table 1: Summary of Typical Material Performance Requirements for SPF in Construction

Standard Type	Standard	Types	Grizzly Gold 2lb
Thermal Performance (R-value)	ASTM C518, C177 or C1363	50mm (90 Days)	R 10.9 RSI 1.92
		25mm (90 Days)	-
Corner Wall Test	CAN/ULC-S127	-	330
Flame Spread	CAN/ULC-S102 Steiner Tunnel		Flame 5 Smoke 130
Flame Spread	ASTM E84 Class 1		<25
Core Density	ASTM D1622	-	2.2 lb/ft <sup>3</sup> 34.5 kg/m <sup>3</sup>
Open Cell Content	ASTM D2856 or D6226	-	2.5%
Tensile Strength	ASTM D1623	-	64.5 psi or 445 kPa
Compressive Strength	ASTM D1621	-	25.4 Psi 175 kPa
Dimensional Stability	ASTM D2126	After 28 Days	-20°C, +1.0% 80°C, +1.0% 70°C & 97% ±3%RH, +9.0%
Water Vapor Transmission	ASTM E96	50 mm	0.63 US Perms 36.1 ng/ (Pa·s·m <sup>2</sup> )
Air Permeance	ASTM D E283 or D2178	-	0.002 L/S·m <sup>2</sup>





<b>Water Absorption (% Volume)</b>	ASTM D2842	-	3.3%
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Table 2: Transport to the building site (A4) assumptions used in this study.

<b>Name</b>	<b>Unit</b>	<b>Close Cell / Close cell</b>
<b>Outbound distance from the plant to the jobsite</b>	km	1400

Table 3: Technical Requirements for 1 Functional Unit of Grizzly Gold Product

<b>Grizzly Gold</b>	
<b>RSI @ 25MM</b>	0.96
<b>RSI/MM</b>	0.038
<b>RSI = 1 (mm)</b>	26.0
<b>RSI = 1 (Meters)</b>	0.03
<b>Density kg/m3</b>	34.5

Table 4: Installation (A5) Assumptions used in this study.

<b>Name</b>	<b>Unit</b>	<b>Grizzly Gold (closed cell)</b>
<b>Ancillary materials</b>	kg	0.00436
<b>Electricity consumption</b>	KWh	0.0556
<b>Diesel for construction equipment</b>	MJ	3.68
<b>Product loss per functional unit</b>	Kg	10% loss at installation
<b>Waste materials at the construction site before waste processing, generated by product installation</b>	Kg	Barrels, PPE, and Pallets

This LCA assumes the impacts from the product manufactured in accordance with the standards outlined in this report. This LCA is a cradle-to-grave study





## POLYURETHANE SPRAY FOAM INSTALLATION DESIGN SUMMARY

The following tables provide a polyurethane spray foam installation product considered in this EPD along with key performance parameters.

Table 5: Declared product with Grizzly Gold considered in this environmental product declaration.

Prod#	Unique name/ID	Short description	Product type	Unit	Density, dry kg/Unit	Product Group
1	Grizzly Gold 2lb	A 2lb HFO-blown insulation with low global warming impact.	ccSPF	m2-RSI	34.50	spray foam

Side "A" of the two-part mixture is defined in this study; Side "B" is covered by intellectual property and therefore the composition is listed as substance role in descending order for Grizzly Gold product. The table below is the composition of Side B.

Prod#	Product Name	Ingredients in Descending Order
1	Grizzly Gold 2lb	Polyester Polyol Sucrose Polyol Alcohol Flame Retardant Silicone Surfactant Tertiary Amine Metal Catalyst Surfactant Organic Dye Surfactant Water Blowing Agent

### A1 RAW MATERIAL RECYCLED CONTENT AND MATERIAL LOSSES

CANADIAN URETHANE SPRAY EQUIPMENT does not use recycled materials as non-linear inputs to their product. Any recycled material in this study follows the "Polluter Pays" principle. A standard 2% material loss was used across all categories.

### SYSTEM BOUNDARIES

The following figure depicts the cradle-to-grave system boundary considered in this study:





## Life Cycle Impacts

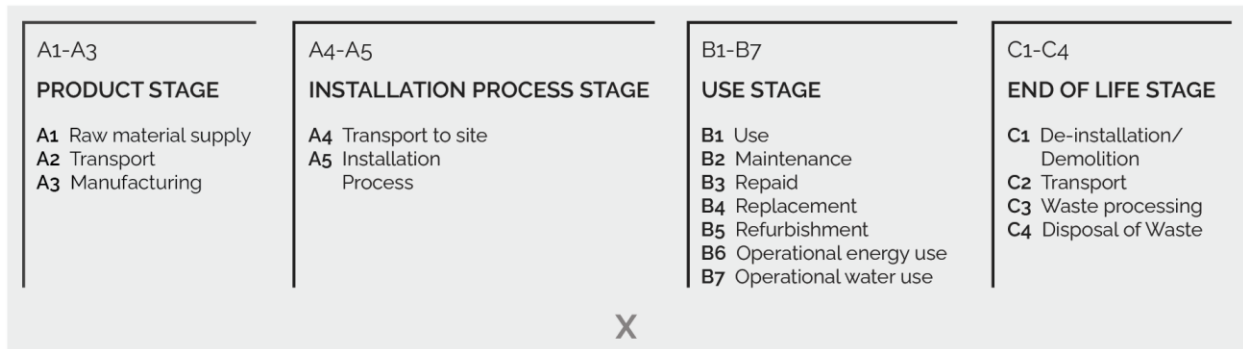


Figure 1: **General life cycle phases for consideration in a construction works system.**

This is a Cradle-to-grave life cycle assessment and the following life cycle stages are included in the study:

- A1: Raw material supply (upstream processes) - Extraction, handling, and processing of the materials used in manufacturing the declared product in this LCA.
- A2: Transportation - Transportation of A1 materials from the supplier to the "gate" of the manufacturing facility (i.e., A3).
- A3: Manufacturing (core processes)- The energy and other utility inputs used to store, move, and manufacturer the declared product and to operate the facility.
- A4: Product plant gate-to-site of use logistics
- A5: Product at-site installation requirements
- B: Product use phase requirements and direct emissions (if applicable)
- C: Product end-of-life requirements

As according to the PCR, the following figure illustrates the general activities and input requirements for producing polyurethane spray foam installation product and is not necessarily exhaustive.

In addition, as according to the relevant PCR, the following requirements are excluded from this study:

- Production, manufacture and construction of A3 building/capital goods and infrastructure.
- Production and manufacture of steel production equipment, steel delivery vehicles, earth-moving equipment, and laboratory equipment;
- Personnel-related activities (travel, furniture, office supplies);
- Energy use related to company management and sales activities.

For this LCA, the manufacturing plant is located in Brantford, Ontario. All operating data is formulated using the actual data from the plant at the above location, including water, energy consumption and waste generation. All inputs for this system boundary are calculated for the plant.

This life cycle inventory was organized in a spreadsheet and was then input into an RStudio environment where pre-calculated LCIA results for relevant product/activities stemming from the ecoinvent v3.8 database and a local EPD database in combination with primary data from Canadian Urethane Spray Equipment were utilized. Explanations of the contribution of each data source to this study are outlined in the section 'Data Sources and Quality'. Further LCI details for the declared product are provided in the sections 'Detailed LCI tables' and 'Transport tables' of the detailed LCA report. A





parameter uncertainty analysis was also performed where key statistical results (e.g., min/mean/max etc.) are provided in the detailed LCA report.

No known flows are deliberately excluded from this EPD.

## CUT-OFF CRITERIA

ISO 14044:2006 and the focus PCR requires the LCA model to contain a minimum of 95% of the total inflows (mass and energy) to the upstream and core modules be included in this study. The cut-off criteria were applied to all other processes unless otherwise noted above as follows. A 1% cut-off is considered for all renewable and non-renewable primary energy consumption and the total mass of inputs within a unit process where the total of the neglected inputs does not exceed 5%.

## DATA SOURCES AND DATA QUALITY ASSESSMENT

No recovered on-site energy occurs at this facility.

Table 7: Reused or recycled components/materials at the A3 facility site

Component/material for re-use/recycling	Value	Units	Re-used/recycled on-site or off-site
Plastic packaging	80052	kg	Off-site
Cardboard packaging	NA	kg	Off-site
Plastic components	335	kg	Off-site
Steel components	538,853	kg	Off-site

The following statements explain how the above facility requirements/generation were derived:

**Raw material transport:** All raw material data are for the reference year 2021. This includes a complete chemical inventory of the product covered in this study to 100 ppm. The transportation was reported using primary CUSE data and consisted of the distance, mode of transport, and location data in the city, state, and country.

There are three types of transportation modeled in this study. The first is from the manufacturing facility to the distributor in distributor-owned trucks, where the average distance to the distributors was used. Secondly is transportation from the manufacturer to the distributor in contracted trucks. In this case, the type of truck has been divided between a typical truck and a refrigerated one. The average distance to those distributors has been used from primary records. Lastly is the transportation from the distributor to the job site. Which is not primary information since it is not sold direct. To include additional transportation, this study uses 25 km as an average distance one-way.

**Electricity:** This study assumes the use of national grid of the Ontario, Canada. Therefore, all primary data gathered was reported using kWh. The product covered in this EPD consist of 99% of the overall product volume; therefore, all electricity was allocated based on that 99% figure.

**Process/space heating:** All primary data was reported using megajoules (MJ). The product covered in this EPD consist of 99% of the overall product volume; therefore, all electricity was allocated based on that 99% figure.



**Fuel required for machinery:** Propane is used to move materials at the facility. Primary data was gathered from the vendor bills for the propane tanks and reported in liters. The product covered in this EPD consists of 99% of the overall product volume; therefore, all electricity was allocated based on that 99% figure.

**Waste generation:** All waste for A3 was calculated using primary information from vendor bills. For hazardous waste the number of barrels was multiplied by the density of the product to get the total kg of disposed material. Transportation defaults were used because the driver's route and ultimate final destination are unknown. Therefore, the exact mileage could not be confirmed by the waste hauler. Transportation for waste in the end-of-life modules also uses default distances set by the PCR.

**Recovered energy:** No on-site energy is recovered on site.

**Recycled/reused material/components:** New barrels and totes are purchased for the products in this study. A new barrel consists of 19.1 kg of steel. A tote is made of HPDE and steel. It weighs 58 kg, 90% of that weight being the HPDE and the remaining 10% steel. After installation, the contractors clean out the steel barrels and the plastic/steel totes and resell them. Because they are worth \$65+ per barrel and there is a recycling and reselling infrastructure, nearly 100% of the barrels and totes are reused.

**Module A1 material losses:** Default material losses, 2%, were used.

**Direct A3 emissions accounting:** Direct emissions at the facility, natural gas, and propane were captured using ecoinvent 3.8 unit processes. Natural gas used the region-specific process for Canada, and the propane used the global unit process, RoW. For additional information on the processes used, see the table outlining A3 processes.

Hydrofluorocarbons (HFCs) were eliminated in the spray polyurethane foams before 2021; Grizzly Gold is formulated without harmful HFCs, resulting in an ultra-low Global Warming Potential (GWP) of 1.0. Compared to closed-cell alternatives that have GWPs ranging from 700-1400, it offers a lower GWP emission value.

**A4 Product transport requirements:** CUSE's product arrives at the job site in two ways. The first is by customer's truck. Large commercial installers will pick up the product directly from company. A total of more than 3,000 barrels were delivered this way, with an average distance to the job site of 600 km. CUSE also contracts with transport companies to transport their product to distributors. The two types of trucks used are regular semis and refrigerated trucks. The frequency distribution is 75% of the time semis are used while 25% of the time a refrigerated truck is used; the combined average distance to the distributor is 1375 km. Since the distance to the job site varies and is one step removed from that information, the same distance of 0.41km/FU was used as it appeared in CUSE the industry average LCA/EPD.

**A5 Product installation:** High-pressure SPF, including open-cell and closed-cell, is installed by professional applicators by on-site mixing of the A-side and B-side chemicals. Side A is purchased and not manufactured at site. Side B is the proprietary ingredients included in this study and manufactured by CUSE. The combination of sides A and B makes up the Functional Unit. Protective equipment such as goggles, protective suits, and respirator cartridges is required to protect applicators from chemical exposure during installation. Also needed are disposable materials such as masking tape and drop





cloths. All of the PPE and drop cloths are assumed to be landfilled. The amount of waste per functional unit is 0.00308 kg.

Typical equipment components that produce high-pressure SPF foam are unpressurized A-side and B-side liquid drums with transfer pumps connected to the proportioner system for heating and pressuring the chemicals. The chemicals then pass through a heated hose connected to a spray gun for application. This system requires electricity and diesel. The system runs on electricity, but in some spaces, there may not be easy access to electricity, so a diesel generator is used. The values used are 0.04 kWh and 2.9 MJ per functional unit for the electricity and diesel, respectively.

Lastly, this study assumes a 3% waste factor during installation and a stepped release of the blowing agent in the Grizzly Gold product. This study assumes 10% of the blowing agent is released during installation.

**B Product use phase:** The Reference Service Life (RSL) of the building is 75 years; therefore, there is only one product application. There is no energy used during the use phase of this product. The PCR states that during the lifetime of products using a blowing agent, 24% of the blowing agent is released.

**C Product end-of-life:** At the end of the Service Life of the building, it is assumed that only manual labor is involved to remove the foam. To align with the PCR, the removed foam (waste) is assumed to be transported 48 km to the disposal site. The spray foam is assumed to be landfilled at end-of-life, as is typical for construction and demolition waste. Per the PCR, 16% of the original physical blowing agent (Grizzly Gold only) is emitted at this stage in the life cycle.

The following tables depict a list of assumed life cycle inventory utilized in the LCA modeling to generate the impact results across the life cycle modules in scope. An assessment of the quality of each LCI activities utilized from various sources is also provided.

Table 8: LCI inputs assumed for module A1 (i.e. raw material supply)

Input	LCI Activity	Data Source	Geo	Year	Technology	Time	Geography	Reliability	Completeness
<b>Tertiary Amine 2</b>	Proprietary	ecoinvent v3.8	Kansas	v3.8 in 2021	2	3	2	3	3
<b>Tertiary Amine 3</b>	Proprietary	ecoinvent v3.8	Multiple Regions	v3.8 in 2021	2	3	2	3	3
<b>Steel Drums</b>	steel production, electric, low-alloyed/steel, low-alloyed/RoW/kg	ecoinvent v3.8	Multiple Regions	v3.8 in 2021	1	3	1	3	3
<b>Tertiary Amine 1</b>	Proprietary	ecoinvent v3.8	Kansas	v3.8 in 2021	2	3	2	3	3
<b>Surfactant 2</b>	Proprietary	ecoinvent v3.8	Ontario	v3.8 in 2021	2	3	2	3	3





<b>Flame Retardant 1</b>	Proprietary	ecoinvent v3.8	Kansas	v3.8 in 2021	2	3	2	3	3
<b>Silicone Surfactant 3</b>	Proprietary	ecoinvent v3.8	Ontario	v3.8 in 2021	2	3	2	3	3
<b>Plastic Wrap (HPDE)</b>	extrusion, plastic film/extrusion, plastic film/RoW/kg	ecoinvent v3.8	Multiple Regions	v3.8 in 2021	1	3	1	3	3
<b>Sucrose Polyol 1</b>	Proprietary	ecoinvent v3.8	NA	v3.8 in 2021	2	3	2	3	3
<b>Polyester Polyol 1</b>	Proprietary	ecoinvent v3.8	Texas	v3.8 in 2021	2	3	2	3	3
<b>Chemical, organic</b>	market for chemical, organic/chemical, organic/GLO/kg	ecoinvent v3.8	Multiple Regions	v3.8 in 2021	2	3	2	3	3
<b>Sucrose Polyol 1</b>	Proprietary	ecoinvent v3.8	Kansas	v3.8 in 2021	2	3	2	3	3
<b>Blowing agent</b>	Proprietary	ecoinvent v3.8	Louisiana	v3.8 in 2021	2	3	2	3	3
<b>Tertiary Amine 2</b>	Proprietary	ecoinvent v3.8	Kansas	v3.8 in 2021	2	3	2	3	3
<b>methylene diphenyl diisocyanate Side A</b>	market for methylene diphenyl diisocyanate/methylene diphenyl diisocyanate/RER/kg	ecoinvent v3.8	Multiple Regions	v3.8 in 2021	2	3	2	3	3
<b>Polyether Amine 2</b>	Proprietary	ecoinvent v3.8	Texas	v3.8 in 2021	2	3	2	3	3
<b>Pallets</b>	EUR-flat pallet production/EUR-flat pallet/RoW/unit	ecoinvent v3.8	Multiple Regions	v3.8 in 2021	1	3	1	3	3
<b>Blowing Agent</b>	tap water production, underground water without treatment/tap water/Europe without Switzerland/kg	ecoinvent v3.8	Ontario	v3.8 in 2021	2	3	2	3	3
<b>Polyether Polyol 1</b>	Proprietary	ecoinvent v3.8	Texas	v3.8 in 2021	2	3	2	3	3

Table 10: LCI inputs assumed for module A3

Input	LCI Activity	Data Source	Geo	Year	Technology	Time	Geography	Reliability	Completeness
<b>Bulk Waste</b>	process-specific burdens, inert material landfill/process-specific burdens, inert	ecoinvent v3.8	Ontario	v3.8 in 2021	2	3	2	3	3





	material landfill/RoW/kg								
<b>Electricity</b>	market for electricity, medium voltage/electricity, medium voltage/CA-ON/kWh	ecoinvent v3.8	Ontario	v3.8 in 2021	2	3	2	3	3
<b>Hazardous Waste</b>	process-specific burdens, residual material landfill/process-specific burdens, residual material landfill/RoW/kg	ecoinvent v3.8	Multiple Regions	v3.8 in 2021	2	3	2	3	3
<b>Natural Gas</b>	heat production, natural gas, at boiler modulating >100kW/heat, district or industrial, natural gas/CA-QC/MJ	ecoinvent v3.8	Ontario	v3.8 in 2021	2	3	2	3	3

Table 11: LCI inputs assumed across modules A4 to C4 (i.e. from plant gate-to-grave if applicable)

Input	LCI Activity	Data Source	Geo	Year	Technology	Time	Geography	Reliability	Completeness
<b>C4. blowing agent release at end of life i.e. 16%</b>	Grizzly Gold	See A3 inputs	C4 relevant region	See A3 inputs	3	A3	3	A3	A3
<b>A5. blowing agent release at installation</b>	Grizzly Gold	See A3 inputs	A5 relevant region	See A3 inputs	3	A3	3	A3	A3
<b>B1. blowing agent release During product life 24%</b>	Grizzly Gold	See A3 inputs	B1 relevant region	See A3 inputs	3	A3	3	A3	A3
<b>A4. Delivery to Jobsite Trucks</b>	Product-to-site transport requirements	See A4 transport requirements	Multiple Regions	2021-01-01 to 2021-12-31	NA	NA	NA	NA	NA
<b>A4. Delivery to Jobsite</b>	market for transport, freight, lorry 3.5-7.5	ecoinvent v3.8	see corrsp.	v3.8 in 2021	2	3	1	3	3





<b>Trucks-freight transport via Truck</b>	metric ton, EURO5/transport, freight, lorry 3.5-7.5 metric ton, EURO5/RoW/tkm		product input above						
<b>A5. Diesel for Installation</b>	diesel, burned in building machine/diesel, burned in building machine/GLO/MJ	ecoinvent v3.8	Multiple Regions	v3.8 in 2021	1	3	1	3	3
<b>A5. Electricity for Installation</b>	market for electricity, medium voltage/electricity, medium voltage/US-NPCC/kWh	ecoinvent v3.8	Multiple Regions	v3.8 in 2021	1	3	1	3	3
<b>A4. HDPE Totes</b>	polyethylene production, high density, granulate/polyethylene, high density, granulate/RoW/kg	ecoinvent v3.8	Multiple Regions	v3.8 in 2021	2	3	2	3	3
<b>A4. HDPE Totes-freight transport via Truck</b>	market for transport, freight, lorry 7.5-16 metric ton, EURO6/transport, freight, lorry 7.5-16 metric ton, EURO6/RoW/tkm	ecoinvent v3.8	see corrsp. product input above	v3.8 in 2021	2	3	1	3	3
<b>A4. Outbound to Distributor Refrigerated Trucks</b>	transport, freight, lorry with refrigeration machine, 7.5-16 ton, EURO3, R134a refrigerant, cooling/transport, freight, lorry with refrigeration machine, 7.5-16 ton, EURO3, R134a refrigerant, cooling/GLO/tkm	ecoinvent v3.8	Multiple Regions	v3.8 in 2021	2	3	2	3	3
<b>A4. Outbound to Distributor Trucks</b>	Product-to-site transport requirements	See A4 transport requirements	Multiple Regions	2021-01-01 to 2021-12-31	NA	NA	NA	NA	NA
<b>A4. Outbound to Distributor Trucks-freight transport via Truck</b>	market for transport, freight, lorry 7.5-16 metric ton, EURO6/transport, freight, lorry 7.5-16 metric ton, EURO6/RoW/tkm	ecoinvent v3.8	see corrsp. product input above	v3.8 in 2021	2	3	1	3	3



<b>C4. Pallet disposal</b>	treatment of waste wood, untreated, municipal incineration/waste wood, untreated/RoW/kg	ecoinvent v3.8	Multiple Regions	v3.8 in 2021	1	3	1	3	3
<b>C4. Pallet disposal-freight transport via Truck</b>	market for transport, freight, lorry 7.5-16 metric ton, EURO6/transport, freight, lorry 7.5-16 metric ton, EURO6/RoW/tkm	ecoinvent v3.8	see corrsp. product input above	v3.8 in 2021	2	3	1	3	3
<b>C4. Plastic wrap landfilled</b>	treatment of waste plastic, mixture, sanitary landfill/waste plastic, mixture/RoW/kg	ecoinvent v3.8	Multiple Regions	v3.8 in 2021	1	3	1	3	3
<b>C4. Plastic wrap landfilled-freight transport via Truck</b>	market for transport, freight, lorry 7.5-16 metric ton, EURO6/transport, freight, lorry 7.5-16 metric ton, EURO6/RoW/tkm	ecoinvent v3.8	see corrsp. product input above	v3.8 in 2021	2	3	1	3	3
<b>A5. PPE Disposal</b>	market for waste textile, soiled/waste textile, soiled/RoW/kg	ecoinvent v3.8	Multiple Regions	v3.8 in 2021	1	3	1	3	3
<b>A5. PPE Disposal-freight transport via Truck</b>	market for transport, freight, lorry 7.5-16 metric ton, EURO6/transport, freight, lorry 7.5-16 metric ton, EURO6/RoW/tkm	ecoinvent v3.8	see corrsp. product input above	v3.8 in 2021	2	3	1	3	3
<b>A5. PPE for installation</b>	textile production, nonwoven polypropylene, spunbond/textile, nonwoven polypropylene/RoW/kg	ecoinvent v3.8	Multiple Regions	v3.8 in 2021	1	3	1	3	3
<b>C4. Recycle Drum</b>	treatment of waste reinforcement steel, recycling/waste reinforcement steel/RoW/kg	ecoinvent v3.8	Multiple Regions	v3.8 in 2021	1	3	1	3	3
<b>C4. Recycle Drum-freight</b>	market for transport, freight, lorry 7.5-16 metric ton, EURO6/transport,	ecoinvent v3.8	see corrsp. product	v3.8 in 2021	2	3	1	3	3







<b>transport via Truck</b>	freight, lorry 7.5-16 metric ton, EURO6/RoW/tkm		input above						
<b>A4. Steel Totes</b>	steel production, electric, low-alloyed/steel, low-alloyed/RoW/kg	ecoinvent v3.8	Multiple Regions	v3.8 in 2021	2	3	2	3	3
<b>A4. Steel Totes- freight transport via Truck</b>	market for transport, freight, lorry 7.5-16 metric ton, EURO6/transport, freight, lorry 7.5-16 metric ton, EURO6/RoW/tkm	ecoinvent v3.8	see corrsp. product input above	v3.8 in 2021	2	3	1	3	3
<b>A4. Truck Pickup at CUSE</b>	Product-to-site transport requirements	See A4 transport requirements	Multiple Regions	2021-01-01 to 2021-12-31	NA	NA	NA	NA	NA
<b>A4. Truck Pickup at CUSE- freight transport via Truck</b>	market for transport, freight, lorry 7.5-16 metric ton, EURO6/transport, freight, lorry 7.5-16 metric ton, EURO6/RoW/tkm	ecoinvent v3.8	see corrsp. product input above	v3.8 in 2021	2	3	1	3	3

## DATA QUALITY ASSESSMENT

Data quality/variability requirements, as specified in the PCR, are applied. This section describes the achieved data quality relative to the ISO 14044:2006 requirements. Data quality is judged based on its precision (measured, calculated or estimated), completeness (e.g., unreported emissions), consistency (degree of uniformity of the methodology applied within a study serving as a data source) and representativeness (geographical, temporal, and technological).

**Precision:** Through measurement and calculation, the manufacturers collected and provided primary data on their annual production. For accuracy, the LCA practitioner and 3rd Party Verifier validated the plant gate-to-gate data.

**Completeness:** All relevant specific processes, including inputs (raw materials, energy and ancillary materials) and outputs (emissions and production volume) were considered and modeled to represent the specified and declared product. The majority of relevant background materials and processes were taken from ecoinvent v3.8 LCI datasets where relatively recent region-specific electricity inputs were utilized. The most relevant EPDs requiring key A1 inputs were also utilized where readily available.

**Consistency:** To ensure consistency, the same modeling structure across the respective product systems was utilized for all inputs, which consisted of raw material inputs and ancillary material, energy flows, water resource inputs, product, and co-products outputs, returned and recovered Spray foam



insulation materials, emissions to air, water and soil, and waste recycling and treatment. The same background LCI datasets from the ecoinvent v3.8 database were used across all product systems. Crosschecks concerning the plausibility of mass and energy flows were continuously conducted. The LCA team conducted mass and energy balances at the plant and selected process level to maintain a high level of consistency.

**Reproducibility:** Internal reproducibility is possible since the data and the models are stored and available in a machine-readable project file for all foreground and background processes, and in Labeling Sustainability's proprietary Spray foam insulation LCA calculator\* for all production facility and product-specific calculations. A considerable level of transparency is provided throughout the detailed LCA report as the specifications and material quantity make-up for the declared product are presented and key primary and secondary LCI data sources are summarized. The provision of more detailed publicly accessible data to allow full external reproducibility was not possible due to reasons of confidentiality.

\*Labeling Sustainability has developed a proprietary tool that allows the calculation of PCR-compliant LCA results for spray foam insulation product designs. The tool auto-calculates results by scaling base-unit Technosphere inputs (i.e., 1 kg sand, 1 kWh electricity, etc.) to replicate the reference flow conversions that take place in any typical LCA software like openLCA or SimaPro. The tool was tested against several LCAs performed in openLCA and the tool generated identical results to those realized in openLCA across every impact category and inventory metric (where comparisons could be readily made).

**Representativeness:** The representativeness of the data is summarized as follows.

- Time related coverage of the manufacturing processes' primary collected data from 2021-01-01 to 2021-12-31.
- Upstream (background) LCI data was either the PCR specified default (if applicable) or more appropriate LCI datasets as found in the country-adjusted ecoinvent v3.8 database.
- Geographical coverage for inputs required by the A3 facility(ies) is representative of its region of focus; other upstream and background processes are based on US, North American, or global average data and adjusted to regional electricity mixes when relevant.
- Technological coverage is typical or average and specific to the participating facilities for all primary data.

## ENVIRONMENTAL INDICATORS AND INVENTORY METRICS

Per the PCR, this EPD supports the life cycle impact assessment indicators and inventory metrics as listed in the tables below. As specified in the PCR, the most recent US EPA Tool for the Reduction and Assessment of Chemical and Other Environmental Impacts (TRACI), impact categories were utilized as they provide a North American context for the mandatory category indicators to be included in the EPD. Additionally, the PCR requires a set of inventory metrics to be reported with the LCIA indicators (see tables below).



Table 12: Life cycle impact categories and life cycle inventory metrics

ID	LCIA.indicators	Abbreviations	Units
1	Environmental impact: acidification	AP	moles of H <sup>+</sup> -Eq
2	Environmental impact: eutrophication	EP	kg N
3	Environmental impact: global warming	GWP	kg CO <sub>2</sub> -Eq
4	Environmental impact: ozone depletion	ODP	kg CFC-11-Eq
5	Environmental impact: photochemical oxidation	PCOP	kg NO <sub>x</sub> -Eq
6	Material resources: metals/minerals: abiotic depletion potential (ADP): elements (ultimate reserves)	ADPe	kg Sb-Eq
7	Energy resources: non-renewable: abiotic depletion potential (ADP): fossil fuels	ADPf	MJ, net calorific value
<b>Inventory metrics</b>			
8	Total primary energy	TPE	MJ-Eq
9	Renewable energy	RE	MJ-Eq
10	Non-renewable energy	NRE	MJ-Eq
11	Non-Renewable Resources	NRR	kg
12	Renewable Resources	RR	m <sup>3</sup>
13	Water depletion: WDP	WDP	m <sup>3</sup>
14	Land filling: bulk waste	LFW	kg waste
15	Land filling: hazardous waste	LFHW	kg waste

It should be noted that emerging LCA impact categories and inventory items are still under development and can have high levels of uncertainty that preclude international acceptance pending further development. Use caution when interpreting data in any of the following categories.

- Renewable primary energy resources as energy (fuel);
- Renewable primary resources as material;
- Non-renewable primary resources as energy (fuel);
- Non-renewable primary resources as material;
- Secondary Materials;
- Renewable secondary fuels;
- Non-renewable secondary fuels;
- Recovered energy;
- Abiotic depletion potential for non-fossil mineral resources.
- Land use related impacts, for example on biodiversity and/or soil fertility;
- Toxicological aspects;
- Emissions from land use change [GWP 100 (land-use change)];
- Hazardous waste disposed;
- Non-hazardous waste disposed;
- High-level radioactive waste;
- Intermediate and low-level radioactive waste;
- Components for reuse;
- Materials for recycling;
- Materials for energy recovery;
- Recovered energy exported from the product system



## TOTAL IMPACT SUMMARY

The following table reports the total LCA results for the product produced at the given polyurethane spray foam installation on a per 1 m<sup>2</sup> of installed spray polyurethane foam insulation for RSI = 1 basis.

Table 14: **Total life cycle (across modules in scope) impact results for Grizzly Gold product, assuming the geometric mean point values on a per 1 m<sup>2</sup> of installed spray polyurethane foam insulation for RSI = 1 basis**

a) Midpoint Impact Categories:

Indicator/LCI Metric	AP	EP	GWP	ODP	PCOP	ADPe	ADPf
Unit	moles of H <sup>+</sup> -Eq	kg N	kg CO <sub>2</sub> -Eq	kg CFC-11-Eq	kg NO <sub>x</sub> -Eq	kg Sb-Eq	MJ, net calorific value
<b>Grizzly Gold</b>	1.53E+00	5.42E-03	4.83E+00	1.06E-06	2.00E-02	1.40E-04	1.04E+02

b) Inventory Metrics:

Indicator/LCI Metric	TPE	RE	NRE	NRR	RR	WDP	LFW	LFHW
Unit	MJ-Eq	MJ-Eq	MJ-Eq	kg	m <sup>3</sup>	m <sup>3</sup>	kg waste	kg waste
<b>Grizzly Gold</b>	1.12E+02	5.19E+00	1.06E+02	2.89E+00	1.18E-04	1.59E-02	9.33E-01	1.04E-04

## ADDITIONAL ENVIRONMENTAL INFO

No regulated substances of very high concern are utilized on site.

## REFERENCES

### ISO Standards:

- ISO 6707-1: 2014 Buildings and Civil Engineering Works - Vocabulary - Part 1: General Terms
- ISO 14021:1999 Environmental Labels and Declarations - Self-declared Environmental Claims (Type II Environmental Labeling)
- 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 14067:2018 Greenhouse Gases – Carbon Footprint of Products – Requirements and Guidelines for Quantification
- ISO 14050:2009 Environmental Management - Vocabulary





- ISO 21930:2017 Sustainability in Building Construction - Environmental Declaration of Building Products

**EN Standards:**

- EN 16757 Sustainability of construction works - Environmental product declarations – Product Category Rules for concrete and concrete elements
- EN 15804 Sustainability of construction works - Environmental product declarations -Core rules for the product category of construction products

**Other References:**

- USGBC LEED v4 for Building Design and Construction, 11 Jan 2019 available at <https://www.usgbc.org/resources/pcr-committee-process-resources-part-b>
- USGBC PCR Committee Process & Resources: Part B, USGBC, 7 July 2017 available at <https://www.usgbc.org/resources/pcr-committee-process-resources-part-b>.
- US EPA (2020) Advancing Sustainable Materials Management: 2018 Fact Sheet, [https://www.epa.gov/sites/production/files/2021-01/documents/2018\\_ff\\_fact\\_sheet\\_dec\\_2020\\_fnl\\_508.pdf](https://www.epa.gov/sites/production/files/2021-01/documents/2018_ff_fact_sheet_dec_2020_fnl_508.pdf)

